ID7
e-document
FILED
FEDERAL COURT OF APPEAL
COUR D'APPEL FÉDÉRALE
DÉPOSÉ
11-APR-2025
Natalie Wong
VAN
6

Federal Court of Appeal File No. A-51-25
Federal Court File No. T-294-25

FEDERAL COURT OF APPEAL

CANADIAN FOOD INSPECTION AGENCY

Appellant
(Respondent)

and

UNIVERSAL OSTRICH FARMS INC.

Respondent
(Applicant)

APPEAL BOOK

Attorney General of Canada
Department of Justice Canada
British Columbia Region
National Litigation Sector
900 – 840 Howe Street
Vancouver, BC V6Z 2S9

Per: Aileen Jones, Banafsheh Sokhansanj and, Paul Saunders

Tel: (604) 666-2061
Fax: (604) 666-2760
Email: Aileen.Jones@justice.gc.ca
Banafsheh.Sokhansanj@justice.gc.ca;
Paul.Saunders@justice.gc.ca

Counsel for the Appellant

Cleveland Doan LLP
1321 Johnston Road
White Rock, BC V4B 3Z3

Per: Michael D. Carter

Tel: (604) 536-5002
Fax: (604) 536-5007
Email:
michael@clevelanddoan.com

Counsel for the Respondent

INDEX

TAB	DESCRIPTION	PAGE NO.
	Originating Documents	
1.	Notice of Appeal issued February 10, 2025	1
	Orders and Decisions	
2.	Order of the Honourable Mr. Justice Battista dated January 31, 2025 (Injunction Decision)	6
	Pleadings from the First Instance	
3.	Notice of Application dated January 30, 2025	9
4.	Notice of Motion dated January 30, 2025	21
	Affidavits	
5.	Affidavit of David Bilinski affirmed January 29, 2025	33
	Exhibit A – Government of Alberta – Biography of Dr. Robert Bertram Church	45
	Exhibit B - Kazuhide Adachi et al, "Development of neutralization antibodies against highly pathogenic H5N1 avian influenza virus using ostrich (Struthio camelus) yolk", (2008) Molecular Medicine Reports 203.	49
	Exhibit C – Statistics Canada – 2021 Census of Population for Edgewood, BC	54
	Exhibit D – BC Ministry of Agriculture – Animal Health Centre Final Report AHC Case 20-832 dated February 10, 2020	56
	Exhibit E – Email and attachments from CFIA West AI Sick Bird to Universal Ostrich re Quarantine documents 4206 Q dated December 31, 2024	57
	Exhibit F – Email and attachments from CFIA Case Officer to Universal Ostrich re Initial Documents BC-820-IP-233 dated January 2, 2025	67
	Exhibit G – Email from CFIA Case Officer to Universal Ostrich re Exemption from Depopulation Required Documents dated January 2, 2025	98

TAB	DESCRIPTION	PAGE NO.
	Exhibit H – Email from CFIA West AI Compensation to Universal Ostrich re BC-IP-233 Compensation Information dated January 3, 2025	100
	Exhibit I – Letter from CFIA re Distinct Unit Evaluation and request for exemption from destruction order issued on December 31, 2024 for Ostriches on BC-820-IP-233 (Universal Ostrich Farm Inc., Edgewood, BC) dated January 10, 2025	140
	Exhibit J – Email and attachments from CFIA Case Officer to Universal Ostrich re BC-IP-233 Amended Legal Docs, Feed Delivery, Biocontainment Plan, Future Plans dated January 14, 2025	143
	Exhibit K – Email from CFIA Case Officer Lead to Universal Ostrich re BC-IP-233 Response to Questions dated January 15, 2025	155
	Exhibit L – Email from CFIA Case Officer to Universal Ostrich re Amended control documents – BC IP 233 Universal Ostrich dated January 24, 2025	159
6.	Affidavit of Karen Espersen affirmed January 29, 2025	161
	Exhibit A – Letter from UBC to Universal Ostrich dated March 20, 2010	163
7.	Affidavit of Dr. Steven Pelech affirmed January 30, 2025	164
	Exhibit A – Expert Report of Dr. Steven Pelech – Risk of H5N1 influenza transmission from Ostriches located at Universal Ostrich Farms Ltd. dated January 29, 2025	165
8.	Affidavit of Katrina Jones sworn January 30, 2025	310
	Exhibit A – Canadian Food Inspection Agency – Role of the World Organization for Animal Health	313
	Exhibit B – World Organization for Animal Heath – Terrestrial Animal Health Code • Chapter 10.4 – Infection with High Pathogenicity Avian Influenza Viruses • Glossary	316

TAB	DESCRIPTION	PAGE NO.
	• Section 5 – Trade Measures, Import / Export Procedures and Veterinary Certification	
	Exhibit C - World Organization for Animal Heath – Manual of Diagnostic Test and Vaccines for Terrestrial Animals • Chapter 3.3.4 – Avian Influenza (including Infection with High Pathogenicity Avian Influenza Viruses) • Appendix 3.3.4.1 – Biosafety Guidelines for Handling High Pathogenicity Avian Influenza Viruses in Veterinary Diagnostic Laboratories	342
	Exhibit D – Canadian Food Inspection Agency - Overview of how Canada prevents, prepares and responds to bird flu outbreaks	370
	Exhibit E – Canadian Food Inspection Agency – Highly Pathogenic Avian Influenza Vaccination Task Force	382
	Exhibit F – Canadian Food Inspection Agency – Avian Influenza Overview, 2.7 Immunity	387
	Exhibit G – Canadian Food Inspection Agency – Open and Transparent Agency Policy	388
	Exhibit H – Canadian Food Inspection Agency – CFIA's Policy for Providing Guidance on Regulatory Requirements	404
	Exhibit I – Innovation, Science and Economic Development Canada – Field-ready Lateral Flow Test for Avian Influenza	411
	Exhibit J – Canadian Food Inspection Agency – Latest Bird Flu Situation	433
	Exhibit K – Google Maps – Castlegar to Edgewood, British Columbia	436
	Exhibit M – Invoice from Universal Ostrich to Mountain Man Dog Sled Adventures	438
9.	Affidavit of Michael Carter sworn January 30, 2025	440
	Exhibit A – Certificate Concerning Code of Conduct for Expert Witnesses dated January 29, 2025	441

TAB	DESCRIPTION	PAGE NO.
	Exhibit B – Expert Report of Dr. Jeff Wilson – Expert Testimony regarding High Pathogenic Avian Influenza (HPAI) in Ostriches – Request for Stay of Execution dated January 30, 2025	443
10.	Affidavit of Cathy Furness affirmed January 30, 2025	537
	Exhibit A – World Organization for Animal Heath – Terrestrial Animal Health Code, Chapter 10.4 – Infection with High Pathogenicity Avian Influenza Viruses	545
	Exhibit B – World Organization for Animal Heath – Terrestrial Animal Health Code, Glossary	558
	Exhibit C – Canadian Food Inspection Agency Order dated December 31, 2024	569
	Exhibit D – Letter from CFIA re Distinct Unit Evaluation and request for exemption from destruction order issued on December 31, 2024 for Ostriches on BC-820-IP-233 (Universal Ostrich Farm Inc., Edgewood, BC) dated January 10, 2025	573
Other Relevant Documents		
11.	Transcript of Proceedings from the Injunction Hearing on January 31, 2025	576
12.	Notice of Motion dated February 7, 2025 (Rule 397 Clarification Motion)	669
13.	Order and Reasons of the Honourable Mr. Justice Battista dated February 17, 2025 (Rule 397 Clarification Motion)	674
14.	Agreement on Appeal Book Contents dated March 12, 2025	679
15.	Certificate of Completeness of Appeal Book dated April 10, 2025	685

e-document-é A-51-25-ID 1
FILED FEDERAL COURT OF APPEAL COUR D'APPEL FÉDÉRALE DÉPOSÉ
February 10, 2025
10 février 2025
Natalie Wong
VAN 1

Federal Court of Appeal File No.: _____
Federal Court File No.: T-294-25

FEDERAL COURT OF APPEAL

CANADIAN FOOD INSPECTION AGENCY

Appellant

AND

UNIVERSAL OSTRICH FARMS INC.

Respondent

NOTICE OF APPEAL

TO: Universal Ostrich Farms Inc. (the "Respondent")

A LEGAL PROCEEDING HAS BEEN COMMENCED by the Appellant. The relief claimed by the appellant appears on the following page.

THIS APPEAL will be heard by the Court at a time and place to be fixed by the Judicial Administrator. Unless the Court directs otherwise, the place of hearing will be as requested by the appellant. The appellant requests that this appeal be heard at 701 West Georgia Street, Vancouver, British Columbia.

IF YOU WISH TO OPPOSE THIS APPEAL, to receive notice of any step in the appeal or to be served with any documents in the appeal, you or a solicitor acting for you must prepare a notice of appearance in Form 341A prescribed by the *Federal Courts Rules*, and serve it on the appellant's solicitor, or where the appellant is self-represented, on the appellant, WITHIN 10 DAYS after being served with this notice of appeal.

IF YOU INTEND TO SEEK A DIFFERENT DISPOSITION of the order appealed from, you must serve and file a notice of cross-appeal in Form 341B prescribed by the *Federal Courts Rules*, instead of serving and filing a notice of appeal.

Copies of the *Federal Courts Rules*, information concerning the local offices of the Court and other necessary information may be obtained on request to the Administrator of this Court at Ottawa (613-992-4283) or at any local office.

IF YOU FAIL TO OPPOSE THIS APPEAL, JUDGEMENT MAY BE GIVEN IN YOUR ABSENCE AND WITHOUT FURTHER NOTICE TO YOU.

Date: February 10, 2025 *Issued by:* NATALIE WONG
REGISTRY OFFICER
AGENT DU GREFFE
(Registry Officer)

Address of local office:

Federal Court of Appeal
701 West Georgia Street
Vancouver, BC V7Y 1K8

TO: Universal Ostrich Farms Inc. (Respondent)
301 Langille Road
Edgewood, BC V0G 1J0

APPEAL

THE APPELLANT APPEALS to the Federal Court of Appeal from the order of the Honourable Justice Battista ("Motions Judge") dated January 31, 2025 (Court File No. T-294-25) ("Order"), by which the Motion Judge granted the Respondent's motion for an interlocutory injunction staying a notice dated December 31, 2024 requiring the Respondent to dispose of their ostriches by February 1, 2025 pursuant to subsection 48(1) of the *Health of Animal Act*, SC 1990, c 21 ("Notice").

THE APPELLANT ASKS that this Honourable Court:

(a) allow the appeal and set aside the Order; and

(b) grant such further and other relief as counsel may advise and this Honourable Court may permit.

THE GROUNDS OF APPEAL are as follows:

1. The Motions Judge erred in law and in principle, and/or seriously misapprehended the facts, in:

    a. finding that irreparable harm "in the form of the closure of its 25-year old business and the loss of the [Respondent's] decades-long efforts in cultivating a unique herd of ostriches" would flow to the Respondent if an injunction were not granted, notwithstanding that the injunction motion was only in respect of the Notice and not in respect of the Minister's authority to dispose of the ostriches pursuant to subsection 48(1) of the *Health of Animals Act* if the Respondent did not do so; and

    b. finding that the balance of convenience favoured granting the injunction, including by:

        i. erroneously concluding that not issuing the injunction would render the underlying application moot;

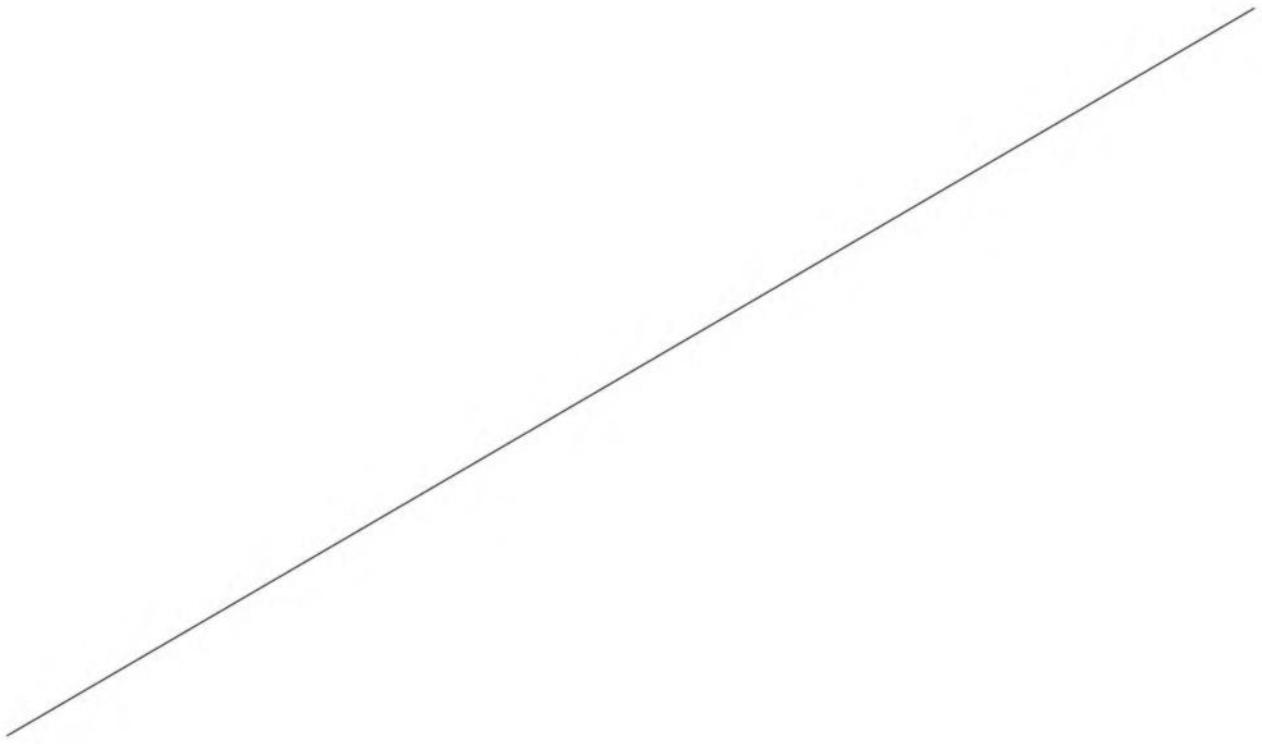
        ii. finding that the Appellant has "a range of options under the *HAA* [*Health of Animal Act*] to address its concerns regarding public

safety", when there were no options other than disposal of the ostriches; and

iii. failing to account for or seriously misapprehending the facts concerning public interest factors that overwhelmingly favoured not issuing an injunction.

2. To the extent the Motions Judge made an order enjoining the Minister from disposing of Universal's ostriches under subsection 48(1) of the *Health of Animals Act*, or pursuant to the Minister's authority under other sections of that *Act*, the Motions Judge erred in law and in principle, including by exceeding his jurisdiction. On February 7, 2025, the Appellant filed a motion in Federal Court file T-294-25, seeking clarification as to the scope of the Federal Court's January 31, 2025 Order, including whether the Order was intended to enjoin the Minister from disposing of Universal's ostriches under subsection 48(1) of the *Health of Animals Act.*

3. Such further and other grounds as counsel may advise and this Honourable Court may permit.



4. The Appellant relies on, *inter alia*:

    a. *Health of Animals Act,* SC 1990, c 21, including s. 48, and regulations made under that Act;

    b. *Canadian Food Inspection Agency Act*, SC 1997, c 6; and

    c. Such other and further legislation and materials as counsel may advise and this Honourable Court may permit.

Dated: February 10, 2025

I HEREBY CERTIFY that the above document is a true copy of the original issued out of/filed in the Court on the 10 day of FEB A.D. 20 25
Dated this 10 day of FEB 20 25
NATALIE WONG
REGISTRY OFFICER
AGENT DU GREFFE

Counsel for the Appellant
Attorney General of Canada
Department of Justice
British Columbia Region
National Litigation Sector
900 – 840 Howe Street
Vancouver, BC V6Z 2S9

Per: Aileen Jones
Paul Saunders

Tel: (604) 666-1296
Fax: (604) 775-5942

Email: aileen.jones@justice.gc.ca
paul.saunders@justice.gc.ca

Counsel for the Appellant

Federal Court Cour fédérale

Date: 20250131

Docket: T-294-25

Toronto, Ontario, January 31, 2025

PRESENT: The Honourable Justice Battista

BETWEEN:

UNIVERSAL OSTRICH FARMS INC.

Applicant

and

CANADIAN FOOD INSPECTION AGENCY

Respondent

ORDER

UPON the Applicant's motion for an injunction prohibiting the execution of the Notice issued by the Canadian Food Inspection Agency [CFIA] on December 31, 2024, requiring the Applicant to dispose of animals in its possession, and for an amendment to the Requirement to Quarantine notice dated December 28, 2024;

AND UPON considering that a party seeking an injunction must satisfy the following three-part test: (1) that the application for judicial review raises a "serious question to be tried"; (2) that the moving party will suffer irreparable harm if a stay were refused; and (3) that the balance of convenience (*i.e.*, the assessment of which party would suffer greater harm from the granting or

refusal of the stay pending a decision on the merits) favours granting the stay (*RJR-MacDonald Inc v Canada (Attorney General)*, 1994 CanLII 117 (SCC), [1994] 1 SCR 311 [*RJR*] at 334);

AND UPON considering that the Applicant has demonstrated that the main application raises at least two serious questions, first, whether the Notice requiring disposal of the animals was reasonable in light of the discretion available to the Respondent to require either disposal or vaccination of the animals under subsections 48(1) and (2), respectively, of the *Health of Animals Act*, SC 1990, c 21 [*HAA*] (*Canada (Minister of Citizenship and Immigration) v Vavilov*, 2019 SCC 65 at para 108) and second, whether the Notice is an incursion upon provincial responsibility under the *British Columbia Animal Health Act*, SBC 2014, c 16;

AND UPON being satisfied that the Applicant has demonstrated that irreparable harm would result if the injunction is not granted, in the form of the closure of its 25-year old business and the loss of the Applicant's decades-long efforts in cultivating a unique herd of ostriches;

AND UPON being satisfied that the balance of convenience favours the Applicant in granting the Order, considering that refusing the injunction would expose the Applicant to irreparable harm and render the main application for judicial review moot, and that the Respondent has a range of options under the *HAA* to address its concerns regarding public safety;

THIS COURT ORDERS that:

1. The Notice dated December 31, 2024 requiring the Applicant to dispose of the ostriches pursuant to subsection 48(1) of the *HAA*, is stayed until a decision is rendered in the underlying application for judicial review;

2. The request to amend the Requirement to Quarantine notice is denied;

3. There is no order regarding costs.

"Michael Battista"
Judge

FILED / DÉPOSÉ
FEDERAL COURT
COUR FÉDÉRALE
January 30, 2025
30 janvier 2025
Court
Svetlana Dobrota
VAN 1

FEDERAL COURT

UNIVERSAL OSTRICH FARMS INC.

APPLICANT

- and -

CANADIAN FOOD INSPECTION AGENCY

RESPONDENT

APPLICATION UNDER THE *FEDERAL COURTS ACT*,
R.S.C. 1985, C. F-7, S. 18.1

NOTICE OF APPLICATION

TO THE RESPONDENT:

A PROCEEDING HAS BEEN COMMENCED AGAINST YOU by the applicant. The relief claimed by the applicant appears below.

THIS APPLICATION will be heard by the Court at a time and place to be fixed by the Judicial Administrator. Unless the Court orders otherwise, the place of hearing will be as requested by the applicant. The applicant requests that this application be heard at (*place where Federal Court ordinarily sits*).

IF YOU WISH TO OPPOSE THIS APPLICATION, to receive notice of any step in the application or to be served with any documents in the application, you or a solicitor acting for you must file a notice of appearance in Form 305 prescribed by the *Federal Courts Rules* and serve it on the applicant's solicitor or, if the applicant is self-represented, on the applicant, WITHIN 10 DAYS after being served with this notice of application.

Copies of the *Federal Courts Rules*, information concerning the local offices of the Court and other necessary information may be obtained on request to the Administrator of this Court at Ottawa (telephone 613-992-4238) or at any local office.

IF YOU FAIL TO OPPOSE THIS APPLICATION, JUDGMENT MAY BE GIVEN IN YOUR ABSENCE AND WITHOUT FURTHER NOTICE TO YOU.

January 30, 2025

Issued by: Original signed by Svetlana Dobrota

Address of local office:
BOX 10065
701 West Georgia Street,
Vancouver, BC V7Y 1B6

TO: CANADIAN FOOD INSPECTION AGENCY

Department of Justice Canada

Attention: Paul Saunders

900 – 840 Howe Street

Vancouver, BC V6Z 2S9

AND TO: Minister of Justice and Attorney General of Canada

c/o Deputy Attorney General of Canada

Office of the Deputy Attorney General of Canada

284 Wellington Street

Ottawa, ON K1A 0H8

Application

This is an application for judicial review in respect of:

1. A notice issued by the Canadian Food Inspection Agency ("CFIA") dated December 31, 2024, requiring the Applicant, Universal Ostrich Farms Inc. to dispose of all poultry and poultry carcasses along with other material approved by the CFIA disposal crew from the UOF's premises, pursuant to s.48(1) of the *Health of Animals Act*, by February 1, 2025.

The Applicant makes an application for:

1. An order of certiorari to quash the decision of the Canadian Food Inspection Agency ("CFIA") dated December 31, 2024, requiring the Applicant to dispose of its animals or things by February 1, 2025 (the "December Decision"); and

2. Costs.

The grounds for the application are:

1. The Applicant relies on the following statutes and statutory provisions:

    i. *Federal Courts Act* (R.S.C., 1985, c. F-7) s.18.1;

    ii. *Federal Courts Rules* (SOR/98-106) part 5;

    iii. *Health of Animals Act* (S.C. 1990, c. 21) s. 48;

    iv. *Animal Health Act* (SBC 2014, c. 16); and

    v. The *Canadian Charter of Rights and Freedoms*

Universal Ostrich Farms Inc. and the December Decision

2. UOF raises ostriches on a 58 acre parcel of land located about 10 kilometres outside of Edgewood, British Columbia (the "Property").

3. The principals of UOF are Karen Espersen ("Ms. Espersen") and David Bilinsky ("Mr. Bilinsky").

4. Ms. Espersen and Mr. Bilinsky have been raising ostriches since the early 1990s.

5. Mr. Bilinsky, who has training in genetics, entered the ostrich industry in 1993 with Dr. Robert Church, who was a pioneer of molecular genetics and embryo transfer technology at the University of Calgary.

6. They started a company that began importing specially selected, large ostriches from Africa. They grew the company into the largest ostrich farm in Canada and it became the leading producer of large body ostriches.

7. Ostriches are different from other "poultry" in that, amongst other things, they:

   i. are flightless;

   ii. have red meat;

   iii. weigh up to 350 pounds;

   iv. measure up to 12 feet in height;

   v. run up to 70km/hour;

   vi. live up to 75 years of age;

   vii. take about three and a half years for ostrich hens to become good breeders;

   viii. have a robust immune system; and

   ix. have a high, individual economic value.

8. Ms. Espersen began working with Mr. Bilinsky in 1995 and UOF was formed in the early 2000s.

9. Together they spent the next 32 years selectively breeding the ostriches and improving the genetics to create a large, healthy bloodline of ostrich.

10. When the Covid 19 pandemic began in March 2020 it essentially shut down UOF's business.

11. Mr. Bilinsky and Ms. Espersen then became involved in scientific research that was being conducted on antibodies appearing in ostrich eggs.

12. Ostrich eggs are uniquely suited for developing antibodies because the yolks are large and a high concentration of antibodies appears in the yolks after an immune reaction occurs.

13. UOF then began working with a company that was developing protocols to produce antibodies for Covid 19. From there the scientific research led to developing many other opportunities for utilizing antibodies in the egg yolks.

14. UOF also began working closely with Dr. Tsukamoto and a group of researchers from Kyoto Prefecture University in Japan. This research was directed towards

producing and extracting IgY (immune globin yolk) antibodies from the UOF ostrich eggs.

15. From there UOF began a venture with Struthio Bio Science Inc. and entered into an agreement to provide Struthio with ostrich eggs, which would then be used to extract antibodies.

16. Since 2020 UOF has been entirely dedicated to the production of antibodies with its ostrich herd. It is not a commercial poultry facility and it does not produce any ostrich meat or eggs for human consumption.

17. UOF had approximately 450 ostriches as of early December, 2024.

18. In mid-December, 2024 some of UOF's ostriches were showing signs of illness, and then some began to die.

19. On December 30, 2024 CFIA tested two dead ostriches with swab samples and took them for analysis.

20. On December 31, 2024 CFIA issued a quarantine order, and later advised UOF that the test was positive for H5N1 Avian Influenza.

21. On January 2, 2025 CFIA issued the December Decision, which was dated December 31, 2024.

22. Vaccinations were available for the UOF ostriches but CFIA would not permit UOF to treat or test the ostriches.

23. On January 2, 2025 a CFIA representative told UOF that, based on the information CFIA had gathered, the UOF ostriches fall into the "birds classified as having rare and valuable genetics", which provided an exemption from the December Decision.

24. The CFIA representative told UOF to send documents regarding their cooperation with Dr. Tsukamoto, which UOF did.

25. On January 10, 2025 CFIA denied the exemption saying the exemption requires a "significant burden of proof" and "robust processes must be in place".

26. CFIA had not disclosed to UOF the test or burden of proof. Instead, UOF thought CFIA had already placed the ostriches in the "bird classified as having rare and valuable genetics category".

27. If CFIA had told UOF about the "significant burden of proof" then it would have changed UOF's approach to the exemption process.

28. Ostriches have robust immune systems, and by mid-January 2025 the herd had recovered from the illness.

29. Although 69 ostriches died, the last ostrich to die from H5N1 type symptoms was on January 15, 2025.

30. A term of the quarantine order prohibits UOF from testing or treating the ostriches. However, based on expert opinions obtained, it is highly likely the ostriches have reached herd immunity, and it is extremely unlikely they would be shedding the virus to each other, or people, birds, and other animals.

31. In fact, the opinion suggests it is safer to keep the ostriches with herd immunity, rather than killing them and bringing in ostriches without the immunity.

32. There are approximately 390 ostriches that are now healthy, but the December Decision mandates that they be killed.

CFIA Breached the Principles of Natural Justice and Procedural Fairness

33. On January 2, 2025, the CFIA case officer advised the UOF that its ostriches fell into the "birds classified as having rare and valuable genetics" category and outlined a brief list of documents that UOF would need to provide to CFIA for the purposes of completing the "exemption from depopulation" process. UOF provided the CFIA with the requested documentation within a matter of days.

34. In its decision letter dated January 10, 2025, CFIA advised that UOF's request for an exemption to depopulation of its ostriches based on them having "rare and valuable poultry genetics" was denied (the "Exemption Decision").

35. The CFIA failed to observe procedural fairness in making its Exemption Decision.

36. Administrative decision-makers, generally, must also observe procedural fairness in the implementation of statutes (*Brown v. Canada (Citizenship and Immigration)*, 2020 FCA 130 at para 138.).

37. Where a decision involves the potential for significant impact or harm on the party whose conduct is at issue, greater procedural protection is required (*Canada (Minister of Citizenship and Immigration) v. Vavilov, 2019 SCC 65 (CanLII)*, [2019] 4 SCR 653, at para 133).

38. The CFIA's Exemption Decision and December Decision will result in significant financial harm to UOF and its employees, as well as have a significant negative impact on UOF's ongoing research collaborations and on bio-medical research advancements that specialize in HPAI, IgY antibody, and ostrich research.

39. A decision-maker should consider the following factors to ensure procedural fairness, summarized in *Canada (Attorney General) v. Mavi, 2011 SCC 30*, [2011] 2 S.C.R. 504 at paragraph 42:

    i. the nature of the decision being made and the process followed in making it;

    ii. the nature of the statutory scheme and the 'terms of the statute pursuant to which the body operates;

    iii. the importance of the decision to the individual or individuals affected;

    iv. the legitimate expectations of the person challenging the decision; and

    v. the choices of procedure made by the agency itself, particularly when the statute leaves to the decision-maker the ability to choose its own procedures, or when the agency has an expertise in determining what procedures are appropriate in the circumstances.

40. The simple overarching requirement in administrative decision-making is fairness (*Mavi*, 2011 SCC 30 at para 42).

41. A party's legitimate expectation is a further aspect to procedural fairness, which is engaged where a decision-maker makes representations that a certain procedure will be followed, or a certain outcome will result. Where that occurs, a party may seek review where that procedure was not followed, or where the expected outcome did not result.

42. The CFIA made representations in its January 2, 2025 email to UOF that a certain procedure would be followed to substantiate that UOF's ostriches fall into the "birds classified as having rare and valuable genetics" category (the "Rare and Valuable Category"), and as a result they may be exempt from stamping-out based on qualifying under that category. CFIA gave UOF a legitimate expectation with respect to the procedure and result.

43. The CFIA led UOF to believe that CFIA had a formal procedure in place that it would follow in making its decision with respect to whether UOF's ostriches qualified under the Rare and Valuable Category.

44. The CFIA led UOF to believe that because its ostriches qualified under the Rare and Valuable Category, they would be exempt from stamping-out.

45. Despite making these representations and advising UOF what documents it must provide to the CFIA, the CFIA failed to follow its own procedure, and rejected the exemption request.

46. CFIA breached the rules of procedural fairness by failing to notify UOF of the requirements that it would need to meet in order to qualify under the Rare and Valuable Category, and it failed to outline the procedure that would be followed in making the decision with respect to the exemption.

CFIA Failed to Follow its Own Policy of "Transparent and Open by Design".

47. The CFIA published an Open and Transparent Agency Policy (the "Policy"). In its Policy statement, CFIA claims that one of its guiding principles is being "open by design", and its commitment to offering stakeholders and CFIA staff with clear, plain language explanations and a commitment to "transparent decision making" and "accessible and timely information".

48. Under the Policy, requirement 7.2 states that "information must be released in a timely manner that allows users to derive maximum benefit from them for decision-making purposes".

49. Despite committing to offering stakeholders with transparent decision making, the CFIA has failed to follow its own Policy by failing to publish the requirements its stakeholders would need to meet to qualify under the Rare and Valuable Category and failing to publish the internal decision-making process CFIA follows in making its stamping-out exemption decisions.

50. CFIA also failed to follow its own Policy by failing to communicate its "transparent decision making" process to UOF in making its Exemption Decision.

51. In making its Exemption Decision, CFIA was neither open by design, transparent, nor accessible. Its decision making process, and the requirements that must be met in order for a stakeholder's animals to qualify under the Rare and Valuable Category are unclear, inaccessible, and incomprehensible.

The December Decision was Unreasonable

52. The World Organisation for Animal Health (WOAH) is the international standard-setting organization for the safe trade in animals and animal products under the SPS Agreement of the World Trade Organization. This agreement allows member countries, including Canada, to adopt their measures necessary to protect human, animal, and plant life and health, provided these measures are not applied in a discriminatory manner or as a disguised restriction on international trade.

53. The CFIA is Canada's national animal health authority and the lead authority for the prevention, detection, response and management of reportable diseases in domestic mammals and poultry in Canada.

54. The WOAH standards influence the CFIA's regulations and practices, ensuring that Canadian measures align with international standards to facilitate safe trade and protect animal health.

55. The CFIA is the liaison with the WOAH. Through its legislative authority under the *Health of Animals Act*, the CFIA implements WOAH's standards to manage the importation and health of animals in Canada.

56. The Applicant relies on the following standards published by WOAH:

    i. The World Organisation for Animal Health Terrestrial Animal Health Code (2024) (the "WOAH Health Code"); and

    ii. The World Organisation for Animal Health Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (the "WOAH Manual").

57. In Article 10.4.1 of the WOAH Health Code, WOAH acknowledges that the use of vaccination against the high pathogenicity avian influenza virus ("HPAI") may be recommended under specific conditions.

58. In the glossary of the WOAH Health Code, vaccination is defined as the administration of a vaccine, in accordance with the manufacturer's instructions and the Terrestrial Manual (the WOAH Manual), when relevant, with the intention of inducing immunity in an animal or group of animals against one or more pathogenic agents.

59. In the WOAH Manual, WOAH states that vaccination against HPAI has previously been used during outbreaks in Mexico, Pakistan, and Hong Kong. Additional countries have also implemented emergency and/or preventative vaccination programs for HPAI control, including several European Union countries, which have permitted preventative vaccination to be used against HPAI for outdoor poultry and zoo birds in the 2000s.

60. The WOAH Manual states that experimental work for HPAI has shown that potent and properly administered vaccines increase resistance to, or prevent infection, protect against clinical signs and mortality, prevent drops in egg production, reduce virus shedding from respiratory and intestinal tracts, protect from diverse field viruses within the same haemagglutinin subtype, protect from low and high challenge exposure, and reduce excretion and thus prevent contact transmission of challenge virus.

61. The CFIA, on the Government of Canada's webpage, also acknowledges that vaccination has and can be used as an effective tool to fight against HPAI. CFIA states that vaccination has been used in various poultry species, and its effectiveness in preventing clinical signs and mortality is well documented.

62. CFIA has even formed the Highly Pathogenic Avian Influenza Vaccination Task Force in June 2023 to study the development and implementation of an HPAI vaccination program in Canada, recognizing vaccination as a viable means of fighting against HPAI.

63. Despite being presented with an optimal opportunity to utilize the vaccination alternative and order UOF to vaccinate its ostriches against HPAI, the CFIA acted unreasonably by failing to consider vaccination as an option and instead resorting to the ill-suited method of stamping-out the herd.

64. Under s.48(2) of the *Health of Animals Act* the Minister of Agriculture and Agri-Food (the Minister) may treat any animal or thing described in subsection (1), or require its owner or the person having the possession, care or control of it to treat it or to have it treated, where the Minister considers that the treatment will be effective in eliminating or preventing the spread of the disease or toxic substance.

65. The Minister has the discretion to order the UOF to treat its ostriches against HPAI rather than to impose a stamping-out order. The CFIA acted unreasonably by failing to exercise this discretion and failing to consider treatment as an alternative to stamping-out the ostriches.

66. "Stamping out" the UOF ostriches does not adequately address CFIA's concerns of the HPAI infecting humans, domestic animals and wildlife.

67. Dr. Pelech states that it is extremely unlikely that the ostriches would be shedding the virus to each other or to humans, other birds, and animals. The longer the ostriches remain healthy, the lower the risk is of potential transmission of HPAI.

68. By stamping-out the UOF's ostriches and bringing in naïve ostriches (that have had no previous exposure to HPAI and thus may not have the naturally acquired immunity) it would simply re-create a geographical location for potential transmission of HPAI virus via the wild birds that visit the UOF property.

69. Once the ostriches achieve natural immunity to HPAI, the flock may actually offer some protection to wild birds from future infection of HPAI. Wild birds that come onto the UOF property would be less likely to visit neighbouring sites and

infect the birds or other animals located there, which may be naïve to HPAI and thus vulnerable to getting sick and further propagating the spread of the disease.

70. The CFIA's decision to impose stamping-out of the UOF's ostriches fails to adequately address the CFIA's main concern of HPAI transmission to humans, domestic animals, and wildlife. Instead, stamping-out may further propagate this disease, whereas keeping the UOF's ostriches alive, with the appropriate CFIA restrictions in place, would assist in fighting against the spread of HPAI.

The December Decision Interferes with Provincial Jurisdiction

71. Provinces have significant jurisdiction over health, including property and civil rights, as well as some jurisdiction over animal genetic development and animal labs.

72. The UOF's ostriches do not serve as food and they are not bred for human consumption of any kind. Nor are they a threat to the human, avian, or wildlife population.

73. The UOF operates as a farm and genetic laboratory for the purposes of producing immunoglobulin yolk known as IgY antibodies (the "Antibodies"), meant to advance genetic development and is thus primarily subject to the provincial authority.

74. The UOF's property and its research are subject to British Columbia's *Animal Health Act*.

75. Despite the UOF's operations being subject to the provincial authority, an inspector under the *Animal Health Act* has not been offered an opportunity to attend the UOF property and to conduct an inspection of its premises and laboratories, pursuant to Part 4 and s. 24 and s.26 of the *Animal Health Act*.

76. Studying the affected ostriches provides the Province of British Columbia with an important opportunity to study immunity to H5H1 and protect the interests of British Columbians. The provincial authority should be afforded an opportunity to inspect UOF and to issue an order based on its findings.

77. This matter presents a division of powers issue, and a constitutional challenge pending the determination of the jurisdiction of the CFIA.

The December Decision Violates UOF's Charter Rights

78. Under the statutory *Canadian Bill of Rights*, everyone has the right to property.

79. The ostriches, which are the subject of the December Decision, are considered UOF's property.

80. By imposing a stamping-out order on the UOF's ostriches, rather than considering other viable, and scientifically-proven, alternatives to addressing the HPAI concern, CFIA is wrongfully infringing on UOF's right to use and enjoy its property.

This application will be supported by the following material:

1. Affidavit of David Dilinski sworn January 29, 2025;
2. Affidavit of Karen Espersen sworn January 29, 2025;
3. Affidavit of Dr. Steve Pelech sworn January 30, 2025.
4. Affidavit of Katrina Jones sworn January 30, 2025

January 30, 2025

Signature of solicitor

MICHAEL D. CARTER
1321 Johnston Road
White Rock, BC V4B 3Z3
Telephone: 604-536-5002
Fax: 604-536-5007

Email: michael@clevelanddoan.com

I HEREBY CERTIFY that the above document is a true copy of the original *issued out of* the Court on 30-JAN-2025

Dated 30-JAN-2025

Svetlana Dobrota

ACTION_____

FEDERAL COURT

BETWEEN:

UNIVERSAL OSTRICH FARMS LTD.

APPLICANT

AND

CANADIAN FOOD INSPECTION AGENCY

RESPONDENT

NOTICE OF MOTION

TAKE NOTICE THAT Universal Ostrich Farms Ltd. will make a motion to the Federal Court on Friday, January 31, 2025, at 9:30 A.M. or as soon thereafter as the motion can be heard, at 701 West Georgia Street, Vancouver, BC.

TAKE NOTICE THAT Universal Ostrich Farms Ltd. will make a motion to the Federal Court under rule 361 of the *Federal Courts Rules*.

THE MOTION IS FOR the following:

1. An interlocutory injunction staying the Notice to Dispose of Animals or Things issued by the Canadian Food Inspection Agency (“CFIA”) on December 31, 2024 (the “Cull Order”); and

2. An order amending the Requirements to Quarantine and/or Licence to Transport Animals or Things (the “Quarantine Order”) issued by the CFIA to allow testing of animals pursuant to protocols that comply with CFIA’s requirements.

THE GROUNDS FOR THE MOTION ARE

1. Universal Ostrich Farms Inc. (“UOF”) applies pursuant to Sections 18(1), 18.2 and 44 of the *Federal Court Act,* and Rule 361 of the Federal Court Rules to stay the Cull Order to allow the Application for Judicial Review to be heard.

Background

2. UOF raises ostriches on a 58 acre parcel of land located about 10 kilometres outside of Edgewood, British Columbia (the “Property”).

3. The principals of UOF are Karen Espersen (“Ms. Espersen”) and David Bilinsky (“Mr. Bilinsky”).

4. Ms. Espersen and Mr. Bilinsky have been raising ostriches since the early 1990s.

5. Mr. Bilinsky, who has training in genetics, entered the ostrich industry in 1993 with Dr. Robert Church, who was a pioneer of molecular genetics and embryo transfer technology at the University of Calgary.

6. They started a company that began importing specially selected, large ostriches from Africa. They grew the company into the largest ostrich farm in Canada and it became the leading producer of large body ostriches.

7. Ms. Espersen began working with Mr. Bilinsky in 1995 and UOF was formed in the early 2000s.

8. Together they spent the next 32 years selectively breeding the ostriches and improving the genetics to create a large, healthy bloodline of ostrich.

9. When the Covid 19 pandemic began in March 2020 it essentially shut down UOF’s business.

10. Mr. Bilinsky and Ms. Espersen then became involved in scientific research that was being conducted on antibodies appearing in ostrich eggs.

11. Ostrich eggs are uniquely suited for developing antibodies because the yolks are large and a high concentration of antibodies appears in the yolks after an immune reaction occurs.

12. UOF then began working with a company that was developing protocols to produce antibodies for Covid 19. From there the scientific research led to developing many other opportunities for utilizing antibodies in the egg yolks.

13. UOF also began working closely with Dr. Tsukamoto and a group of researchers from Kyoto Prefecture University in Japan. This research was

directed towards producing and extracting IgY (immune globin yolk) antibodies from the UOF ostrich eggs.

14. From there UOF began a venture with Struthio Bio Science Inc. and entered into an agreement to provide Struthio with ostrich eggs, which would then be used to extract antibodies.

15. Since 2020 UOF has been entirely dedicated to the production of antibodies with its ostrich herd. It is not a commercial poultry facility and it does not produce any ostrich meat or eggs for human consumption.

16. UOF had approximately 450 ostriches as of early December, 2024.

17. In mid-December, 2024 some of UOF's ostriches were showing signs of illness, and then some began to die.

18. On December 30, 2024 CFIA tested two dead ostriches with swab samples and took them for analysis.

19. On December 31, 2024 CFIA issued the Quarantine Order, and later advised UOF that the test was positive for H5N1 Avian Influenza.

20. On January 2, 2025 CFIA issued the Cull Order.

21. On January 2, 2025 a CFIA representative told UOF that, based on the information CFIA had gathered, the UOF ostriches fall into the "birds classified as having rare and valuable genetics", which provided an exemption from the Cull Order.

22. The CFIA representative told UOF to send documents regarding their cooperation with Dr. Tsukamoto, which UOF did.

23. On January 10, 2025 CFIA denied the exemption saying the exemption requires a "significant burden of proof" and "robust processes must be in place".

24. CFIA had not disclosed to UOF the test or burden of proof. Instead, UOF thought CFIA had already placed the ostriches in the "bird classified as having rare and valuable genetics category".

25. If CFIA had told UOF about the "significant burden of proof" then it would have changed UOF's approach to the exemption process.

26. Ostriches have robust immune systems, and by mid-January 2025 the herd had recovered from the illness.

27. Although 69 ostriches died, the last ostrich to die from H5N1 type symptoms was on January 15, 2025.

28. A term of the Quarantine Order prohibits UOF from testing or treating the ostriches. However, based on expert opinions obtained, it is highly likely the ostriches have reached herd immunity, and it is extremely unlikely they would be shedding the virus to each other, or people, birds, and other animals.

29. In fact, the opinion suggests it is safer to keep the ostriches with herd immunity, rather than killing them and bringing in ostriches without the immunity.

30. There are approximately 390 ostriches that are now healthy, but the Cull Order mandates that they be killed by February 1, 2025.

Injunction Staying Enforcement of the Cull Order

31. The test for an interlocutory injunction is well know and has three parts:

    a. Is there a serious question to be tried?

    b. Has the applicant demonstrated that it will suffer irreparable harm if the injunction is not granted?

    c. Where does the balance of convenience lie as between the parties.

    JR-MacDonald Inc. V. Canada (Attorney General), [1994] 1 SCR 311 *("MacDonald")*

32. An injunction and a stay of proceedings are remedies of the same nature and have the same test, *Toth v. Canada (Minister of Employment & Immigration),* [1988] F.C.J. No. 587.

    Serious Issue to be Tried

33. In order to satisfy this element of the test a judge must merely be satisfied that the issues to be tried are not vexatious or frivolous. It is a low threshold, *MacDonald at paras 54 and 55.*

34. There are a number of serious issues to be tried in the Application for Judicial Review.

    Breach of Natural Justice

35. The first serious issue to be tried is that CFIA breached the principles of natural justice by failing to provide UOF with procedural fairness in applying for the "rare and valuable genetics" exemption to the Cull Order.

36. On January 2, 2025, the CFIA case officer advised the UOF that its ostriches fell into the “birds classified as having rare and valuable genetics” category and outlined a brief list of documents that UOF would need to provide to CFIA for the purposes of completing the “exemption from depopulation” process. UOF provided the CFIA with the requested documentation.

37. In its decision letter dated January 10, 2025, CFIA advised that UOF’s request for an exemption to depopulation of its ostriches based on them having “rare and valuable poultry genetics” was denied (the “Exemption Decision”).

38. In that letter the CFIA said the exemption requires a “significant burden of proof” and “robust processes must be in place”.

39. CFIA had not disclosed to UOF the test or burden of proof. Instead, UOF thought CFIA had already placed the ostriches in the “bird classified as having rare and valuable genetics category”.

40. If CFIA had told UOF about the “significant burden of proof” then it would have changed UOF’s approach to the exemption process.

41. The CFIA failed to observe procedural fairness in making its Exemption Decision.

42. Procedural fairness is subject to the “correctness” standard of review.

43. Administrative decision-makers, generally, must also observe procedural fairness in the implementation of statutes (*Brown v. Canada (Citizenship and Immigration)*, 2020 FCA 130 at para 138.).

44. Where a decision involves the potential for significant impact or harm on the party whose conduct is at issue, greater procedural protection is required (*Canada (Minister of Citizenship and Immigration) v. Vavilov, 2019 SCC 65 (CanLII)*, [2019] 4 SCR 653, at para 133).

45. The CFIA’s Exemption Decision and December Decision will result in significant financial harm to UOF and its employees, as well as have a significant negative impact on UOF’s ongoing research collaborations and on bio-medical research advancements that specialize in HPAI, IgY antibody, and ostrich research.

46. The simple overarching requirement in administrative decision-making is fairness (*Mavi*, 2011 SCC 30 at para 42).

47. A party’s legitimate expectation is a further aspect to procedural fairness, which is engaged where a decision-maker makes representations that a certain procedure will be followed, or a certain outcome will result. Where that occurs,

a party may seek review where that procedure was not followed, or where the expected outcome did not result.

48. The CFIA made representations in its January 2, 2025 email to UOF that a certain procedure would be followed to substantiate that UOF's ostriches fall into the "birds classified as having rare and valuable genetics" category (the "Rare and Valuable Category"), and as a result they may be exempt from "stamping-out" based on qualifying under that category. CFIA gave UOF a legitimate expectation with respect to the procedure and result.

49. The CFIA led UOF to believe that CFIA had a formal procedure in place that it would follow in making its decision with respect to whether UOF's ostriches qualified under the Rare and Valuable Category.

50. The CFIA led UOF to believe that because its ostriches qualified under the Rare and Valuable Category, they would be exempt from "stamping-out".

51. CFIA breached the rules of procedural fairness by failing to notify UOF of the requirements that it would need to meet in order to qualify under the Rare and Valuable Category, and it failed to outline the procedure that would be followed in making the decision with respect to the exemption.

Lack of Transparency

52. The second serious issue to be tried is that CFIA did not follow its own policy of being "transparent and open by design".

53. The CFIA published an Open and Transparent Agency Policy (the "Policy"). In its Policy statement, CFIA claims that one of its guiding principles is being "open by design", and its commitment to offering stakeholders and CFIA staff with clear, plain language explanations and a commitment to "transparent decision making" and "accessible and timely information".

54. Under the Policy, requirement 7.2 states that "information must be released in a timely manner that allows users to derive maximum benefit from them for decision-making purposes".

55. Despite committing to offering stakeholders with transparent decision making, the CFIA has failed to follow its own Policy by failing to publish the requirements its stakeholders would need to meet to qualify under the Rare and Valuable Category, and by failing to publish the internal decision-making process CFIA follows in making its "stamping-out" exemption decisions.

56. CFIA also failed to follow its own Policy by failing to communicate its "transparent decision making" process to UOF in making its Exemption Decision.

57. In making its Exemption Decision, CFIA was neither open by design, transparent, nor accessible. Its decision making process, and the requirements that must be met in order for a stakeholder's animals to qualify under the Rare and Valuable Category are unclear, inaccessible, and incomprehensible.

Lack of Reasonableness

58. The third serious issue to be tried is that CFIA acted unreasonably by requiring the ostriches be destroyed (ie, "stamping out"), without considering the characteristics of ostriches, the value of the research potential, and the alternatives to "stamping out" provided by the World Organization of Animal Health ("WOAH").

59. WOAH is the international standard-setting organization for the safe trade in animals and animal products under the SPS Agreement of the World Trade Organization. This agreement allows member countries, including Canada, to adopt their measures necessary to protect human, animal, and plant life and health, provided these measures are not applied in a discriminatory manner or as a disguised restriction on international trade.

60. The WOAH standards influence the CFIA's regulations and practices, ensuring that Canadian measures align with international standards to facilitate safe trade and protect animal health.

61. The CFIA is the liaison with the WOAH. Through its legislative authority under the *Health of Animals Act*, the CFIA implements WOAH's standards to manage the importation and health of animals in Canada.

62. In Article 10.4.1 of the WOAH Health Code, WOAH acknowledges that the use of vaccination against the high pathogenicity avian influenza virus ("HPAI") may be recommended under specific conditions.

63. In the glossary of the WOAH Health Code, vaccination is defined as the administration of a vaccine, in accordance with the manufacturer's instructions and the Terrestrial Manual (the WOAH Manual), when relevant, with the intention of inducing immunity in an animal or group of animals against one or more pathogenic agents.

64. In the WOAH Manual, WOAH states that vaccination against HPAI has previously been used during outbreaks in Mexico, Pakistan, and Hong Kong.

Additional countries have also implemented emergency and/or preventative vaccination programs for HPAI control, including several European Union countries, which have permitted preventative vaccination to be used against HPAI for outdoor poultry and zoo birds in the 2000s.

65. The WOAH Manual states that experimental work for HPAI has shown that potent and properly administered vaccines increase resistance to, or prevent infection, protect against clinical signs and mortality, prevent drops in egg production, reduce virus shedding from respiratory and intestinal tracts, protect from diverse field viruses within the same haemagglutinin subtype, protect from low and high challenge exposure, and reduce excretion and thus prevent contact transmission of challenge virus.

66. The CFIA, on the Government of Canada's webpage, also acknowledges that vaccination has and can be used as an effective tool to fight against HPAI. CFIA states that vaccination has been used in various poultry species, and its effectiveness in preventing clinical signs and mortality is well documented.

67. CFIA has even formed the Highly Pathogenic Avian Influenza Vaccination Task Force in June 2023 to study the development and implementation of an HPAI vaccination program in Canada, recognizing vaccination as a viable means of fighting against HPAI.

68. Despite being presented with an optimal opportunity to utilize the vaccination alternative, and order UOF to vaccinate its ostriches against HPAI, the CFIA acted unreasonably by failing to consider vaccination as an option, and, instead, resorted to the ill-suited method of "stamping-out" the herd.

69. Under s.48(2) of the *Health of Animals Act* the Minister of Agriculture and Agri-Food (the Minister) may treat any animal or thing described in subsection (1), or require its owner or the person having the possession, care, or control of it, to treat it or to have it treated, where the Minister considers that the treatment will be effective in eliminating or preventing the spread of the disease or toxic substance.

70. The Minister has the discretion to order the UOF to treat its ostriches against HPAI rather than to impose a "stamping-out" order. The CFIA acted unreasonably by failing to exercise this discretion, and by failing to consider treatment as an alternative to "stamping-out" the ostriches.

Provincial Authority

71. The fourth serious issue to be tried is whether the provincial authority should be afforded an opportunity to inspect UOF and issue an order based on its finding.

72. Provinces have significant jurisdiction over health, including property and civil rights, as well as some jurisdiction over animal genetic development and animal labs.

73. The UOF's ostriches do not serve as food and they are not bred for human consumption of any kind. Nor are they a threat to the human, avian, or wildlife population.

74. The UOF operates as a farm and genetic laboratory for the purposes of producing immunoglobulin yolk known as IgY antibodies (the "Antibodies"), meant to advance genetic development, and is, thus, primarily subject to provincial authority.

75. The UOF's property and its research is subject to the *Animal Health Act* of British Columbia.

76. Despite the UOF's operations being subject to the provincial authority, an inspector under the *Animal Health Act* has not been offered an opportunity to attend the UOF property, and to conduct an inspection of its premises and laboratories, pursuant to Part 4 and s. 24 and s.26 of the *Animal Health Act.*

77. The provincial authority should be afforded an opportunity to inspect UOF and to issue an order based on its findings.

78. This matter presents a division of powers issue, and a constitutional challenge pending the determination of the jurisdiction of the CFIA.

Charter Violation

79. The final serious issue to be tried is whether CFIA has violated UOF's Charter rights by unreasonably ordering the destruction of UOF's property, including ostriches and ostrich eggs that were not affected by the illness.

Irreparable Harm

80. "Irreparable" refers to the nature of the harm suffered. A harm is "irreparable" if it cannot be quantified in monetary terms, cannot be cured, or would be difficult to compensate in damages.

81. Examples of irreparable harm include being put out of business, suffering a permanent market loss or irrevocable damages to a business' reputation, or a permanent loss of natural resources, *MacDonald at para 64.*

82. An applicant need only demonstrate that it may suffer irreparable harm because there is doubt that damages would provide an adequate remedy, should it succeed at trial. Clear proof of irreparable harm is not required, *British Columbia (Attorney General) v. Wale (1986),* 9 B.C.L.R. (2d) 333 (CA), aff'd [1991] 1 S.C.R. 62 ("Wale") at paras 47 and 50, *Winking Judge Pub Ltd. v. Donnelly Hospitality,* 2019 BCSC 336 at para 52.

83. In the case at hand, UOF will suffer irreparable harm if the ostriches are killed.

84. First, UOF will not be able to replace the ostriches. Mr. Bilinsky and Ms. Espersen have spent the last 32 years improving the genetics of this particular herd. The herd with the same level of genetics is irreplaceable.

85. Not only is the herd with the same level of genetics irreplaceable, but there is no way to replace it at all. UOF is the largest ostrich producer in Canada, there are not many others, and it would be nearly impossible to purchase 400 ostriches in Canada.

86. Losing UOF as a producer will have an impact on the ostrich industry as a whole.

87. As well, due to the importing and exporting restrictions that are now in place, it is very difficult to import ostriches from abroad.

88. Second, the financial impact of killing the ostriches will cause UOF to go out of business. Under the compensation regime of the *Health of Animals Act,* the maximum compensation for an ostrich is $3,000. However, the cost to purchase an ostrich is $7,500.

89. If UOF was able to purchase ostriches to replace the herd they would be yearlings. It would then take about two years before the hens start producing eggs. Until the hens start laying eggs UOF would not be able to generate income.

90. UOF also has a contractual obligation to supply ostrich eggs to Struthio, and there are several hundred thousands of dollars of potential liability for UOF if the herd is killed.

91. If the ostriches are killed, then UOF will not be able to survive the financial impact of these factors and will go out of business.

92. Third, killing the ostriches will cause irreparable harm because it will extinguish any ability to research the effect of these particular ostriches' natural immunity to H5N1.

93. Dr. Steven Pelech has opined that the UOF ostriches represent an important potential research model for, amongst other things, testing how long and effective herd immunity to H5N1 can last, *Affidavit #1 of Dr. Steven Pelech.*

94. Dr. Pelech also said that "testing egg yolks from an ostrich hen for the presence of antibodies against a virus like H5N1 would be an ideal method to evaluate natural immunity from a previous infection or immunity that may be produced using a vaccine", *Affidavit #1of Dr. Steven Pelech.*

95. Irreparable harm will also be established if the underlying Application for Judicial Review is rendered moot, which is what would occur in this case, *De Medeiros v. Canada (Minister of Employment & Immigration)* [1994] F.C.J.No 11.

96. Finally, in the Application for Judicial Review, UOF has asserted that its *Charter* rights have been violated. An assessment of irreparable harm involving *Charter* rights should keep in mind that damages are not the primary remedy for a *Charter* violation, *MacDonald at para 65.*

Balance of Convenience

97. In the balance of convenience assessment, the question is which of the two parties will suffer greater harm from the granting or refusal of the injunction, pending a decision on the merits, *MacDonald* at para 67.

98. If the injunction is not granted UOF will go out of business and the unique opportunity to study natural immunity will be lost, both for the biomedical research field and CFIA's own Highly Pathogenic Avian Influenza Vaccination Task Force. Damages would be an inadequate remedy.

99. On the other hand, there is very little risk or prejudice if the injunction is granted. It has been six weeks since the ostriches first showed signed of illness, and over two weeks since the last ostrich died of H5N1 type symptoms.

100. The herd now appears healthy and, according to Dr. Pelech, it is extremely unlikely the ostriches are shedding virus. Dr. Pelech opines that it is highly unlikely that the virus would be transmissible to humans at this point. He says "the longer the ostriches remain healthy, the lower the risk of potential transmission of the virus" *Affidavit #1of Dr. Steven Pelech.*

101. It is in the interest of justice for the injunction to be granted, so that UOF can have its Application for Judicial Review adjudicated.

Amendment of the Quarantine Order

102. UOF also seeks an order pursuant to s. 18.2 of the *Federal Court Act* amending the Quarantine Order, so that it can test the ostriches pursuant to protocols that comply with CFIA's requirements.

THE FOLLOWING DOCUMENTARY EVIDENCE will be used at the hearing of the motion:

Affidavit #1 of David Belinsky made January 29, 2025;
Affidavit #1 of Karen Espersen made January 29, 2025;
Affidavit #1 of Katrina Jones made January 30, 2025;
Affidavit #1 of Dr. Steven Pelech made January 30, 2025

January 30, 2025

_____

Signature of solicitor
MICHAEL D. CARTER
1321 Johnston Road
White Rock, BC V4B 3Z3
Telephone: 604-536-5002
Fax: 604-536-5007
Email: michael@clevelanddoan.com

It is expected that the motion will take approximately 2 hours for hearing.

TO: Canadian Food Inspection Agency
c/o Department of Justice

Action _____

FEDERAL COURT

BETWEEN

UNIVERSAL OSTRICH FARMS LTD.

APPLICANT

AND

CANADIAN FOOD INSPECTION AGENCY

RESONDENT

AFFIDAVIT

I, David Bilinski, businessman, of 301 Langille Road, Edgewood, British Columbia, hereby AFFIRM AND SAY AS FOLLOWS:

1. I am a director of the Petitioner in this proceeding, and as such have personal knowledge of the facts and matters herein, except where I state they are based upon information and belief, in which case I believe them to be true.

My Background

2. I began raising ostriches in 1993 after I decided to diversify from raising beef cows. At the time I had been working with Dr. Robert Bertram Church, who is a pioneer of molecular genetics and embryo transfer technology in cattle.

3. Dr. Church PhD was a founding member of the Faculty of Medicine at the University of Calgary and Associate Dean of Research from 1981 to 1988. He was also the first head of the department of Medical Biochemistry, a position he held for fourteen years. I have attached as **Exhibit "A"** a true printout of a summary of Dr. Church's work published by the Government of Alberta.

4. I have also taken training in genetics through Olds College in Alberta and Thompson River University. Using artificial insemination and selected genetics I, with my family, created a registered bloodline of cattle that topped breed sales for three out of five years in Calgary, and contributed genetics to the Grand Champion Carcass at the Pacific National Exhibition.

5. At that time we had 750 cows on two ranches, one in Edgewood, British Columbia and one in Ft. St. John, British Columbia, before realizing that ostrich had more to offer to mankind than beef cattle.

6. In 1993 Dr. Church, Steve Lilford (a farmer from Zimbabawe) and I decided to start raising ostriches. We started Rocky Mountain Ostrich ("RMO").

7. After researching the advantages of the ostrich bird and the limited genetic information available we decided that we would go to Africa to start selecting ostriches to import to Canada.

8. Dr. Church was well versed in importing animals and he was looking for the best quality ostriches in Africa to import.

9. RMO decided to import the larger species of ostrich. Others in North America had been importing the smaller species because they were easier to transport, but we determined that the larger species had better attributes and more economic value.

10. In 1993 RMO constructed quarantine facilities in Zimbabwe and Namibia, where the ostriches with the genetics we selected were quarantined before being exported. The ostriches were then flown to the United Kingdom and quarantined for one month in another facility we constructed there. They were then flown to Edmonton for a final month of quarantine before becoming "Canadian".

11. RMO became the "go-to" farm for the production of large body genetics and we grew it into the largest ostrich farm in Canada. At one point we reached an ostrich count of 1100 birds.

12. By 1995 20% of all breeder sales of ostriches in Canada were from the Rocky Mountain genetic selection program.

13. One of the problems we encountered though was there were no good breeding records for ostriches. To start a recording program I initiated a DNA fingerprinting program for ostriches in Canada. I worked with Dr. Kim Cheng, a director of the Avian Research Centre at the University of British Columbia, to develop the program.

14. Unfortunately shortly after starting the program the market for breeding ostrich collapsed and the program was suspended.

About Ostriches

15. Ostriches are native to Africa. Although they are generally considered a 'bird" they are unique in that they, amongst other things, have red meat and are flightless.

16. Ostriches can:

    a. weigh up to 350 pounds;

    b. measure up to 12 feet in height;

    c. run up to 70km/hour; and

    d. live up to 75 years of age.

17. It takes approximately 3.5 years before an ostrich can be used as a good "breeder" ostrich, meaning laying eggs that can be incubated and hatched.

18. Ostriches have one of the most robust immune systems out of any land animal.

19. The antibodies ostriches produce in response to an infection can last several years, and are found in extremely high concentration in the yolks of their eggs. These antibodies can be used to develop neutralization antibodies against, amongst other things, the H5N1 virus. I have attached as **Exhibit "B"** a true copy of a study published by Dr. Yasuhiro Tsukamoto, Laboratory of Veterinary Anatomy, Graduate School of Biology and Environmental Sciences, Osaka Prefecture University

About Universal Ostrich Farm

20. Karen Espersen ("Karen") and I began working together in the ostrich industry in about 1995.

21. By 1999 Karen had started Universal Ostrich Farms Inc. ("UOF"), which I ended up joining in 2004.

22. We operated UOF from a 58 acre parcel of land located about 10 kilometres outside of Edgewood, British Columbia (the "Property").

23. The Property is fenced and cross-fenced to provide for separate handling and containment areas for the ostriches.

24. Edgewood, British Columbia is quite remote. According to Statistics Canada, the 2021 Census Profile of Edgewood lists a total population of 235 people. I

have attached as **Exhibit "C"** a true printout from Statistics Canada for the 2021 Census Profile of Edgewood, BC.

25. The closest population centre of any density is Vernon, BC, which is over 125 kilometers by road northwest of the Property.

26. When UOF began in 1999 it adopted a herd of ostriches from RMO, which Dr. Church and I had been working with.

27. For over the next 25 years UOF continued the work of RMO, which was that of selectively breeding the ostriches and improving the genetics to create a large, healthy ostrich.

28. As we were breeding and developing the ostriches we would only keep the ostriches that showed the desirable genetic traits as future breeders. This included selecting for the size of the ostriches as they had high economic value.

29. The other younger ostriches were culled and sent to the market.

30. Because ostriches live so long we still have ostriches in our herd from when we first began importing ostriches in 1993. It has been a continuous process of breeding, selecting and improving the genetics of the herd for about 32 years.

31. As well, it can take many years, and a tremendous amount of time and effort, to develop a harmonious herd of ostriches. Since we have been developing the herd for so long though the ostriches know us and each other.

32. This does not mean the ostriches are "tame" to strangers. They can be quite aggressive and violent, but with our herd we can walk amongst them, which is very rare. Even when we are treating them we do this by walking up to them.

33. Until the covid-19 pandemic hit in March 2020 UOF was primarily in the business of 1) selling ostriches for breeding purposes, 2) some meat processing, and 3) agritourism through teaching people how to incubate and hatch ostrich eggs, and 4) sharing knowledge about ostriches .

Antibody Research

34. When the COVID-19 pandemic hit in March 2020 it essentially shut down our business. Processing plants closed, breeder sales plummeted and farms downsized.

35. We then became familiar with the work of Dr. Tsukamoto, who was studying the IgY (Immune Globin Yolk) antibodies in ostrich eggs.

36. Based on Dr. Tsukamoto's and others' research, we learned that ostrich eggs are uniquely situated for developing antibodies because of the size of the yolk and the concentration of the antibodies produced.

37. For example, one ostrich egg is the equivalent of 100 chicken eggs in antibody production, or the blood of 800 rabbits. There is also the added benefit that you do not need to harvest the animal itself to extract the antibodies.

38. Dr. Tsukamoto was very interested in our herd because of the size of the ostriches. However, he was not able to provide us with the antigens for producing the antibodies during Covid due to the lockdowns and travel restrictions.

39. As a result we began working with Bio Solutions Inc. ("Bio Solutions") in Quebec, which was working on protocols to produce antibodies for Covid 19 due to a $13,000,000 grant from the Government of Canada.

40. In or around 2021 Bio Solutions provided antigens to UOF which then allowed us to produce antibodies using the ostrich eggs.

41. Bio Solutions found that UOF's antibodies were superior to the previous chicken derived antibodies, since they were stronger and more robust. Since the results from the ostrich eggs were showing positive results we decided to commit the entire operation of UOF to antibody production.

42. Then, in about 2022 UOF began a venture with Struthio Bio Science Inc ("Struthio") and entered into a contract wherein UOF must provide Struthio with ostrich eggs, failing which UOF would be in breach of the contract.

43. In summary, since 2020 UOF has been entirely dedicated to the production of antibody IgY.

44. To be clear, UOF is not a commercial poultry facility and it does not produce any ostrich meat or eggs for human consumption.

<u>The 2020 Illness</u>

45. As of February 2020 UOF had approximately 250 ostriches. Some of the ostriches became sick and about ten of them died.

46. We took tissue samples from a deceased ostrich to our veterinarian and they were sent for analysis. A report from the BC Animal Health Centre returned positive results for "Proteus sp., Pseudomonas aeruginosa and E. coli (non-haemolytic)". I have attached as **Exhibit "D"** a true copy of the lab results from the BC Animal Health Centre.

47. All but 10 of the ostriches recovered from the 2020 illness within a couple weeks and remained healthy.

The December 2024 Illness

48. On about December 10, 2024 we began noticing that some of the ostriches in the herd were showing signs of illness. The sick ostriches were showing very similar symptoms to those that were sick back in 2020.

49. In the following week we discovered an ostrich that died from apparent illness. More ostriches then began dying and we contacted our local veterinarian.

50. On December 30, 2024 representatives from the Canadian Food Inspection Agency ("CFIA") came to the Property and took swab samples from two of the dead ostriches.

51. The CFIA representatives told us it would take 2 – 3 days to obtain the test results.

52. On December 31, 2024 we received an email from CFIA with a Requirement to Quarantine. We had already implemented strict quarantine measures which included, amongst other things, restricting access to and from the Property. I have attached as **Exhibit "E"** a true copy of the email received on December 31, 2024 together with the attachments.

53. We have complied with the conditions of the Requirement to Quarantine.

54. On December 31, 2024 we were told by CFIA that the PCR test result was positive for the H5N1 type of Avian Influenza.

55. On January 2, 2025 I received an email from a case officer from CFIA, Ms. Cassandra Berreth ("Ms. Berreth), attaching amongst other documents, the following:

    a. An Order to Dispose of Animals or Things;

    b. Declaration of an Infected Place;

    c. a Requirement to Quarantine; and

    d. Licence for Removal of Animals or Things.

I have attached as **Exhibit "F"** a true copy of the January 2, 2025 email together with the attachments.

56. We then began working with Ms. Berreth to navigate what was going to happen.

Application for Exemption based on Rare and Valuable Genetics

57. On January 2, 2025 I received another email from Ms. Berreth where she noted that "based on the information we've gathered, you fall into the 'birds classified as having rare and valuable genetics' category". I have attached as **Exhibit "G"** a true copy of that email.

58. Karen and I were extremely relieved by the fact that the ostriches fell into this category because it was what we had been working on for 32 years.

59. As part of that email on January 2, 2025 Ms. Berreth asked us to fill out and return to her the "Distinct Unit Package".

60. The next day, on January 3, 2025, we had a five and a half hour meeting with various CFIA representatives to discuss the layout of the Property, movements on and off the Property, the quarantine requirements and many other things.

61. To the best of my recollection, not once in that meeting did anyone from CFIA discuss the Distinct Unit Package or the "rare and valuable genetics category", or what would be required from UOF as part of those processes.

62. In the following days we were pulled between, amongst other things, trying to care for the ostrich herd, attending to the dead ostriches, creating and implementing protocols, applying for feed and movement permits and responding to CFIA's questions.

63. For example, we had to create and implement the quarantine protocols, apply for and obtain a permit so that we could bring in feed to feed the ostriches, create a disposal plan for how to dispose of the ostriches that had died and also apply for a permit so that we could move between where we lived and the Property. I have attached as **Exhibit "H"** true copies of some of the email correspondence between Ms. Berreth, Karen, and I from January 2 – 9, 2025 as we tried to respond to the situation.

64. This whole process was all focused on implementing protocols and plans to quarantine the Property and dispose of the dead ostriches, all of which we fully complied with. Ms. Berreth kept stressing that we had to be compliant and cooperative with all of CFIA's requests and requirements. We wanted to be cooperative and do everything we could to contain the illness, stop the spread and care for our animals.

65. Aside from the initial January 2, 2025 email from CFIA, there was no explanation during this time of what was required for the "rare and valuable genetics exemption".

66. When it came to the exemption, in Ms. Berreth's email on January 2, 2025 she asked us to send in documents of the agreement between UOF and Dr. Tsukamoto's group at the Kyoto Prefecture University, which we did, along with other documentation.

67. On January 10, 2025, however, CFIA wrote to us to say that our request for an exemption was denied. The letter said that the exemption requires a "significant burden of proof" and "robust processes must be in place". I have attached as **Exhibit "I"** a true copy of the January 10, 2025 letter from CFIA.

68. We were shocked by the January 10, 2025 email because we had not been told what the test was or about the "significant burden of proof" required. None of those requirements were disclosed to us. Rather, in Ms. Berreth's email it seemed to us that CFIA had already placed the UOF's ostriches into the "bird classified as having rare and valuable genetics" category. We were just told to send in some documents to show what we had been doing.

69. Karen and I certainly did the best we could in the short timeframe and given the circumstances to apply for the exemption. But if we had known the question was open, and there was such a high standard, it would have changed our approach to it. We would have pulled in other experts we know who could have additional evidence and marshalled everything we possibly could have.

Amended CFIA Orders

70. On January 14, 2025 CFIA issued amended orders. I have attached as **Exhibit "J"** a true copy of the email we received on January 14, 2025 together with the attachments.

71. In January we wanted our local veterinarian, Dr. Amber Robinson, to test our live ostriches, but she was not able to do that because of the quarantine order.

72. On January 15, 2025 Karen and I wrote to CFIA asking a number of questions about the procedure, and Randy Keely responded to our email. I have attached as **Exhibit "K"** a true copy of that email.

73. On January 24, 2025 representatives from CFIA came to the Property to inspect. During that visit I asked the CFIA representatives if they saw any sick or unhealthy ostriches, and they responded "no". We took a recording of that interaction.

74. On January 24, 2025 CFIA delivered another amended set of orders. I have attached as **Exhibit "L"** a true copy of an email dated January 24, 2025 together with the attachments.

75. We have continued to implement strict procedures for limiting access to and from the Property. We have been fully complying with all the quarantine requirements that CFIA has imposed, and will continue to do so.

Health of the Herd

76. The entire ostrich herd has now seemingly fully recovered from the December 2024 illness. However, the CFIA orders state that we are not allowed to test the ostriches, so we are prevented from verifying whether the ostriches are still infected.

77. The last ostrich to die from flu-like symptoms was on January 15, 2025. In total 69 ostriches died from flu like symptoms from when the illness started in December 2024 until January 15, 2025.

78. We have had a few ostriches die from other causes in January 2025. Three have died as a result of accidents slipping on the ice. Although this sounds odd, regrettably every winter UOF has ostriches that die from accidents such as slipping on the ice.

79. Ostriches have small tendons in their legs which are quite weak. They are not well equipped to navigate ice and snow because if they slip they can easily tear this tendon. Normally Karen and I spend a lot of time spreading dirt on the ice to reduce these accidents. These last few weeks though we have been quite preoccupied and have not had the same amount of time to prevent these types of accidents.

80. The three ostriches that slipped on the ice in January tore their tendons (which makes them unable to get up by themselves) and were not able to survive the cold weather we have been having.

81. We had one other ostrich die from getting caught in a wire fence with a severe laceration on its neck. There was a reported cougar in the area so we suspect the ostrich may have been running away from a predator and ran into the wire fence.

Effect of Culling Herd

82. CFIA has ordered that we kill all the ostriches by February 1, 2025.

83. The first major problem is that UOF would be incapable of recovering if the ostriches were killed.

84. Some of the ostriches in the herd are from the very first group we started with 32 years ago, and we have spent the last 32 years improving the genetics of this particular herd. There is no way to replace the herd with the same level of genetics if we had to kill the entire herd and start over.

85. Not only that, but there is no way to replace the herd at all. UOF is the largest ostrich producer in Canada, and there are not many others, so it may be nearly impossible to purchase 400 ostriches in Canada. Losing UOF as a producer will have an impact on the ostrich industry as a whole.

86. As well, due to the importing and exporting restrictions that are now in place, it is very difficult to import ostriches from other countries.

87. Even if UOF was able to purchase more ostriches, they would be yearlings and it would take about two years before they started producing eggs, and thereby generating income for UOF. It would take much longer than two years to develop the type of harmony and relationship that we have with our ostriches.

88. UOF cannot afford to start from scratch and raise an entire herd of ostriches for two years without any income from the eggs.

89. Another consideration is that under the compensation regime of the *Health of Animals Act,* the maximum compensation for an ostrich is listed as $3,000. In reality, though, an ostrich costs around $7,500 to purchase.

90. There is a deficit of $4,000 per ostrich, and UOF cannot afford to replace its herd with that type of deficit in the compensation.

91. Another consideration is that UOF has a contractual liability to Struthio for several hundred thousands of dollars, based on the agreement that UOF would deliver its ostrich eggs to Struthio. If the herd was killed then UOF would be in breach of its agreement with Struthio. To be clear, if the ostriches are not killed, UOF does not intend to, and will not, be delivering any eggs to Struthio until all of the CFIA quarantine restrictions are removed.

92. UOF would not be able to survive the financial impact of having the herd killed, which would in turn affect me as an owner of UOF. I am 72 years old, and I do

not have enough time left to recover from the financial impact of killing the entire herd.

93. The second major problem if the herd is killed is that it would negate any ability for the scientific community to research the effect of the ostriches natural immunity to H5N1. Importantly, none of the ostriches in the herd that survived the illness back in February 2020 became sick with the December 2024 illness.

94. All of the ostriches that died from the December 2024 illness were ostriches that we had brought onto the Property after the February 2020 illness took place.

95. There is a group of scientists at the University of British Columbia and at the University of Guelph who would like to research how UOF's ostriches have responded to the illnesses. The fact that ostriches have good research potential because of the high concentration of antibodies in the egg yolks, combined with the fact that the herd has made it through two illnesses makes the ostriches uniquely situated for research.

96. There has been overwhelming support for UOF during this difficult time, including from our legal Member of the Legislative Assembly, Member of Parliament and many others.

97. The third major problem is that the Property is not well suited for killing 400 ostriches at once. We do not have an enclosed facility where we can contain the ostriches and use gas to kill them.

98. Shooting the ostriches is also not a viable option since they are so large and run so fast. If someone began shooting at them they would stampede and tear through the fencing.

99. It would also not be safe for people to walk amongst the ostriches in white hazmat suits, as the CFIA agents attempted to do. Although the ostriches allow us to walk amongst them, having multiple people in white hazmat suits would very likely cause the ostriches to become aggressive.

100. As a director of UOF, I confirm that UOF undertakes to abide by any order the court may make as to damages in the event that CFIA sustains damages as a result of UOF seeking an injunction.

SWORN (OR AFFIRMED) BEFORE)
ME at Vernon British Columbia)
on January 29, 2025)
) DAVID BILINSKI
.....)
A commissioner for taking)
affidavits for British Columbia)

RYAN IRVING
Barrister and Solicitor
#301 2706 - 30 Avenue
Vernon BC V1T 2B6
Telephone (250) 542-5353

Alberta Alberta.ca

Search

Search Alberta.ca Search Alberta.ca

AI search tool

Try our new Search AI tool as an alternative to the search below to improve your experience on Alberta.ca using artificial intelligence. See the AISearch fact sheet for more information.

Popular topics:

- Refocusing health care in Alberta
- Foster and kinship care
- Elder abuse – Get help
- Child care subsidy
- Renew your vehicle registration

This is Exhibit " A " referred to in the affidavit of David Bilinski sworn before me at Vernon this 29 day of January 2025

Close

Menu

Find a service

Find all of the Alberta government services and information you need.

Public engagements

Help shape the future of government policies, programs and services.

Jobs

Government of Alberta jobs, job postings across the province, and resources for job seekers.

Government action

Priority Government of Alberta initiatives and action plans.

News

- January 24, 2025

  Large load impacts travel in northeast Alberta

- January 24, 2025

  Alberta tourism shines on the national stage

- January 23, 2025

Bolstering cancer support programs for Albertans

- Alberta.ca home
- Open government
- Contact government
- Social media directory

- Facebook
- Twitter
- Instagram
- Linkedin

Feature

Wildfire prevention and mitigation

67% of wildfires in Alberta are started by people. Learn what you can do to reduce the risk of wildfires and mitigate their impact.



Dr. **Robert Bertram Church** PhD

Dr. Robert (Bob) B. Church is a pioneer of molecular genetics and embryo transfer technology in cattle. During his 25-year career at the University of Calgary, he became an internationally known leader and expert in transferring the technologies of genetics, reproductive physiology and molecular biology to the agricultural and biotechnology industries.

Robert Church

Dr. Church was a founding member of the Faculty of Medicine at the University of Calgary and Associate Dean of Research from 1981 to 1988. He was the first head of the department of Medical Biochemistry, a position he held for fourteen years. The department established an endowed lectureship in biotechnology to honour Professor Church. This lectureship will enable the university to promote technology transfer and bioengineering.

Serving in a scientific advisory capacity to numerous biotechnology projects, he has been personally involved in the establishment of eleven new high technology companies in Alberta, the United States, New Zealand and Australia. Dr. Church is a former director of Calgary-based Alberta Livestock Transplants and Alta Genetics Inc.; Connaught Laboratories Ltd. of Willowdale, Ontario; Veterinary Infectious Disease Organization, Saskatoon; and current Director of Biostar Inc., Saskatoon; Continental Pharma Cryosan Ltd., Montreal; CIBA Canada and Vencap Equities Ltd., Edmonton.

In 1967, he founded Church Livestock Consultants, which specializes in technical advice and program design in animal breeding, embryo transfer, livestock management and the development of food products worldwide.

Dr. Church has been active in the livestock industry through involvement on various committees in the development of breed organizations, sire and dam evaluation, genetic defect testing and breed development.

While a director of Highfield Stock Farms, he assisted in the development of one of the world's outstanding Simmental and Charolais herds and the establishment of showplace facilities at Aldersyde, Alberta.

In 1974 Dr. Church began operating the Lochend Luing Ranches, northwest of Airdrie. The Lochend Luing Ranch operation is an example of "back to the future" range management in operation. His operation initiated the first verified production protocol for producing, processing, quality control and marketing of a retail-ready product, branded "natural choice". This resulted in his appointment to the Board of Directors of Canada's newly established Agri-Food Competitiveness Council, helping Canada remain competitive in the global marketplace.

In addition to his contributions as a scientist and administrator, Dr. Church has authored over 100 scientific publications in animal genetics and biotechnology. He is also an acclaimed teacher and lecturer, and has been cited for excellence in teaching biology to undergraduate university students. Dr. Church has been an inspiring teacher and supervisor of 17 graduate students and eight postdoctoral fellows. Professor Church was honoured as the Klinck Lecturer of the Agricultural Institute of Canada in 1989.

Dr. Church's contributions to the community are also noteworthy and include 20 years with the Calgary Exhibition and Stampede as director. He was a founding member of the Natural Sciences and Engineering Research Council, a board member for the Alberta Children's Hospital Research Centre, and director of the Canadian Institute for Advanced Research for nearly ten years. He served as a member of the Alberta Research Council, the Medical Research Council of Canada and trustee of the Western Heritage Centre. Dr. Church was appointed as vice-chairman of the Premier's Council on Science and Technology and as a member of the

National Advisory Board of the Banff Centre of Management. A recipient of many awards and honours, Dr. Church was inducted in the Canadian Agricultural Hall of Fame in 1991 for his work in the area of cattle genetics. In 1992, he received the Outstanding Contribution to Alberta Science and Technology Community Award from the ASTech Foundation.

A third-generation Albertan, his grandparents homesteaded in the Yankee Valley and Nose Creek districts. Raised on the family farm and ranch at Balzac, Alberta, Dr. Church continues to help his brother Gordon during the busy seeding and harvest seasons.

Described as an outstanding scientist, administrator, teacher and friend, Dr. Robert Church has been credited with bringing modern-day science to the Canadian agricultural community

Dr. Church was inducted into the Alberta Order of Excellence in 1993

This biography has been excerpted from the program of that induction ceremony
Back to Members
Alberta.ca

- Ministries
- Jobs
- Contact government
- Staff directory

- Using Alberta.ca
- Disclaimer
- Privacy
- Accessibility

- Facebook
- Twitter
- Instagram
- Linkedin

© 2025 Government of Alberta
Back to top

EXPERIMENTAL AND THERAPEUTIC MEDICINE 2: 41-45, 2011

Ostrich produce cross-reactive neutralization antibodies against pandemic influenza virus A/H1N1 following immunization with a seasonal influenza vaccine

KAZUHIDE ADACHI[1], KENTARO TAKAMA[1], MASAYA TSUKAMOTO[1], MARIE INAI[1], EKOWATI HANDHARYANI[2], SATOSHI HIROI[3] and YASUHIRO TSUKAMOTO[1]

[1]Department of Animal Hygiene, Graduate School of Environmental and Biological Sciences, Kyoto Prefecture University, Shimogamo, Kyoto 606-8522, Japan; [2]Faculty of Veterinary Medicine, Bogor Agricultural University, JL. Agatis, Kampus IPB Darmaga, Bogor 16680, Indonesia; [3]Department of Virology, Osaka Prefectural Institute of Public Health, Higashinari-ku, Osaka City, Osaka 537-0025, Japan

Received October 6, 2010; Accepted November 12, 2010

DOI: 10.3892/etm.2010.180

This is Exhibit " B " referred to in the affidavit of David Bilinski sworn before me at Vernon this 29 day of January 2025

Abstract. An outbreak of influenza in 2009 was found to be caused by a novel strain of influenza virus designated as pandemic influenza A/H1N1 2009. Vaccination with recent seasonal influenza vaccines induced little or no cross-reactive antibody response to the pandemic influenza virus A/H1N1 2009 in any age group in human populations. Accordingly, most people had low immunity against this pathogen, thus resulting in the worldwide spread of the infection to produce a so-called 'pandemic'. This report presents the important finding that ostrich eggs generate cross-reactive antibodies to the pandemic influenza virus A/H1N1 following immunization of female ostrich with a seasonal influenza vaccine. This simple method produced a large amount of antibodies against influenza viruses by one female ostrich. An enzyme-linked immunosorbent assay (ELISA) and immunocytochemistry indicated that the ostrich antibodies possessed strong cross-reactivity to the pandemic A/H1N1 as well as to the seasonal A/H1N1, A/H3N2 and B viruses. The hemaggregation activities of erythrocytes induced by this pandemic strain were also inhibited by the ostrich antibodies. In addition, the cytopathological effects of infection with a pandemic virus on MDCK cells were clearly inhibited in co-cultures with the ostrich antibodies, thereby indicating the neutralization of viral infectivity in the cells. In conclusion, cross-reactive neutralization antibodies against pandemic influenza virus A/H1N1 2009 were successfully generated in ostrich eggs produced by females immunized with seasonal influenza viral vaccine.

Correspondence to: Professor Yasuhiro Tsukamoto, Department of Animal Hygiene, Graduate School of Biology and Environmental Sciences, Kyoto Prefecture University, 1-5 Nakaragicho, Shimogamo, Kyoto 606-8522, Japan
E-mail: ytsuka@kpu.ac.jp

Key words: influenza virus, pandemic, H1N1, antibody, ostrich

Introduction

Public health officials in Mexico City were confronted with an outbreak of influenza late in the 2009 influenza season. The 2009 pandemic H1N1 virus contained a unique combination of genes from both North American and Eurasian swine lineages that had not been previously indentified in either swine or human populations (1,2). The pandemic 2009 H1N1 hemagglutinin (HA) was found to be antigenically and genetically distinct from the HA of contemporary human seasonal influenza H1N1 viruses, but had a greater similarity to the swine H1N1 influenza virus that caused an influenza outbreak among military recruits in Fort Dix, New Jersey, in 1976 (1,3). Little is known about the level of pre-existing immunity to 2009 H1N1 in humans, which is one of the determining factors for susceptibility to a novel influenza virus. Vaccination has been a mainstay of influenza prevention, with annual vaccination recommended for adults and children at high risk. However, vaccination with recent seasonal influenza vaccines induced little or no cross-reactive antibody response to the pandemic A/H1N1 2009 influenza virus in any age group in human populations (4). Accordingly, most people had low immunity against this novel pathogen, thus resulting in the worldwide spread of the infection to produce a so-called 'pandemic'.

A convenient method for the mass production of antibodies has been developed using the female ostrich *(Struthio camelus)* (5,6). The avian egg has proven to be an attractive source for the noninvasive production of antibodies, with applications in research, diagnosis and immunotherapy (7-9). In addition, the production of avian antibodies offers many advantages over mammalian antibodies with regard to the specificity for antigens, production cost and their uses (7). The predominant class of immunoglobulin in birds is immunoglobulin yolk (IgY), which is transferred from the serum to the yolk to confer passive immunity to the embryo (10,11). The ostrich grows to be 250 cm in height and 160 kg in weight, and their life span is appoximately 60 years. Ostrich eggs weigh approximately 1.5 kg and are 30-fold larger than chicken eggs. Ostrich can lay one hundred eggs every year. It is possible to purify about

2-4 g of IgY per ostrich egg. Accordingly, approximately 400 g of IgY can be obtained from only one ostrich in the course of a year. Therefore, the ostrich egg might provide an excellent source of antibodies for industrial purposes (5).

The present study demonstrated that a large amount of cross-reactive and neutralizing antibodies to the pandemic influenza virus A/H1N1 was generated by the ostrich using a simple and economical method involving immunization with a seasonal influenza viral vaccine.

Materials and methods

Generation of antibodies against seasonal influenza virus HA antigens. A mixture of HA antigens of vaccine strains of seasonal influenza virus, A/NewCaledonia/20/99 (H1N1), A/Hiroshima/52/2005 (H3N2) and B/Malaysia (The Kitasato Institute Research Center for Biologicals, Japan) was used as antigens for the immunization of the ostrich. The female ostrich were immunized intramuscularly in the lumber region at multiple sites with 30 μg of the mixture of HA. Boosters were administered every other week with each antigen. The eggs were then collected 4 weeks after the initial immunization. The yolk was separated from the albumin of the eggs and diluted 5-fold with TBS buffer [0.02 M Tris/HCl (pH 7.5), 0.15 M NaCl], and an initial 1/10-fold with 30% dextran sulfate in TBS and 2/3-fold with 2.5 M $CaCl_2$ in TBS, and then stored at 4˚C for at least 4 h. The supernatant containing the IgY was collected by centrifugation (10,000 x g at 4˚C for 15 min) and precipitated with 45% saturated ammonium sulfate. The solution was centrifuged again at 10,000 x g at 4˚C for 15 min. The precipitate was then redissolved in TBS and dialyzed against PBS. Finally, the purified antibody solutions were verified by 10% SDS-PAGE under non-reducing conditions and stained with Coomassie Brilliant Blue (CBB).

Enzyme-linked immunosorbent assay (ELISA). Each well of a polystyrene ELISA plate (Sumitomo Bakelite, Japan) was coated with 0.2 μg of HA antigens from each vaccine strain and pandemic A/H1N1 (Protein Science, USA), and the plate was incubated overnight at 4˚C. Each of the following incubation steps was preceded by washing the wells twice with PBS containing 0.05% Tween-20. The wells were blocked for nonspecific binding by the addition of a commercial blocking buffer (DS Pharma Biomedical, Japan) and incubated at 37˚C for 2 h. Serial dilutions of purified ostrich IgY generated by the seasonal influenza vaccine immunization were added vertically to the wells and kept for incubation at 37˚C for 1 h. The HRP-conjugated rabbit IgG against ostrich IgY (5) diluted 1:5,000 in PBS was dispensed into each well. The plate was incubated for 1 h at 37˚C and washed. A substrate buffer containing TMB (Sumitomo Bakelite, Japan) was added to each well and kept for incubation at 37˚C for 15 min. The reaction was terminated by the addition of a stopping reagent (1.25 M sulfuric acid). The absorbance was recorded at 450 nm using an ELISA plate reader (DS Pharma Biomedical).

Influenza viruses. Seasonal influenza viruses [A/Osaka/309/2007 (H1N1), A/Osaka/2587/2005 (H3N2) and B/Osaka 21/2005] and a pandemic virus [A/Osaka/2040/2009 (H1N1) pdm] cloned from patients in Osaka Prefecture, Japan, were used throughout this study. The viral solutions were titered as $TCID_{50}$ using a cell culture system (MDCK cells) onto 96-well microtiter plates by serial 4-fold dilutions of the samples in the routine manner.

Immunocytochemistry. MDCK cells were independently infected with each influenza virus (10^2 $TCID_{50}$) for 2-5 days at 35˚C. The infected cells were fixed with 10% buffered formalin for immunocytochemistry. The cells were washed in PBS, incubated with the ostrich IgY generated by seasonal influenza vaccine immunization (1:4000) for 1 h at 37˚C and incubated with FITC-conjugated rabbit IgG (1:4000) against ostrich IgY (5) following a sufficient number of washes in PBS. Finally, the specific signal was observed using fluorescence microscopy.

Hemagglutination inhibition (HI) test. Serial dilutions of ostrich IgY were mixed with 8-HA units of each influenza virus in clear 96-well micro-test polystyrene assay plates (Becton Dickinson, USA). The plates were incubated for 30 min at room temperature. Guinea pig erythrocytes were added, pipetted gently, and incubation was carried out for another 45 min at room temperature. Each well was observed, and the HI titers were scored based on the HA titer with immune IgY versus the HA titer with preimmune IgY (a higher ratio indicates a stronger inhibitory activity of the antibody against the pandemic influenza virus).

Neutralization assays for influenza virus infection. Serial dilutions of ostrich IgY were mixed at a ratio of 1:1 with influenza viruses at 10^2 $TCID_{50}$, incubated for 1 h at 37˚C, and transferred to a microtiter plate with an MDCK cell monolayer. The cultures were incubated for 2-3 days at 35˚C and inspected to determine the cytopathic effect (CPE). The neutralizing titer, expressed as the reciprocal of the IgY dilution at which virus growth is inhibited by 50%, was calculated by the number of virus negative wells and the IgY dilution (12).

Results

Cross-reactive antibody responses of ostrich IgY to the pandemic influenza virus A/H1N1. IgY was purified from eggs produced by female ostrich immunized with a seasonal influenza vaccine. The molecular weight of purified IgY was ~200 kDa (SDS-PAGE; data not shown). Each immunized ostrich egg yielded ~4 g of IgY. The reactivity of the IgY to the seasonal and pandemic influenza viruses was estimated by ELISA. The antibody titers for each antigen of the seasonal A/H1N1, A/H3N2 and B viruses were increased dramatically in the ostrich yolk after immunization (Table I). In addition, it appeared that the antibody had a high cross-reactivity to the pandemic influenza viral antigens.

The reactivity of the ostrich IgY to the infectious influenza viruses was examined by immunocytochemistry. MDCK cells were infected with each seasonal influenza virus and pandemic influenza virus A/H1N1. The infected cells were fixed and reacted with IgY generated by the seasonal influenza vaccine immunization. The cytoplasm of the cells infected with the seasonal A/H1N1, A/H3N2 and B viruses was strongly labeled with the IgY (Fig. 1). In contrast, preimmune

Table I. Cross-reactivities of ostrich antibodies (IgY) generated by seasonal influenza vaccine immunization.

	Antibody titer against the indicated influenza virus HA antigens			
	Seasonal influenza viruses			Pandemic influenza virus
Antibody	A/H1N1	A/H3N2	B	2009 A/H1N1
Ostrich IgY	102,400	204,800	102,400	51,200

The antibody titer against the seasonal and pandemic influenza viruses was estimated by ELISA. The ELISA titers against the seasonal influenza viruses [A/Osaka/309/2007 (H1N1), A/Osaka/2587/2005 (H3N2), B/Osaka/21/2005] were markedly increased in ostrich egg yolk (IgY) at 4 weeks post-immunization. In addition, the reactivity to a pandemic influenza virus [A/Osaka/2040/2009 (H1N1)pdm] was also increased in the IgY. This indicates that the antibody was also cross-reactive to the pandemic influenza virus A/H1N1. The antibody titers were defined as the reciprocal of the highest dilution (initial volume, 2 mg/ml) that produced an ELISA signal twice as intense as the signal from equivalently diluted preimmune IgY.

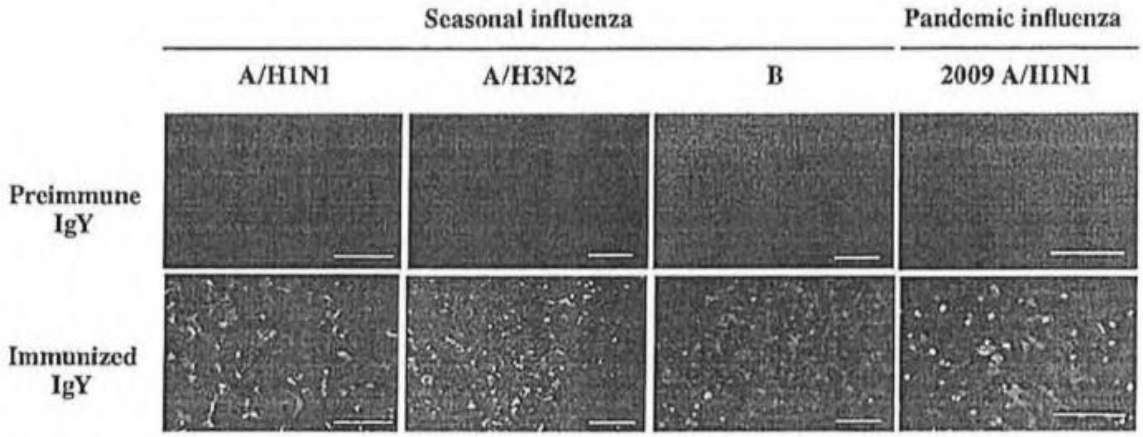


Figure 1. Immunocytochemistry of influenza virus-infected MDCK cells. MDCK cells were infected with seasonal influenza viruses [A/Osaka/309/2007 (H1N1), A/Osaka/2587/2005 (H3N2), B/Osaka/21/2005] and pandemic A/H1N1 [A/Osaka/2040/2009 (H1N1)pdm)]. The cells were fixed 5 days after infection, reacted with ostrich IgY, and then visualized with an FITC-conjugated secondary antibody. None of the cells infected with each virus were stained by preimmune IgY. In contrast, the cells infected with each seasonal influenza virus were strongly stained with the IgY produced by ostrich immunized with the seasonal influenza vaccine. Notably, the IgY cross-reacted with the cells infected with the pandemic A/H1N1 virus. Bars, 100 μm.

IgY did not react with the infected cells. Notably, the cells infected with the pandemic influenza virus also reacted with the IgY. This demonstrated the cross-reactivity of the ostrich antibodies to the pandemic influenza virus A/H1N1, thereby supporting the ELISA findings.

Inhibition of hemaggregation activities of pandemic influenza virus A/H1N1 by ostrich IgY. The HA activities of the influenza viruses were estimated using erythrocytes, since the viral strains in this study originated from sporadic cases of infection and their characteristics had not yet been clarified. The highest dilutions of viral fluids showing hemaggregation were scored as a single HA unit. Each strain of the influenza virus was used for HI testing at 8-HA units.

Hemaggregation by the seasonal A/H1N1, A/H3N2 and B viruses was dramatically inhibited by the ostrich IgY. Importantly, the hemaggregation activities of the pandemic influenza virus A/H1N1 were also impeded by the IgY (Table II). Accordingly, this antibody blocked the HA on the surface of the pandemic A/H1N1 virus as well as on the seasonal influenza viruses, and also inhibited the interaction of HA and erythrocytes, thereby leading to the inhibition of hemaggregation.

Neutralization assays for pandemic influenza virus A/H1N1 infection. The seasonal and pandemic influenza viruses were reacted with the ostrich IgY followed by inoculation into MDCK cells. The degree of neutralization was determined by the observation of CPE after 4 days of inoculation. As shown in Table III, the IgY strongly inhibited the infectivity of all seasonal influenza viruses, A/H1N1, A/H3N2 and B; even a small volume of IgY obstructed the infections of the viruses in the MDCK cells. Notably, the infection of pandemic influenza virus A/H1N1 to MDCK cells was also strongly inhibited by the ostrich IgY. The IgY appeared to bind to the HA of the pandemic influenza virus as well as of the seasonal viruses, and blocked the interaction between viral particles and the receptors on cells, thus leading to the inhibition of viral infectivity.

Table II. Inhibitory activity of ostrich IgY on hemaggregations by the pandemic influenza virus A/H1N1.

	Seasonal influenza viruses			Pandemic influenza virus
	A/H1N1	A/H3N2	B	2009 A/H1N1
HI titer	512	512	128	256

Guinea pig erythrocytes were reacted with seasonal influenza viruses [A/Osaka/309/2007 (H1N1), A/Osaka/2587/2005 (H3N2), B/Osaka/21/2005] and a pandemic virus [A/Osaka/2040/2009 (H1N1)pdm] after incubation with IgY. The activity of IgY against each of the viruses was represented as HI by a titer ratio: 'the highest dilution of immune IgY indicating clear inhibition on hemaggregations' versus 'the highest dilution of preimmune IgY indicating clear inhibition on hemaggregations'. Higher HI titers indicated strong inhibitory activity of the antibody against aggregation by the viruses. Note that the ostrich IgY exhibits inhibitory activities on hemaggregation by a pandemic influenza virus as well as by all of the seasonal influenza viruses.

Table III. Neutralizing activities of ostrich IgY against the infectivities of seasonal and pandemic influenza viruses.

	Neutralizing titers (μg/ml)			
	Seasonal influenza viruses			Pandemic influenza virus
Antibody (IgY)	A/H1N1	A/H3N2	B	2009 A/H1N1
Preimmune IgY	>384.0	>384.0	>384.0	>384.0
Immunized IgY	2.6	8.9	22.3	11.2

Neutralization assays were performed using MDCK cells infected with seasonal influenza viruses [A/Osaka/309/2007 (H1N1), A/Osaka/2587/2005 (H3N2), B/Osaka/21/2005] and a pandemic virus [A/Osaka/2040/2009 (H1N1)pdm]. The titers are indicated as the mean of 50% inhibition on CPE at 5 days post-infection. Note that a pandemic influenza virus as well as all of the seasonal influenza viruses were inhibited with a small volume of immunized ostrich IgY.

Discussion

Hemagglutinin is essential for viral binding to cells and entrance into host cells. Therefore, these antigens are widely used in the vaccination against influenza in humans (13). The inhibition of HA antigens by antibodies is useful for protecting against these viral infections.

The pandemic influenza virus belongs to strain A/H1N1, but its HA is genetically distinct from the HA of seasonal A/H1N1 (2). Vaccination with seasonal influenza vaccines, even when formulated with oil-in-water adjuvants, was found to provide little or no benefit to any age group in human populations with respect to an increase in cross-reactive neutralizing antibodies against pandemic A/H1N1 (4). Importantly, the present study demonstrated that vaccination of a seasonal trivalent influenza HA vaccine into the ostrich resulted in a marked increase in the level of cross-reactive antibody to pandemic influenza A/H1N1. One important finding of the present study was the observation that ostrich IgY obstructed the hemaggregation activities of the pandemic influenza virus A/H1N1. The HA antigens on the pandemic influenza virus A/H1N1 might be masked by ostrich antibodies, thus resulting in the effective blocking of viral adsorption into the cells. The neutralization activities of ostrich antibodies were assessed using living cells to confirm this paradigm. The infection of pandemic influenza viruses from patients was prevented by the IgY, and the CPE of MDCK cells was dramatically inhibited by the antibodies. Therefore, ostrich antibodies might inhibit the entrance of the pandemic influenza virus into cells by blocking HA activities, thus resulting in the escape of cells from viral infection. The ostrich IgY against seasonal A/H1N1 in the trivalent vaccine had cross-reactivity to pandemic A/H1N1, because of the antigenic similarity among strains of A/H1N1. Ongoing studies are underway to determine the mechanism by which ostrich produce cross-reactive neutralizing antibodies to pandemic influenza virus A/H1N1 by immunization with seasonal influenza vaccine.

There is an increasing need for the development of antibodies for research, diagnostic and therapeutic purposes. However, antibodies from experimental mammals, including the mouse and rabbit, are not suited for industrial use because of their high production cost. The avian egg has proven to be an attractive source for the non-invasive production of antibodies, with applications in research, diagnosis and immunotherapy (8,9). A simple and economical method has been developed for the mass production of antibodies, and 4 g of IgY can be purified from one yolk; thus, 400 g of antibodies can be obtained from one female ostrich in one year (5). This suggests that anti-pandemic influenza virus antibodies can be provided in large quantities at a relatively low price using ostrich. Accordingly, the ostrich egg might provide an excellent source of antibodies for industrial purposes.

Recently, various types of facial masks and air-conditioner filters have been used for the prevention of airborne infections.

However, the small influenza virus can pass through currently used filters, thus resulting in human infection, as the virus is still alive even after drying (14-16). Therefore, a high grade filter employing new prevention mechanisms must be developed. Ostrich IgY is being applied to filters, and can protect against influenza viruses by antigen-antibody reactions. In the present study, a large amount of cross-reactive neutralization antibodies against the various influenza viruses, including pandemic A/ H1N1, was produced in a cost-effective manner, indicating the potential of ostrich antibodies for industrial purposes. Filters impregnated with ostrich antibodies may therefore become a powerful tool for protecting humans against pandemic influenza viruses.

Acknowledgements

We thank Dr Tetsuo Kase at the Osaka Prefectural Institute of Public Health for providing the clinical strains of the influenza viruses. We also thank Dr Yoji Goto at The Kitasato Institute Research Center for Biologicals, Japan, for providing the HA antigens of the influenza virus vaccine strains. This study was supported in part by a Grant-in-Aid for Scientific Research (no. 21380182) from the Ministry of Education, Science, Sports and Culture, Japan.

References

1. Garten RJ, Davis CT, Russell CA, Shu B, Lindstrom S, Balish A, Sessions WM, Xu X, Skepner E, Deyde V, Okomo-Adhiambo M, Gubareva L, Barnes J, Smith CB, Emery SL, Hillman MJ, Rivailler P, Smagala J, De Graaf M, Burke DF, Fouchier RA, Pappas C, Alpuche-Aranda CM, López-Gatell H, Olivera H, López I, Myers CA, Faix D, Blair PJ, Yu C, Keene KM, Dotson PD Jr, Boxrud D, Sambol AR, Abid SH, St George K, Bannerman T, Moore AL, Stringer DJ, Blevins P, Demmler-Harrison GJ, Ginsberg M, Kriner P, Waterman S, Smole S, Guevara HF, Belongia EA, Clark PA, Beatrice ST, Donis R, Katz J, Finelli L, Bridges CB, Shaw M, Jernigan DB, Uyeki TM, Smith DJ, Klimov AI and Cox NJ: Antigenic and genetic characteristics of swine-origin 2009 A(H1N1) influenza viruses circulating in humans. Science 325: 197-201, 2009.
2. Novel Swine-Origin Influenza A (H1N1) Virus Investigation Team: Emergence of a novel swine-origin influenza A (H1N1) virus in humans. N Engl J Med 360: 2605-2615, 2009.
3. Nelson MI, Viboud C, Simonsen L, Bennett RT, Griesemer SB, St-George K, Taylor J, Spiro DJ, Sengamalay NA, Ghedin E, Taubenberger JK and Holmes EC: Multiple reassortment events in the evolutionary history of H1N1 influenza A virus since 1918. PLoS Pathog 4: e1000012, 2008.
4. Hancock K, Veguilla V, Lu X, Zhong W, Butler EN, Sun H, Liu F, Dong L, DeVos J, Gargiullo PM, Brammer TL, Cox NJ, Tumpey TM and Katz JM: Cross-reactive antibody responses to the 2009 pandemic H1N1 influenza virus. N Engl J Med 361: 1945-1952, 2009.
5. Adachi K, Handharyani E, Sari DK, Takama K, Fukuda K, Endo I, Yamamoto R, Sawa M, Tanaka M, Konisi I and Tsukamoto Y: Development of neutralization antibodies against highly pathogenic H5N1 avian influenza virus using ostrich (*Struthio camelus*) yolk. Mol Med Rep 1: 203-209, 2008.
6. Adachi K, Hagimori K, Kato H, Fukuda K, Kikuta M and Tsukamoto Y: Potential role of SC1, a cell adhesion molecule, in mammary gland tumors. Mol Med Rep 1: 219-224, 2008.
7. Schade R, Pfister C, Halatsch R and Henklein P: Polyclonal IgY antibodies from chicken egg yolk – an alternative to the production of mammalian IgG type antibodies in rabbits. ATLA 19: 403-419, 1991.
8. Schade R, Schniering A and Hlinak A: Polyclonal avian antibodies extracted from egg yolk as an alternative to the production of antibodies in mammals – a review. ALTEX 9: 43-56, 1992.
9. Gross M and Speck J: Avian yolk antibodies in diagnosis and research. Dtsch Tierarztl Wochenschr 103: 417-422, 1996.
10. Larsson A, Balow RM, Lindahl TL and Forsberg PO: Chicken antibodies: taking advantage of evolution – a review. Poult Sci 72: 1807-1812, 1993.
11. Leslie GA and Clem LW: Phylogeny of immunoglobulin structure and function. III. Immunoglobulins of the chicken. J Exp Med 130: 1337-1352, 1969.
12. Reed LJ and Muench H: A simple method of estimating fifty percent endo-points. Am J Hyg 27: 493-797, 1938.
13. Bosch FX, Orlinch M, Klenk HD and Rott R: The structure of the hemagglutinin, a determinant for the pathogenicity of influenza viruses. Virology 95: 197-207, 1979.
14. Wiwanitkit V: N-95 face mask for prevention of bird-flu virus: An appraisal of nanostructure and implication for infectious control. Lung 184: 373-374, 2006.
15. Gralton J and McLaws ML: Protecting healthcare workers from pandemic influenza: N95 or surgical masks? Crit Care Med 38: 657-667, 2010.
16. Aiello AE, Murray GF, Perez V, Coulborn RM, Davis BM, Uddin M, Shay DK, Waterman SH and Monto AS: Mask use, hand hygiene, and seasonal influenza-like illness among young adults: a randomized intervention trial. J Infect Dis 201: 491-498, 2010.

Statistics Canada Statistique Canada

Census Profile, 2021 Census of Population

Profile table

This is Exhibit " C " referred to in the affidavit of David Bilinski sworn before me at Vernon this 29 day of January 2025

Characteristic	Total
Population and dwellings	
Population, 2021 [1]	235
Population, 2016 [1]	236
Population percentage change, 2016 to 2021	- 0.4
Total private dwellings [2]	139
Private dwellings occupied by usual residents [3]	128
Population density per square kilometre	114.3
Land area in square kilometres	2.06
Age characteristics	
Total - Age groups of the population - 100% data	235
0 to 14 years	10
0 to 4 years	0
5 to 9 years	0
10 to 14 years	15
15 to 64 years	125
15 to 19 years	10
20 to 24 years	10
25 to 29 years	5
30 to 34 years	5

Characteristic	Total
35 to 39 years	5
40 to 44 years	10
45 to 49 years	15
50 to 54 years	15
55 to 59 years	20
60 to 64 years	35
65 years and over	95
65 to 69 years	30
70 to 74 years	40
75 to 79 years	20
80 to 84 years	10
85 years and over	0
85 to 89 years	0
90 to 94 years	0
95 to 99 years	0
100 years and over	0
Total - Distribution (%) of the population by broad age groups - 100% data	100.0
0 to 14 years	4.3
15 to 64 years	53.2
65 years and over	40.4
85 years and over	0.0
Average age of the population	56.4
Median age of the population	62.4
Household and dwelling characteristics	
Total - Occupied private dwellings by structural type of dwelling - 100% data	130

Ministry of Agriculture

Animal Health Centre

AAVLD - Accredited Laboratory

Ministry of Agriculture
1767 Angus Campbell Road
Abbotsford BC V3G 2M3
Telephone: (604) 556-3003
Facsimile: (604) 556-3010
Toll-Free: 1-800-661-9963

Final Report AHC Case: 20-832

Last Updated: 02/10/20 8:24 AM
Case Coordinator: Anthony (Tony) Redford
Received Date: 02/05/20
Collected Date: 02/03/20
Client Ref No:

Submitter: White Valley Vet. Services
Phone:

Owner: Universal Ostrich Farm
Phone:(250) 269-7447
Premise ID:

Veterinarian: Dr. J. Perry
Clinic: White Valley Vet. Service
Phone: (250) 547-9700
Fax: (250) 547-9704

Animal Data
Species: Ostrich
Breed:
Sex: Male
Age: 16 Months
Animal ID:

Case History

Received. 1x other (white substance). Testing requested: Bacteriology and PCR.

16 mon old male ostrich, died Feb. 1/20. White nodules at back of mouth. Cold like -coughing slightly -dull eyes -a little pink -coughing up white chunks. Treated - 5cc Duplocillin LA, 3cc Dex 5, Tubed with Electrolytes.

Diagnostic investigation.

*All histories are copied verbatim from the submission form

Bacteriology

Aerobic Culture - Prod Resulted by: Erin Zabek Verified by: Katrina Abram on 02/07/20 @ 12:06 PM

Specimen	ID	Isolate	Result	Level
Tissue	Unknown	Proteus sp.	Positive	
Tissue	Unknown	Pseudomonas aeruginosa	Positive	4+
Tissue	Unknown	E.coli (non-haemolytic)	Positive	4+

AVGN Resulted by: Jaime Battle Verified by: Erin Zabek on 02/10/20 @ 8:24 AM

This is Exhibit " D " referred to in the affidavit of...David Bilinski
sworn before me at...Vernon
this...25...day of...January....20.25
.....

Katrina Jones

From: West AI Sick Bird / Ouest IA Les oiseaux malades (CFIA/ACIA) <cfia.WestAISickBird-OuestIALesoiseauxmalades.acia@inspection.gc.ca>
Sent: Tuesday, December 31, 2024 8:26 AM
To: universalostrich@gmail.com
Subject: Quarantine douments 4206 Q
Attachments: AI 2022 BC BC-820 Dave Bilinski 2024-12-30 4206 Q (22839) Zhang,I.pdf; AI General Information.pdf; Privacy Notice Statement for Animal Disease Investigations.pdf; Requirement to Quarantine - Producer Information Sheet.pdf

Hello,

Please see the following attachment documents with regards to movement control/quarantine being placed on your premise due to the pending Avian Influenza Testing. This movement control/quarantine will remain in place until you receive documents of release from CFIA.

Please find the following attachments regarding movement controls/quarantine on premise:

1. General information on Avian Influenza
2. Producer information sheet on the requirements for quarantine
3. Privacy notice statement from CFIA
4. Legal documents (4206) for quarantine of poultry and poultry products.

Please reply back as a recognition of receiving these documents.
Kind regards,

Nicki Conner
AI 2022 AB Sick Bird Call Group
(403) 338-5225

This is Exhibit " E " referred to in the affidavit of David Bilinski sworn before me at Vernon this 29 day of January 2025

.....

Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments

File Number / Numéro de dossier
BC-820 22839

HEALTH OF ANIMALS ACT / LA LOI SUR LA SANTÉ DES ANIMAUX

NOTICE / AVIS

REQUIREMENT TO QUARANTINE AND/OR LICENSE TO TRANSPORT ANIMALS OR THINGS / OBLIGATION DE METTRE EN QUARANTAINE ET/OU PERMIS DE TRANSPORTER DES ANIMAUX OU DES CHOSES

To: / À :
Universal Ostrich
Owner Name (legal owner of premise): Dave Bilinski
Email: universalostrich@gmail.com
Phone #: 778-692-9389
301 Langille Road, Edgewood, BC, V0G 1J0

Location of Animal(s)/Thing(s) - Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
301 Langille Road, Edgewood, BC, V0G 1J0
Lat: 49.862402 Long: -118.149296
Premise ID: BC44K4PMR

The requirement must be met in the following manner during the period commencing on the date of this notice

I find or suspect that the animals/things described below are affected or contaminated by AVIAN INFLUENZA

Pursuant to section 6/9/59 of the Health of Animals Regulations, I therefore require you as the owner or person having the possession, care or control of the animals/things described below to quarantine the animals/things described below.

All birds/carcasses are kept indoors or in the barn. Confine to the above described premises in such manner that there is no contact with any birds, animals, humans (other than humans involved in the care or disposal of birds), and other things exposed to birds including things related to the conveyance, care and maintenance of avians and the care and maintenance of the premises which may result in transmission of the disease.

Report any signs of avian influenza or increased mortality to the Canadian Food Inspection Agency (CFIA) immediately. Complete the flock health questionnaire provided and return to the CFIA at the specified times. Quarantine conditions must remain in effect until released by an inspector of the Canadian Food Inspection Agency.

Any of the above-mentioned animals or things will require a License to Transport Animals or Things from CFIA in order to move or to be removed from the site.

L'obligation imposée doit être remplie de la façon suivante à compter de la date du présent avis

Je constate ou soupçonne que les choses ou les animaux visés ci-dessous sont atteints ou contaminés par _____

Conformément aux articles 6, 9 et 59 du Règlement sur la santé des animaux, vous êtes tenu, en qualité de propriétaire ou de personne qui a la possession, la responsabilité ou la charge des soins des choses ou des animaux visés ci-dessous, de mettre en quarantaine les choses ou les animaux en question.

2024-12-30
Date

Digitally signed by ZHANG, XIANG
Date: 2024.12.30 11:13:16 -08'00'
Signature

Ian Zhang
Name of Inspector / Nom de l'inspecteur

Telephone / Téléphone

TERMINATION OF QUARANTINE
TERMINAISON DE QUARANTAINE

Date

Signature

Name of Inspector / Nom de l'inspecteur

Telephone / Téléphone

	Identification Number / Numéro d'identification	Age / Âge	Sex / Sexe	Description of Animal(s) or Thing(s) / Description de l'(des) animal(aux) ou de la(des) chose(s)
1				"All animals of susceptible species on-site (see below) and any related
2				animal products, by-products and things along with any animals,
3				products, by-products and things having contact with them".
4				
5				Description of susceptible species present on-site:
6				All Avian species on this premise.
7				
8				
9				
10				Sick bird Call Log#:773
11				
12				
13				
14				

The information on this document is collected by the Canadian Food Inspection Agency under the authority of the Health of Animals Act for the purpose of protecting human and animal health. Information may be accessible or protected as required under the provisions of the *Access to Information Act*.

Les renseignements figurant dans le présent document sont recueillis par l'Agence canadienne d'inspection des aliments en vertu de la loi sur la santé des animaux afin de protéger la santé des personnes et des animaux. Les renseignements peuvent être accessibles ou protégés selon ce que prescrit la *Loi sur l'accès à l'information*.

Quarantine

The following provisions of the Health of Animals Regulations relate to the requirement to quarantine animals or things:

6. Where an inspector finds or suspects that:

a) a thing is a disease agent,
b) an animal or thing is affected by or contaminated with a communicable disease, or
c) any record or document required by or under the Act and these Regulations to prevent the spread of any disease within Canada, or to any other country from Canada, by an animal or thing is not produced for inspection by an inspector,

the inspector may order the person who owns or has possession, care or control of the animal or thing, to quarantine the animal or thing, and the provisions of section 91.4 apply.

9. Where an inspector finds or suspects that:

a) a thing is a disease agent,
b) an animal or thing imported into Canada is affected by or contaminated with a communicable disease, or
c) any information or documentation required by or under the Act and these Regulations to prevent the introduction of Any disease into Canada by an animal or thing is not presented to an inspector,

the inspector may order the person who owns or has possession, care or control of the animal or thing to quarantine the animal or thing, and the provisions of section 91.4 apply.

59. The Minister may, for the purpose of preventing the introduction of communicable disease into Canada or into any other country from Canada, require any animal imported into Canada to be quarantined, and the provisions of section 91.4 apply.

91.4(1) Where an inspector orders a quarantine of a disease agent, animal or thing, the notice of quarantine shall be communicated by personal delivery to the person who owns or has possession, care or control of the disease agent, animal or thing and the notice may specify the manner, condition, place or places and time of quarantine, necessary to prevent the spread of the communicable disease.

2) In respect of a disease agent, animal or thing quarantined pursuant to these Regulations, no person shall do or permit to be done any of the following actions, without the authorization of an inspector:
a) remove the disease agent, animal or thing from the place of quarantine;
b) allow the disease agent, animal or thing to come into contact with an animal that is not quarantined under the same quarantine order;
c) destroy the disease agent, animal or thing; or
d) treat or test the disease agent, animal or thing for a communicable disease.

(3) Every person who owns or has the possession, care or control of an animal quarantined pursuant to these Regulations shall immediately notify a veterinary inspector of any quarantined animal that appears sick.

(4) In respect of a disease agent or thing quarantined pursuant to these Regulations, no person shall do or permit to be done any of the following actions, without the authorization of an inspector:
a) move the disease agent or thing;
b) alter the appearance of the disease agent or thing;
c) remove of any tag, sign or other notice that the disease agent or thing is under quarantine; or
d) open any container or remove any wrapping or cover around the disease agent or thing.

(5) No person shall transport or cause to be transported a disease agent, animal or thing quarantined pursuant to these Regulations unless:

a) a licence for its transportation has been issued by an inspector;
b) a copy of the licence issued pursuant to paragraph (a) has been provided to the person in charge of the conveyance transporting the disease agent, animal or thing;
c) and the disease agent, animal or thing is transported directly to the location stated in the licence.

(6) Every person who receives a notice referred to in subsection (1) shall comply with the notice.

Penalty

Section 66 of the *Health of Animals Act*:

66. Every person who fails to comply with a notice delivered to the person under section 18, 25, 27, 37, 43 or 48 or the regulations is guilty of:

a) an offence punishable on summary conviction and liable to a fine not exceeding fifty thousand dollars or to imprisonment for a term not exceeding six months, or to both; or
b) an indictable offence and liable to a fine not exceeding two hundred thousand dollars or to imprisonment for a term not exceeding two years, or to both.

Quarantaine

Les dispositions suivantes du Règlement sur la santé des animaux ont trait à l'obligation de mettre en quarantaine des animaux ou des choses :

6. L'inspecteur peut ordonner au propriétaire d'un animal ou d'une chose ou à la personne en ayant la possession, la responsabilité ou la charge des soins de le mettre en quarantaine, auquel cas les dispositions de l'article 91.4 s'appliquent, lorsqu'il constate ou soupçonne que :
a) la chose est un agent causant une maladie;
b) l'animal ou la chose est affecté ou contaminé par une maladie transmissible;
c) tout registre ou documentation exigé en vertu de la Loi ou du présent règlement afin de prévenir la propagation de toute maladie au sein du Canada, ou du Canada à un autre pays, par l'animal ou la chose, ne lui est pas fourni aux fins d'inspection.

9. L'inspecteur peut ordonner au propriétaire d'un animal ou d'une chose ou à la personne en ayant la possession, la responsabilité ou la charge des soins de le mettre en quarantaine, auquel cas les dispositions de l'article 91.4 s'appliquent, lorsqu'il constate ou soupçonne que :
a) la chose est un agent causant une maladie;
b) l'animal ou la chose est importé et est affecté ou contaminé par une maladie transmissible;
c) tout renseignement ou documentation exigé en vertu de la Loi ou du présent règlement afin de prévenir l'introduction de toute maladie au Canada, par l'animal ou la chose, ne lui est pas fourni.

59. Le ministre peut, afin de prévenir l'introduction de maladies transmissibles au Canada, ou dans un autre pays depuis le Canada, exiger que tout animal importé au Canada soit mis en quarantaine, auquel cas les dispositions de l'article 91.4 s'appliquent.

91.4(1) Lorsqu'un inspecteur ordonne la mise en quarantaine d'un agent causant une maladie, d'un animal ou d'une chose, l'avis de mise en quarantaine doit être remis en main propre au propriétaire de l'agent, de l'animal ou de la chose ou à la personne en ayant la possession, la responsabilité ou la charge des soins, et cet avis peut préciser les modalités, les conditions, le ou les lieux et le délai de quarantaine nécessaires pour prévenir la propagation de la maladie transmissible.

(2) En ce qui concerne un agent causant une maladie, un animal ou une chose mis en quarantaine aux termes du présent règlement, il est interdit, sans l'autorisation d'un inspecteur, de prendre les mesures suivantes ou de permettre qu'elles soient prises :
a) retirer l'agent, l'animal ou la chose du lieu de quarantaine;
b) laisser l'agent, l'animal ou la chose entrer en contact avec un animal qui n'est pas mis en quarantaine en vertu de la même ordonnance;
c) détruire l'agent, l'animal ou la chose;
d) traiter l'agent, l'animal ou la chose pour une maladie transmissible ou mener des tests de dépistage à cet égard.

(3) Le propriétaire d'un animal mis en quarantaine aux termes du présent règlement, ou la personne en ayant la possession, la responsabilité ou la charge des soins, doit sans délai aviser un vétérinaire-inspecteur lorsque l'animal semble malade.

(4) En ce qui concerne un agent causant une maladie ou une chose mis en quarantaine aux termes du présent règlement, il est interdit, sans l'autorisation d'un inspecteur, de prendre les mesures suivantes ou de permettre qu'elles soient prises :
a) déplacer l'agent ou la chose;
b) en modifier l'apparence;
c) enlever une étiquette, une indication ou un autre avis précisant que l'agent ou la chose est en quarantaine;
d) ouvrir un contenant ou enlever un emballage dans lequel se trouve l'agent ou la chose ou en enlever la couverture.

(5) Il est interdit de transporter ou de faire transporter un agent causant une maladie, un animal ou une chose mis en quarantaine aux termes du présent règlement, sauf si :

a) un permis pour son transport a été délivré par un inspecteur;

b) une copie du permis a été fournie à la personne chargée du véhicule qui transporte l'agent, l'animal ou la chose;

c) l'agent, l'animal ou la chose est transporté directement à l'endroit indiqué sur le permis.

(6) Quiconque reçoit l'avis visé au paragraphe (1) doit s'y conformer.

Pénalité

L'article 66 de la *Loi sur la santé des animaux*:

66. Quiconque contrevient à l'avis qui lui a été signifié au titre des articles 18, 25, 27, 37, 43 ou 48 ou des règlements commet une infraction et encourt, sur déclaration de culpabilité :

a) par procédure sommaire, une amende maximale de cinquante mille dollars et un emprisonnement maximal de six mois, ou l'une de ces peines; ou
b) par mise en accusation, une amende maximale de deux cents mille dollars et un emprisonnement maximal de deux ans, ou l'une de ces peines.

CFIA / ACIA 4200 (2011/08)

Avian influenza in birds

Avian influenza (AI), often called "bird flu," is caused by the Type "A" influenza virus. This virus can affect several species of food-producing birds (chickens, turkeys, quails, guinea fowl, etc.), as well as pet and wild birds.

Avian influenza viruses can be broadly classified into 2 types, based on the severity of the illness caused in birds:

- low pathogenic avian influenza (LPAI)
- highly pathogenic avian influenza (HPAI)

Most avian influenza viruses are low pathogenic. These typically cause little or no signs of illness in infected birds.

However, highly pathogenic viruses can cause severe illness and death in birds.

Different strains of avian influenza

Avian influenza viruses are divided by subtypes based on 2 proteins found in the viruses: hemagglutinin, or "H" protein, and neuraminidase, or "N" protein. There are 16 H types and 9 N types which create a total 144 possible combinations.

The H5 and H7 subtypes of the virus are of particular concern, given the ability of these 2 H-types to mutate from low pathogenic to highly pathogenic after they infect domestic birds. These 2 H-types have been known to cause serious disease or mortality in domestic poultry, yet low pathogenic H5 and H7 viruses are quite common in wild waterfowl.

Different strains of the same type of virus can exist, particularly in different parts of the world. Such strains can have very different characteristics and structure. For example, the H5N1 strain that has been reported in various parts of Europe is low pathogenic and is distinctly different from the Asian strain, which is highly pathogenic.

Avian influenza in humans

Avian influenza viruses, such as the highly pathogenic H5N1 virus present in Asia, can, on rare occasions, cause disease in humans.

Transmission to humans has occurred when people have had close contact with infected birds or heavily contaminated environments.

Due to the potential for human infection, it is recommended that people working with poultry suspected of being infected with avian influenza, or in contact with such poultry, wear protective clothing. This includes, face masks, goggles, gloves and boots.

Additional information:

- Avian Influenza and Poultry (Health Canada)
- Human Health Issues Related to Avian Influenza in Canada (Public Health Agency of Canada)

Where avian influenza is found

Avian influenza viruses have been found in Canada and around the world.

The Canadian Food Inspection Agency (CFIA) publishes reports on previous disease incidents in Canada.

Detailed information on the distribution of the H5N1 subtype and highly pathogenic avian influenza around the world is available from the World Organisation for Animal Health (OIE)

What the clinical signs of avian influenza are

Some or all of the following clinical signs are evident in infected birds:

- a drop in production of eggs, many of which are soft-shelled or shell-less
- diarrhea
- haemorrhages on the hock
- high and sudden mortality rate
- quietness and extreme depression
- swelling of the skin under the eyes
- wattles and combs become swollen and congested

The incubation period of AI ranges from 2 to 14 days.

The signs of AI (or more commonly known as bird flu) are very similar to those seen with Velogenic Newcastle Disease and other poultry diseases.

How to diagnose avian influenza

Avian influenza should be suspected on the basis of clinical signs.

Laboratory testing is needed to confirm the presence of the avian influenza virus. Contact your local veterinarian or provincial veterinary laboratory for assistance.

How to treat avian influenza

There is no treatment for birds that have the disease.

Vaccinating the birds may play a role in reducing the spread of the disease but does not eliminate the virus.

How avian influenza is transmitted and spread

Wild birds, especially waterfowl, are natural reservoirs of influenza viruses. They are not normally affected by the disease, but can still transmit it to domestic birds.

The disease can spread to birds through contact with infected poultry and poultry products. It can also spread through contaminated manure, litter, clothing, footwear, vehicles, equipment, feed and water.

It is essential for commercial poultry producers to use strict biosecurity practices in order to prevent introduction of the virus to their flock. Farmers should take the following measures.

- Keep poultry away from areas frequented by wild birds.
- Maintains strict control over access to poultry houses.
- Make sure that equipment is cleaned and disinfected before taking it into poultry houses.
- Do not keep bird feeders or create duck ponds close to poultry barns because they attract wild birds.
- Maintain high sanitation standards.

Avian influenza in pets

Pet birds can be infected by avian influenza and spread the disease to humans. In order to prevent the spread of AI, Canada has strict import requirements for pet birds from countries affected by avian influenza.

The highly pathogenic Asian strain of H5N1 has also been detected in mammals, including rats, mice, weasels, ferrets, pigs, cats and dogs.

However, the number of documented cases of avian influenza H5N1 in non-avian species is very low, despite the fact that this virus has caused large avian outbreaks globally over the last few years.

Current science suggests that the risk of a human contracting avian influenza from a mammalian pet is very low. Nonetheless, owners are encouraged to take appropriate precautions to protect their pets and themselves.

How to protect domestic poultry from avian influenza in Canada

The CFIA imposes strict regulations on the import of animals and animal products from countries where avian influenza is known to occur. These regulations are enforced through port-of-entry inspections done either by the Canada Border Services Agency or the CFIA.

The CFIA has enhanced its avian influenza surveillance for commercial poultry flocks in Canada with the launch of the Canadian Notifiable Avian Influenza Surveillance System (CanNAISS).

This surveillance program was developed in collaboration with provincial and territorial governments, poultry farmers and other industry representatives.

The Government of Canada, provincial and territorial governments, and animal health experts also conduct an annual surveillance program of avian influenza in wild birds. Through this program, live and dead birds are sampled and tested for avian influenza viruses.

Highly pathogenic avian influenza and low pathogenic avian influenza by subtypes H5 and H7 is a reportable disease under the *Health of Animals Act and Regulations*. This means that all suspected cases must be reported to the CFIA for immediate investigation by inspectors.

Under the Avian Influenza Hazard Specific Plan, the CFIA responds to both highly pathogenic and low pathogenic H5 and H7 viruses by reporting disease outbreaks to the OIE, establishing quarantines, ordering the humane destruction of poultry, conducting trace-out activities, overseeing the cleaning and disinfection of premises, and verifying that the affected farms remain free of avian influenza according to OIE standards.

How the CFIA responds to an outbreak of avian influenza in Canada

Canada's emergency response strategy to an outbreak of avian influenza would be to eradicate the disease and re-establish Canada's disease-free status as quickly as possible.

The CFIA's AI emergency response strategy includes the following measures:

- the humane destruction of all infected and exposed animals
- surveillance and tracing of potentially infected or exposed animals
- strict quarantine and animal movement controls to prevent disease spread
- strict decontamination of infected premises
- zoning to define infected and disease-free areas

Owners whose animals are ordered destroyed by the CFIA may be eligible for compensation.

What travellers can do to help protect Canadian livestock from an outbreak of avian influenza

While out of the country, travellers should avoid visiting areas where they may come into contact with live birds, including

- poultry farms
- live bird markets
- any other area where birds congregate

This is most important in countries that are experiencing an outbreak of highly pathogenic avian influenza.

If you are in contact with live birds infected with the AI virus, the virus may persist on your clothing, footwear and in your hair. Take appropriate personal hygiene measures, such as the following.

- Wash your hands
- Shower
- Wash all of the clothing you had with you while abroad
- Clean and disinfect your footwear

When you return home, do the following.

- Avoid contact with farmed animals (including poultry), zoo animals or wildlife for 5 days after you return if you were exposed to similar animals while you were abroad.
- Do not visit Canadian farms for 14 days if you visited a farm or had contact with wild birds while abroad.
- Be sure the footwear you wore to the farm or when you had contact with wild birds is disinfected and your clothing is washed thoroughly and dried at a high temperature.
- Complete the appropriate areas of your Customs Declaration Card - PDF (45 kb) regarding farm visits.
- Ensure all birds and poultry products you bring into Canada are eligible for entry. Declare all animal products upon arrival.

Privacy Notice Statement for Animal Disease Investigations

The Canadian Food Inspection Agency (CFIA) is committed to protecting the privacy rights of individuals, including safeguarding the confidentiality of information provided by individuals and institutions.

This information is being collected and used under this Agency's legislative authority for the following purpose: to support the eradication and/or control of livestock diseases in Canada which are reportable in accordance with the *Health of Animals Act*. This information will be retained in accordance with the Agency's retention and disposition policies.

The personal information collected appears in Personal Information Bank Monitoring and Enforcement for the Canadian Food Inspection Agency, which is described within InfoSource.

Personal information collected by CFIA and the Government of Canada is protected from disclosure to unauthorized persons and/or agencies pursuant to the provisions of the Privacy Act. Individuals to whom the personal information pertains have the right to the protection of and access to their personal information under the *Privacy Act*, subject to certain exceptions and exemptions.

For inquiries, concerning the treatment of personal information in the custody of CFIA, individuals may contact the Canadian Food Inspection Agency's Access to Information and Privacy Office at cfia.atip-aiprp.acia@canada.ca or located at 1400 Merivale Road, Tower 1, Room 0-149 Ottawa, ON K1A 0Y9, Canada, for access to their personal information pursuant to the provisions of the *Privacy and Access to Information Acts*.

Owner or person having the care of the animals /things Information Sheet

☐Requirement to Quarantine

If animals are suspected of being infected with a contagious Reportable animal disease, a CFIA staff member (usually the district veterinarian) will visit the premises to meet with you. At that time, the animals and things present on your premises will be "quarantined" and precautionary movement restrictions will be put in place. The CFIA employee will provide you with documentation outlining the rules of the "Requirement to quarantine" and discuss your responsibilities. He or she will also answer any questions you may have.

Movement restrictions are necessary to control the potential spread of the disease. Some diseases are highly contagious and can spread rapidly through close contact between animals, as well as on contaminated equipment, clothing and footwear, on contaminated material such as hay and feed, or deadstock that could be accessed by susceptible animals. In addition, some diseases can spread by the air (virus excreted in the breath of an infected animal then carried through the air to other livestock).

During the quarantine period, you are not authorized to:

- remove animals or things (e.g. animal products and by-products, feed, manure, hay, straw, vehicles and equipment) from the place of quarantine;
- let the animals or things (e.g. animal products and by-products, feed, manure, hay, straw, vehicles and equipment) come into contact with an animal that is not quarantined under the same quarantine order;
- destroy the animal or thing;
- treat or test the animal or thing for a communicable disease;
- do the following, unless you have obtained prior authorization of a CFIA inspector:
    - Move a thing or alter its appearance, remove any tag, sign or notice indicating that the thing is under quarantine.
- transport or cause to be transported an animal or thing under quarantine unless a license for its transport has been issued by an inspector and a copy of the license has been provided to the transporter.

During the quarantine period, you must:

- Maintain signage indicating that the animals /things are under "Quarantine";
- Notify, without delay, a veterinary inspector of any quarantined animal that appears sick;
- If authorized, transport animals / things directly to location stated in the license.

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)**
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Thu, Jan 2, 2025 at 10:33 AM
Subject: Initial Documents BC-820-IP-233
To: universalostrich@gmail.com <universalostrich@gmail.com>, universalostrich@hotmail.com <universalostrich@hotmail.com>
Cc: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

This is Exhibit " F " referred to in the affidavit of David Bilinski sworn before me at Vernon this 30 day of January 2025

Hello!

Apologies for not getting this sent right after our call this morning! As discussed earlier, because of the complex situation, many of the attached information documents won't reflect the process as they're geared to commercial poultry farms. So, in the document list below, I've highlighted the documents most important for you to review.

As you are aware, your premises has been identified as an infected premises for Avian Influenza. Regulatory actions on your premises will be put into place immediately.

For your reference, there is a lot of useful information regarding avian influenza and the role of CFIA on our external website: Avian Influenza (bird flu) - Canadian Food Inspection Agency (canada.ca)

I have been assigned as your case officer and will serve as your primary contact for any issues/questions that come up throughout this process. Likewise, any questions that CFIA has for you should come through me.

Attached to this email are the legal documents related to your premises. These include:

1. Order to dispose of animals or things (4202)
2. Declaration of infected place (4204)
3. Requirement to quarantine (4206)
4. Licence for removal of animals or things (1509). This last document describes the animals/things that can move from your premises without restriction, provided sound biosecurity (see biosecurity protocols for holders of licences, in your initial quarantine email). Anything that needs to move other than this, or to enter the restricted zone on your premises (eg. delivery of shavings for compost) must do so under provisions of a movement permit.
5. BC CDC Letter
6. Biocontainment procedures for owners of IPs and AI general Information sheet
7. Privacy Notice Statement
8. A Generic What to expect- Step by step document of the process
9. **Letter of Direction – this needs to be signed by you, the producer for any third party (non CFIA) depopulation activities to take place. I will need you to sign the attachment and send back to me as soon as you can via email.**

Next steps:

- As discussed on the call earlier this morning, I'll send you a Microsoft Teams link to join our meeting scheduled for tomorrow, January 3, 2025 at 13:00 PST. This meeting is an epidemiologic questionnaire and will discuss layout of premises, movements on and off the property, clinical history of birds on site, ect. These calls range 1-3 hours normally. Given the situation – I'd expect it to maybe be longer, so please plan for that. It's always helpful to have a calendar and flock health records on hand for the call.
    - If you can, please send me any flock health records or visitor logs from the past month or two. You can send these via text.
- I will be sending you an another email shortly about the paperwork needed to start the process of the depopulation exemption.

I think that's all I have for now. Please don't hesitate to text or call me at the number below if you have any questions.

Kind regards,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Lethbridge, AB

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461



Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments

File Number / Numéro de dossier
BC-820-IP-233 22930

HEALTH OF ANIMALS ACT / LA LOI SUR LA SANTÉ DES ANIMAUX

NOTICE / AVIS

REQUIREMENT TO QUARANTINE AND/OR LICENSE TO TRANSPORT ANIMALS OR THINGS / OBLIGATION DE METTRE EN QUARANTAINE ET/OU PERMIS DE TRANSPORTER DES ANIMAUX OU DES CHOSES

To: / À :

Universal Ostrich
Owner Name (legal owner of premise): Dave Bilinski
Email: universalostrich@gmail.com
Phone #: 778-692-9389
301 Langille Road, Edgewood, BC, V0G 1J0

Location of Animal(s)/Thing(s) - Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)

301 Langille Road, Edgewood, BC, V0G 1J0
Lat: 49.862402 Long: -118.149296
Premise ID: BC44K4PMR

The requirement must be met in the following manner during the period commencing on the date of this notice

I find or suspect that the animals/things described below are affected or contaminated by AVIAN INFLUENZA

Pursuant to section 6/9/59 of the Health of Animals Regulations, I therefore require you as the owner or person having the possession, care or control of the animals/things described below to quarantine the animals/things described below.

All birds/carcasses are kept indoors or in the barn. Confine to the above described premises in such manner that there is no contact with any birds, animals, humans (other than humans involved in the care or disposal of birds), and other things exposed to birds including things related to the conveyance, care and maintenance of avians and the care and maintenance of the premises which may result in transmission of the disease.

Report any signs of avian influenza or increased mortality to the Canadian Food Inspection Agency (CFIA) immediately. Complete the flock health questionnaire provided and return to the CFIA at the specified times. Quarantine conditions must remain in effect until released by an inspector of the Canadian Food Inspection Agency.

Any of the above-mentioned animals or things will require a License to Transport Animals or Things from CFIA in order to move or to be removed from the site.

L'obligation imposée doit être remplie de la façon suivante à compter de la date du présent avis

Je constate ou soupçonne que les choses ou les animaux visés ci-dessous sont atteints ou contaminés par _____

Conformément aux articles 6, 9 et 59 du Règlement sur la santé des animaux, vous êtes tenu, en qualité de propriétaire ou de personne qui a la possession, la responsabilité ou la charge des soins des choses ou des animaux visés ci-dessous, de mettre en quarantaine les choses ou les animaux en question.

2024-12-28
Date

Koetsier, Meghan
Digitally signed by Koetsier, Meghan
Date: 2025.01.02 11:05:47 -05'00'
Signature

MEGHAN KOETSIER
Name of Inspector / Nom de l'inspecteur

Telephone / Téléphone

TERMINATION OF QUARANTINE / TERMINAISON DE QUARANTAINE

Date

Signature

Name of Inspector / Nom de l'inspecteur

Telephone / Téléphone

	Identification Number / Numéro d'identification	Age / Âge	Sex / Sexe	Description of Animal(s) or Thing(s) / Description de l'(des) animal(aux) ou de la(des) chose(s)
1				"All animals of susceptible species on-site (see below) and any related
2				animal products, by-products and things along with any animals,
3				products, by-products and things having contact with them".
4				
5				Description of susceptible species present on-site:
6				All Avian species on this premise.
7				
8				Sick bird Call Log#:773
9				
10				This revokes and replaces CFIA/ACIA Form 4206Q Requirement to
11				Quarantine Animals and/or Things File Number: BC-820 22839 issued by
12				Xiang Zhang on 2024-12-30. Amendment to backdate the 4206Q, verbal
13				quarantine was placed 2024-12-28.
14				

The information on this document is collected by the Canadian Food Inspection Agency under the authority of the Health of Animals Act for the purpose of protecting human and animal health. Information may be accessible or protected as required under the provisions of the *Access to Information Act*.

Les renseignements figurant dans le présent document sont recueillis par l'Agence canadienne d'inspection des aliments en vertu de la loi sur la santé des animaux afin de protéger la santé des personnes et des animaux. Les renseignements peuvent être accessibles ou protégés selon ce que prescrit la *Loi sur l'accès à l'information*.

Quarantine

The following provisions of the Health of Animals Regulations relate to the requirement to quarantine animals or things:

6. Where an inspector finds or suspects that:

a) a thing is a disease agent,
b) an animal or thing is affected by or contaminated with a communicable disease, or
c) any record or document required by or under the Act and these Regulations to prevent the spread of any disease within Canada, or to any other country from Canada, by an animal or thing is not produced for inspection by an inspector,

the inspector may order the person who owns or has possession, care or control of the animal or thing, to quarantine the animal or thing, and the provisions of section 91.4 apply.

9. Where an inspector finds or suspects that:

a) a thing is a disease agent,
b) an animal or thing imported into Canada is affected by or contaminated with a communicable disease, or
c) any information or documentation required by or under the Act and these Regulations to prevent the introduction of Any disease into Canada by an animal or thing is not presented to an inspector,

the inspector may order the person who owns or has possession, care or control of the animal or thing to quarantine the animal or thing, and the provisions of section 91.4 apply.

59. The Minister may, for the purpose of preventing the introduction of communicable disease into Canada or into any other country from Canada, require any animal imported into Canada to be quarantined, and the provisions of section 91.4 apply.

91.4(1) Where an inspector orders a quarantine of a disease agent, animal or thing, the notice of quarantine shall be communicated by personal delivery to the person who owns or has possession, care or control of the disease agent, animal or thing and the notice may specify the manner, condition, place or places and time of quarantine, necessary to prevent the spread of the communicable disease.

2) In respect of a disease agent, animal or thing quarantined pursuant to these Regulations, no person shall do or permit to be done any of the following actions, without the authorization of an inspector:
a) remove the disease agent, animal or thing from the place of quarantine;
b) allow the disease agent, animal or thing to come into contact with an animal that is not quarantined under the same quarantine order;
c) destroy the disease agent, animal or thing; or
d) treat or test the disease agent, animal or thing for a communicable disease.

(3) Every person who owns or has the possession, care or control of an animal quarantined pursuant to these Regulations shall immediately notify a veterinary inspector of any quarantined animal that appears sick.

(4) In respect of a disease agent or thing quarantined pursuant to these Regulations, no person shall do or permit to be done any of the following actions, without the authorization of an inspector:
a) move the disease agent or thing;
b) alter the appearance of the disease agent or thing;
c) remove of any tag, sign or other notice that the disease agent or thing is under quarantine; or
d) open any container or remove any wrapping or cover around the disease agent or thing.

(5) No person shall transport or cause to be transported a disease agent, animal or thing quarantined pursuant to these Regulations unless:
a) a licence for its transportation has been issued by an inspector;
b) a copy of the licence issued pursuant to paragraph (a) has been provided to the person in charge of the conveyance transporting the disease agent, animal or thing;
c) and the disease agent, animal or thing is transported directly to the location stated in the licence.

(6) Every person who receives a notice referred to in subsection (1) shall comply with the notice.

Penalty

Section 66 of the *Health of Animals Act*:

66. Every person who fails to comply with a notice delivered to the person under section 18, 25, 27, 37, 43 or 48 or the regulations is guilty of:

a) an offence punishable on summary conviction and liable to a fine not exceeding fifty thousand dollars or to imprisonment for a term not exceeding six months, or to both; or
b) an indictable offence and liable to a fine not exceeding two hundred thousand dollars or to imprisonment for a term not exceeding two years, or to both.

Quarantaine

Les dispositions suivantes du Règlement sur la santé des animaux ont trait à l'obligation de mettre en quarantaine des animaux ou des choses :

6. L'inspecteur peut ordonner au propriétaire d'un animal ou d'une chose ou à la personne en ayant la possession, la responsabilité ou la charge des soins de le mettre en quarantaine, auquel cas les dispositions de l'article 91.4 s'appliquent, lorsqu'il constate ou soupçonne que :
a) la chose est un agent causant une maladie;
b) l'animal ou la chose est affecté ou contaminé par une maladie transmissible;
c) tout registre ou documentation exigé en vertu de la Loi ou du présent règlement afin de prévenir la propagation de toute maladie au sein du Canada, ou du Canada à un autre pays, par l'animal ou la chose, ne lui est pas fourni aux fins d'inspection.

9. L'inspecteur peut ordonner au propriétaire d'un animal ou d'une chose ou à la personne en ayant la possession, la responsabilité ou la charge des soins de le mettre en quarantaine, auquel cas les dispositions de l'article 91.4 s'appliquent, lorsqu'il constate ou soupçonne que :
a) la chose est un agent causant une maladie;
b) l'animal ou la chose est importé et est affecté ou contaminé par une maladie transmissible;
c) tout renseignement ou documentation exigé en vertu de la Loi ou du présent règlement afin de prévenir l'introduction de toute maladie au Canada, par l'animal ou la chose, ne lui est pas fourni.

59. Le ministre peut, afin de prévenir l'introduction de maladies transmissibles au Canada, ou dans un autre pays depuis le Canada, exiger que tout animal importé au Canada soit mis en quarantaine, auquel cas les dispositions de l'article 91.4 s'appliquent.

91.4(1) Lorsqu'un inspecteur ordonne la mise en quarantaine d'un agent causant une maladie, d'un animal ou d'une chose, l'avis de mise en quarantaine doit être remis en main propre au propriétaire de l'agent, de l'animal ou de la chose ou à la personne en ayant la possession, la responsabilité ou la charge des soins, et cet avis peut préciser les modalités, les conditions, le ou les lieux et le délai de quarantaine nécessaires pour prévenir la propagation de la maladie transmissible.

(2) En ce qui concerne un agent causant une maladie, un animal ou une chose mis en quarantaine aux termes du présent règlement, il est interdit, sans l'autorisation d'un inspecteur, de prendre les mesures suivantes ou de permettre qu'elles soient prises :
a) retirer l'agent, l'animal ou la chose du lieu de quarantaine;
b) laisser l'agent, l'animal ou la chose entrer en contact avec un animal qui n'est pas mis en quarantaine en vertu de la même ordonnance;
c) détruire l'agent, l'animal ou la chose;
d) traiter l'agent, l'animal ou la chose pour une maladie transmissible ou mener des tests de dépistage à cet égard.

(3) Le propriétaire d'un animal mis en quarantaine aux termes du présent règlement, ou la personne en ayant la possession, la responsabilité ou la charge des soins, doit sans délai aviser un vétérinaire-inspecteur lorsque l'animal semble malade.

(4) En ce qui concerne un agent causant une maladie ou une chose mis en quarantaine aux termes du présent règlement, il est interdit, sans l'autorisation d'un inspecteur, de prendre les mesures suivantes ou de permettre qu'elles soient prises :
a) déplacer l'agent ou la chose;
b) en modifier l'apparence;
c) enlever une étiquette, une indication ou un autre avis précisant que l'agent ou la chose est en quarantaine;
d) ouvrir un contenant ou enlever un emballage dans lequel se trouve l'agent ou la chose ou en enlever la couverture.

(5) Il est interdit de transporter ou de faire transporter un agent causant une maladie, un animal ou une chose mis en quarantaine aux termes du présent règlement, sauf si :
a) un permis pour son transport a été délivré par un inspecteur;
b) une copie du permis a été fournie à la personne chargée du véhicule qui transporte l'agent, l'animal ou la chose;
c) l'agent, l'animal ou la chose est transporté directement à l'endroit indiqué sur le permis.

(6) Quiconque reçoit l'avis visé au paragraphe (1) doit s'y conformer.

Pénalité

L'article 66 de la *Loi sur la santé des animaux*:

66. Quiconque contrevient à l'avis qui lui a été signifié au titre des articles 18, 25, 27, 37, 43 ou 48 ou des règlements commet une infraction et encourt, sur déclaration de culpabilité :
a) par procédure sommaire, une amende maximale de cinquante mille dollars et un emprisonnement maximal de six mois, ou l'une de ces peines; ou
b) par mise en accusation, une amende maximale de deux cents mille dollars et un emprisonnement maximal de deux ans, ou l'une de ces peines.

CFIA / ACIA 4206 (2011/08)

Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments

HEALTH OF ANIMALS ACT
DECLARATION OF AN INFECTED PLACE

LOI SUR LA SANTÉ DES ANIMAUX
DÉCLARATION DE LIEU CONTAMINÉ

Owner or occupier Propriétaire ou occupant	Location of animal(s)/thing(s) Endroit où se trouvent l'(les) animal(aux) ou la(las) chose(s)
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 301 Langille Road, Edgewood, BC, V0G 1J0	301 Langille Road, Edgewood, BC, V0G 1J0 Lat: 49.862402 Long: -118.149296 Premise ID: BC44K4PMR

I have determined or suspect that the disease

J'ai constaté ou soupçonné que la maladie

Avian Influenza

exists in the place described above and pursuant to Section 22 of the Health of Animals Act, I therefore declare the place to be infected.

est présente dans le lieu décrit ci-dessus. Pour ce motif, conformément à l'article 22 de la Loi sur la santé des animaux, je déclare ce lieu contaminé.

Ian Zhang
Inspector Name / Nom de l'inspecteur

Digitally signed by ZHANG, XIANG
Date: 2024.12.31 13:34:46 -08'00'
Inspector (Signature) Inspecteur

2024-12-30
Date

Identification Number Numéro d'identification	Age Âge	Sex Sexe	Description of Animal(s) or thing(s) Description de l'(des) animal(aux) ou de la(des) chose(s)
1			"All animals of susceptible species on-site (see below) and any related
2			animal products, by-products and things along with any animals,
3			products, by-products and things having contact with them".
4			
5			Description of susceptible species present on-site:
6			
7			All avian species in premise
8			
9			All birds/carcasses are kept indoors or in the barn. Any movement on or
10			off the above-mentioned premises will require a License for Removal of
11			Animals or Things from CFIA in order to be removed from the site.
12			
13			File Number: BC-820 22873
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

The information on this document is collected by the Canadian Food Inspection Agency under the authority of the Health of Animals Act for the purpose of protecting human and animal health. Information may be accessible or protected as required under the provisions of the *Access to Information Act*.

Les renseignements figurant dans le présent document sont recueillis par l'Agence canadienne d'inspection des aliments en vertu de la loi sur la santé des animaux afin de protéger la santé des personnes et des animaux. Les renseignements peuvent être accessibles ou protégés selon ce que prescrit la *Loi sur l'accès à l'information*.

Sections of the Health of Animals Act:

22.(1) Where an inspector or officer suspects or determines that a disease or toxic substance exists in a place and is of the opinion that it could spread or that animals or things entering the place could become affected or contaminated by it, the inspector or officer may in writing declare that the place is infected and identify the disease or toxic substance that is believed to exist there, and such a declaration may subsequently be amended by the inspector or officer.

(2) When the declaration is delivered to that occupier or owner of the place to which it relates, the place, together with all contiguous lands, buildings and other places occupied or owned by the occupier or owner, constitutes an infected place.

23.(1) For the purpose of preventing the spread of a disease or toxic substance, an inspector or officer may in writing declare that any land, building or other place, any part of which lies within five kilometres of the limits of a place declared to be infected under section 22, is infected and identify the disease or toxic substance that could spread there.

(2) When the declaration has been delivered to the occupier or owner of any land, building or other place, mentioned in subsection(1), the land, building or other place, together with all contiguous lands, buildings and other places occupied or owned by the same occupier or owner, constitutes an infected place.

24. Where an inspector or officer cannot, after the exercise of due diligence, find the occupier or owner of any land, building or other place, delivery of a declaration may be effected by posting it on the building or on any building or conspicuous object on the land or at the place.

25.(1) Subject to any regulations made under paragraph 64(1)(k), no person shall, without a licence issued by an inspector or officer, remove from or take into an infected place any animal or thing.

Articles de la Loi sur la santé des animaux:

22.(1) L'inspecteur ou l'agent d'exécution peut par écrit, déclarer contaminé tout lieu où il soupçonne constate la présence d'une maladie ou d'une substance toxique qu'il estime susceptibles soit de se propager soit de contaminer les animaux qui s'y rendent ou les choses qui y sont apportées; il doit alors préciser la nature de la maladie ou de la substance. Il peut ensuite, de la même manière, modifier la déclaration.

(2) Sur remise de la déclaration au propriétaire ou à l'occupant, le lieu visé par celle-ci et les terrains bâtiments et autres lieux qui lui sont contigus et sont occupés par la même personne, ou dont celle-ci est propriétaire, constituent des lieux contaminés.

23.(1) Après avoir fait la déclaration prévue à l'article 22 et afin d'empêcher toute propagation, l'inspecteur ou l'agent d'exécution peut, par écrit, déclarer contaminés les terrains, bâtiments ou lieux situés - même en partie dans un rayon de cinq kilomètres du lieu visé par la déclaration originale et auxquels la maladie ou la substance toxique - dont il précise la nature - risquent de se propager.

2) Sur remise au propriétaire ou à l'occupant de la déclaration faite au titre du paragraphe (1), le lieu visé par celle-ci et les terrains, bâtiments ou autre lieux qui lui sont contigus et sont occupés par la même personne, ou dont celle-ci est propriétaire, constituent une partie du lieu contaminé.

24. L'inspecteur ou l'agent d'exécution peut, s'il n'a pu trouver le propriétaire ou l'occupant du lieu après avoir pris les mesures nécessaires en ce sens, afficher la déclaration sur un bâtiment ou un objet en vue situé sur le lieu pour valoir remise au propriétaire ou à l'occupant.

25.(1) Sauf en conformité avec les règlements d'application de l'alinéa 64(1)(k), il est interdit, sans permis signé par un inspecteur ou un agent d'exécution, de sortir tout animal ou toute chose d'un lieu contaminé ou de l'y introduire.

Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments

HEALTH OF ANIMALS ACT
ATTACHMENT TO FORM

LOI SUR LA SANTÉ DES ANIMAUX
ANNEXE AU FORMULAIRE

Owner or occupier Propriétaire ou occupant	Location of animal(s)/thing(s) Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 ~~301 Langille Road, Edgewood, BC, V0G 1J0~~	301 Langille Road, Edgewood, BC, V0G 1J0 Lat: 49.862402 Long: -118.149296 Premise ID: BC44K4PMR

Identification Number Numéro d'identification	Age Âge	Sex Sexe	Description of Animal(s) or thing(s) Description de l'(des) animal(aux) ou de la(des) chose(s)
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			

Inspector Name / Nom de l'inspecteur	Inspector (Signature) Inspecteur	Date
Ian Zhang		2024-12-30

Note: When this form is used to describe additional animals, the original of any form it is used with should have the following statement placed on it:

The description of animals/things to which this form applies is on the attached copy(ies) of form CFIA/ACIA 4209 which bear the name and date above.

Nota : Lorsque ce formulaire sert à décrire d'autres animaux, l'original de tout formulaire qui l'accompagne devrait porter la mention suivante :

La description d'animaux/de choses auxquels s'applique le présent formulaire figure sur la(les) copies annexée(s) des formulaires CFIA / ACIA 4209 qui portent le nom et la date ci-haut.

Canada

Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments

LICENSE FOR REMOVAL OF ANIMALS OR THINGS

Under the authority of The Health of Animals Act

PERMIS D'ENLÈVEMENT D'ANIMAUX OU DE SUBSTANCES

En vertu de la Loi sur la santé des animaux

Name / Nom	Address / Adresse
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 301 Langille Road, Edgewood, BC, V0G 1J0	301 Langille Road, Edgewood, BC, V0G 1J0 Lat: 49.862402 Long: -118.149296 Premise ID: BC44K4PMR

Is hereby permitted to Est autorisé par les présentes à	☒ Remove out of: enlever des :	301 Langille Road, Edgewood, BC, V0G 1J0 Lat: 49.862402 Long: -118.149296
	☒ Remove to: ajouter aux :	301 Langille Road, Edgewood, BC, V0G 1J0 Lat: 49.862402 Long: -118.149296

The following animals and or things: / Les animaux ou substances suivantes :

"Under the authority of the Health of Animals Act section 25. (1), no person shall, without a licence issued by an inspector or officer, remove from or take into an infected place any animal or thing.

The entry / removal of the following animals / things may occur in accordance with these conditions:

a) All family private vehicles (cars, vans, bicycles, etc) not used for animal transport following CFIA approved biocontainment procedures listed in the RDIMS 16386266 document.

b) Any outerwear that may have been exposed to, or used in respect of avains, including clothing and footwear, which has been properly cleaned and disinfected according to CFIA approved biocontainment procedures.

c) Anything can move EXCEPT those animals and things prohibited and declared infected under form CFIA/ACIA 4204, that is: all live and dead avains, avian products, avian by products and other animals and things exposed to or used in respect of avains, including but not limited to eggs, feed, manure and litter. This declaration applies to, but is not limited to the above.

d) No visitors shall be allowed access to any barn or any place where avians are confined. No visitor shall be allowed in the immediate vicinity of said barns, or said place of confinement except as authorized by an inspector of the CFIA.

e) All conditions apply until further notified by an inspector of the CFIA.

f) For anything other than those items listed above, a specific license is required to be moved off or on premises. A copy of the license must accompany shipment.

g) CFIA approved biocontainment procedures are to be followed.

File Number:BC-820 22875

Inspector Name / Nom de l'inspecteur	Inspector - Signature - Inspecteur	Date
Ian Zhang	Digitally signed by ZHANG, XIANG Date: 2024.12.31 13:43:19 -08'00'	2024-12-31

Information may be accessible or protected as required under the provisions of the *Access to Information Act.*

Les renseignements peuvent être accessibles ou protégés selon ce que prescrit la *Loi sur l'accès à l'information.*

CFIA / ACIA 1509 (2000/07)

Canada

Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments

HEALTH OF ANIMALS ACT
NOTICE
REQUIREMENT TO DISPOSE OF ANIMALS OR THINGS

LOI SUR LA SANTÉ DES ANIMAUX
AVIS
ORDRE DE DISPOSITION DES ANIMAUX OU DES CHOSES

Owner or occupier / Propriétaire ou occupant	Location of animal(s)/thing(s) / Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 301 Langille Road, Edgewood, BC, V0G 1J0	301 Langille Road, Edgewood, BC, V0G 1J0 Lat: 49.862402 Long: -118.149296 Premise ID: BC44K4PMR

I have determined or suspect that the animal(s)/thing(s) described below is (are) affected or contaminated by

Je constate ou soupçonne que les animaux ou les choses décrits(es) ci-dessous sont atteints(es) ou contaminés(es) par

Avian Influenza

and pursuant to 48.(1) of the *Health of Animals Act*, I hereby require you, the owner or person having the possession, care or control of the animal(s)/thing(s) to dispose of them during the period commencing on the date of this notice and ending on

et, en vertu du paragraphe 48.(1) de la *Loi sur la santé des animaux*, j'exige que vous, le(la) propriétaire ou la personne qui a la possession, la responsabilité ou la charge de ces animaux ou de ces choses, preniez à leur égard, d'ici le

2025-02-01 ,

and in the following manner:
Method of Destruction to be communicated by CFIA

les mesures décrites ci-dessous :

Digitally signed by ZHANG, XIANG
Date: 2024.12.31 13:36:51 -08'00'

Ian Zhang	2024-12-31	
Inspector / Inspecteur	Date	Telephone / Téléphone

Identification Number / Numéro d'identification	Age / Âge	Sex / Sexe	Description of Animal(s) or Thing(s) / Description de l'(des) animal(aux) ou de la(des) chose(s)
1			All poultry and poultry carcasses along with other material
2			approved by CFIA disposal crew from the above noted poultry
3			production premises.
4			
5			
6			
7			
8			
9			
10			
11			File Number:BC-820 22874
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			

The information on this document is collected by the Canadian Food Inspection Agency under the authority of the Health of Animals Act for the purpose of protecting human and animal health. Information may be accessible or protected as required under the provisions of the *Access to Information Act*.

Les renseignements figurant dans le présent document sont recueillis par l'Agence canadienne d'inspection des aliments en vertu de la loi sur la santé des animaux afin de protéger la santé des personnes et des animaux. Les renseignements peuvent être accessibles ou protégés selon ce que prescrit la *Loi sur l'accès à l'information*.

Disposal

Subsection 48 (1) of the Health of Animals Act:

48.(1) The Minister may dispose of an animal or thing, or require its owner or any person having the possession, care or control of it to dispose of it, where the animal or thing

a) is, or is suspected of being, affected or contaminated by a disease or toxic substance;
b) has been in contact with or in close proximity to another animal or thing that was, or is suspected of having been, infected or contaminated by a disease or toxic substance at the time of contact or close proximity; or
c) is, or is suspected of being, a vector, the causative agent of a disease or a toxic substance.

Mesures de dispositions

Le paragraphe 48(1) de la Loi sur la santé des animaux :

48.(1) Le ministre peut prendre toute mesure de disposition, notamment de destruction, - ou ordonner à leur propriétaire, ou la personne qui en a la possession, la responsabilité ou la charge des soins, de le faire - à l'égard des animaux ou choses qui :

a) soit sont contaminés par une maladie ou une substance toxique, ou soupçonnés de l'être;
b) soit ont été en contact avec des animaux ou choses de la catégorie visée à l'alinéa a) ou se sont trouvés dans leur voisinage immédiat;
c) soit sont des substances toxiques, des vecteurs ou des agents causant des maladies, ou sont soupçonnés d'en être.

Penalty

Section 66 of the Health of Animals Act:

66. Every person who fails to comply with a notice delivered to the person under section 18, 25, 27, 37, 43 or 48 or the regulations is guilty of

a) an offence punishable on summary conviction and liable to a fine not exceeding fifty thousand dollars or to imprisonment for a term not exceeding six months, or to both; or
b) an indictable offence and liable to a fine not exceeding two hundred thousand dollars or to imprisonment for a term not exceeding two years, or to both.

Pénalité

L'article 66 de la Loi sur la santé des animaux:

66. Quiconque contrevient à l'avis qui lui a été signifié au titre des articles 18, 25, 27, 37, 43 ou 48 ou des règlements commet une infraction et encourt, sur déclaration de culpabilité :

a) par procédure sommaire, une amende maximale de cinquante mille dollars et un emprisonnement maximal de six mois, ou l'une de ces peines; ou
b) par mise en accusation, une amende maximale de deux cents mille dollars et un emprisonnement maximal de deux ans, ou l'une de ces peines.

Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

HEALTH OF ANIMALS ACT
ATTACHMENT TO FORM

LOI SUR LA SANTÉ DES ANIMAUX
ANNEXE AU FORMULAIRE

Owner or occupier Propriétaire ou occupant	Location of animal(s)/thing(s) Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 ~~301 Langille Road, Edgewood, BC, V0G 1J0~~	301 Langille Road, Edgewood, BC, V0G 1J0 Lat: 49.862402 Long: -118.149296 Premise ID: BC44K4PMR

Identification Number Numéro d'identification	Age Âge	Sex Sexe	Description of Animal(s) or thing(s) Description de l'(des) animal(aux) ou de la(des) chose(s)
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			

Inspector Name / Nom de l'inspecteur	Inspector (Signature) Inspecteur	Date
Ian Zhang		2024-12-31

Note: When this form is used to describe additional animals, the original of any form it is used with should have the following statement placed on it:

The description of animals/things to which this form applies is on the attached copy(ies) of form CFIA/ACIA 4209 which bear the name and date above.

Nota : Lorsque ce formulaire sert à décrire d'autres animaux, l'original de tout formulaire qui l'accompagne devrait porter la mention suivante :

La description d'animaux/de choses auxquels s'applique le présent formulaire figure sur la(les) copies annexée(s) des formulaires CFIA / ACIA 4209 qui portent le nom et la date ci-haut.

Canada

Avian influenza in birds

Avian influenza (AI), often called "bird flu," is caused by the Type "A" influenza virus. This virus can affect several species of food-producing birds (chickens, turkeys, quails, guinea fowl, etc.), as well as pet and wild birds.

Avian influenza viruses can be broadly classified into 2 types, based on the severity of the illness caused in birds:

- low pathogenic avian influenza (LPAI)
- highly pathogenic avian influenza (HPAI)

Most avian influenza viruses are low pathogenic. These typically cause little or no signs of illness in infected birds.

However, highly pathogenic viruses can cause severe illness and death in birds.

Different strains of avian influenza

Avian influenza viruses are divided by subtypes based on 2 proteins found in the viruses: hemagglutinin, or "H" protein, and neuraminidase, or "N" protein. There are 16 H types and 9 N types which create a total 144 possible combinations.

The H5 and H7 subtypes of the virus are of particular concern, given the ability of these 2 H-types to mutate from low pathogenic to highly pathogenic after they infect domestic birds. These 2 H-types have been known to cause serious disease or mortality in domestic poultry, yet low pathogenic H5 and H7 viruses are quite common in wild waterfowl.

Different strains of the same type of virus can exist, particularly in different parts of the world. Such strains can have very different characteristics and structure. For example, the H5N1 strain that has been reported in various parts of Europe is low pathogenic and is distinctly different from the Asian strain, which is highly pathogenic.

Avian influenza in humans

Avian influenza viruses, such as the highly pathogenic H5N1 virus present in Asia, can, on rare occasions, cause disease in humans.

Transmission to humans has occurred when people have had close contact with infected birds or heavily contaminated environments.

Due to the potential for human infection, it is recommended that people working with poultry suspected of being infected with avian influenza, or in contact with such poultry, wear protective clothing. This includes, face masks, goggles, gloves and boots.

Additional information:

- Avian Influenza and Poultry (Health Canada)
- Human Health Issues Related to Avian Influenza in Canada (Public Health Agency of Canada)

Where avian influenza is found

Avian influenza viruses have been found in Canada and around the world.

The Canadian Food Inspection Agency (CFIA) publishes reports on previous disease incidents in Canada.

Detailed information on the distribution of the H5N1 subtype and highly pathogenic avian influenza around the world is available from the World Organisation for Animal Health (OIE)

What the clinical signs of avian influenza are

Some or all of the following clinical signs are evident in infected birds:

- a drop in production of eggs, many of which are soft-shelled or shell-less
- diarrhea
- haemorrhages on the hock
- high and sudden mortality rate
- quietness and extreme depression
- swelling of the skin under the eyes
- wattles and combs become swollen and congested

The incubation period of AI ranges from 2 to 14 days.

The signs of AI (or more commonly known as bird flu) are very similar to those seen with Velogenic Newcastle Disease and other poultry diseases.

How to diagnose avian influenza

Avian influenza should be suspected on the basis of clinical signs.

Laboratory testing is needed to confirm the presence of the avian influenza virus. Contact your local veterinarian or provincial veterinary laboratory for assistance.

How to treat avian influenza

There is no treatment for birds that have the disease.

Vaccinating the birds may play a role in reducing the spread of the disease but does not eliminate the virus.

How avian influenza is transmitted and spread

Wild birds, especially waterfowl, are natural reservoirs of influenza viruses. They are not normally affected by the disease, but can still transmit it to domestic birds.

The disease can spread to birds through contact with infected poultry and poultry products. It can also spread through contaminated manure, litter, clothing, footwear, vehicles, equipment, feed and water.

It is essential for commercial poultry producers to use strict biosecurity practices in order to prevent introduction of the virus to their flock. Farmers should take the following measures.

- Keep poultry away from areas frequented by wild birds.
- Maintains strict control over access to poultry houses.
- Make sure that equipment is cleaned and disinfected before taking it into poultry houses.
- Do not keep bird feeders or create duck ponds close to poultry barns because they attract wild birds.
- Maintain high sanitation standards.

Avian influenza in pets

Pet birds can be infected by avian influenza and spread the disease to humans. In order to prevent the spread of AI, Canada has strict import requirements for pet birds from countries affected by avian influenza.

The highly pathogenic Asian strain of H5N1 has also been detected in mammals, including rats, mice, weasels, ferrets, pigs, cats and dogs.

However, the number of documented cases of avian influenza H5N1 in non-avian species is very low, despite the fact that this virus has caused large avian outbreaks globally over the last few years.

Current science suggests that the risk of a human contracting avian influenza from a mammalian pet is very low. Nonetheless, owners are encouraged to take appropriate precautions to protect their pets and themselves.

How to protect domestic poultry from avian influenza in Canada

The CFIA imposes strict regulations on the import of animals and animal products from countries where avian influenza is known to occur. These regulations are enforced through port-of-entry inspections done either by the Canada Border Services Agency or the CFIA.

The CFIA has enhanced its avian influenza surveillance for commercial poultry flocks in Canada with the launch of the Canadian Notifiable Avian Influenza Surveillance System (CanNAISS).

This surveillance program was developed in collaboration with provincial and territorial governments, poultry farmers and other industry representatives.

The Government of Canada, provincial and territorial governments, and animal health experts also conduct an annual surveillance program of avian influenza in wild birds. Through this program, live and dead birds are sampled and tested for avian influenza viruses.

Highly pathogenic avian influenza and low pathogenic avian influenza by subtypes H5 and H7 is a reportable disease under the *Health of Animals Act and Regulations*. This means that all suspected cases must be reported to the CFIA for immediate investigation by inspectors.

Under the Avian Influenza Hazard Specific Plan, the CFIA responds to both highly pathogenic and low pathogenic H5 and H7 viruses by reporting disease outbreaks to the OIE, establishing quarantines, ordering the humane destruction of poultry, conducting trace-out activities, overseeing the cleaning and disinfection of premises, and verifying that the affected farms remain free of avian influenza according to OIE standards.

How the CFIA responds to an outbreak of avian influenza in Canada

Canada's emergency response strategy to an outbreak of avian influenza would be to eradicate the disease and re-establish Canada's disease-free status as quickly as possible.

The CFIA's AI emergency response strategy includes the following measures:

- the humane destruction of all infected and exposed animals
- surveillance and tracing of potentially infected or exposed animals
- strict quarantine and animal movement controls to prevent disease spread
- strict decontamination of infected premises
- zoning to define infected and disease-free areas

Owners whose animals are ordered destroyed by the CFIA may be eligible for compensation.

What travellers can do to help protect Canadian livestock from an outbreak of avian influenza

While out of the country, travellers should avoid visiting areas where they may come into contact with live birds, including

- poultry farms
- live bird markets
- any other area where birds congregate

This is most important in countries that are experiencing an outbreak of highly pathogenic avian influenza.

If you are in contact with live birds infected with the AI virus, the virus may persist on your clothing, footwear and in your hair. Take appropriate personal hygiene measures, such as the following.

- Wash your hands
- Shower
- Wash all of the clothing you had with you while abroad
- Clean and disinfect your footwear

When you return home, do the following.

- Avoid contact with farmed animals (including poultry), zoo animals or wildlife for 5 days after you return if you were exposed to similar animals while you were abroad.
- Do not visit Canadian farms for 14 days if you visited a farm or had contact with wild birds while abroad.
- Be sure the footwear you wore to the farm or when you had contact with wild birds is disinfected and your clothing is washed thoroughly and dried at a high temperature.
- Complete the appropriate areas of your Customs Declaration Card - PDF (45 kb) regarding farm visits.
- Ensure all birds and poultry products you bring into Canada are eligible for entry. Declare all animal products upon arrival.

If You have Questions Please Contact cfia.ABmovecon-contdeplacements.acia@inspection.gc.ca

BC Centre for Disease Control

Avian influenza in BC for individuals in close contact with poultry

October 2024



Avian influenza and human health

Avian influenza virus easily spreads from bird to bird. It can also infect a wide range of other wild and domestic animals such as cows, goats, skunks, and cats.

Avian influenza can also infect people. The symptoms are similar to the regular (human) flu. Infections may cause mild symptoms or severe outcomes.

When an individual is **co-infected with two influenza strains**, for example avian influenza and a human influenza virus, the strains can exchange genes. This exchange can create a new strain that could spread more easily between people and may cause a range of illness including mild symptoms or severe outcomes. This sort of scenario has caused previous human influenza pandemics. **By protecting yourself, you also protect others.**

It's important to take steps to reduce your chances of getting sick from avian influenza. **Follow these tips to keep yourself and others safe.**

You can be infected by:



- Handling sick birds or touching surfaces sick birds have been on, and then touching your eyes, nose, and mouth
- Breathing in the avian influenza virus in droplets or dust from close contact with sick birds

How to protect yourself?



- **Limit direct contact** with sick or dead birds and their environments, and work in **well-ventilated spaces,** whenever possible
- Wear **personal protective equipment (PPE)**:
  - N95 mask and rubber or disposable gloves
  - Eye protection (e.g., goggles, face shields, safety glasses)
  - Disposable gown or coveralls and disposable protective shoe/boot covers or rubber boots





- **Do not** eat, drink, chew gum, smoke, vape, or use the bathroom when wearing PPE
- **Wash your hands** regularly with soap and water and **clean, disinfect or dispose** any potentially contaminated clothing, equipment or surfaces



- **Get the free annual flu shot**
- Follow WorkSafeBC and AgSafe guidance

If you feel sick within 10 days
after being exposed to the avian influenza virus

- **Stay home** and away from others while you have symptoms until 24 hours after your symptoms are gone. If you have to be near others, **wear a mask and wash your hands** often.
- **Tell your health care provider** that you have been in contact with animals and are concerned about avian influenza. This will help them give you appropriate advice on testing and treatment.

Symptoms include:



How local public health teams help?

- When a farm has avian influenza, local public health **checks who may have been exposed** and provides **guidance on testing and treatment** (including medicine to prevent illness)
- If you have been exposed, public health staff will ask for details about:
  - your exposure and what personal protective measures you used (like N95 masks, eye covering, hand washing, etc);
  - any pre-existing medical conditions;
  - any current flu-like symptoms and whether you had a recent flu shot

How farm owners and operators help?

- Post and share information with farm workers about protecting themselves against avian influenza
- Share contact information with public health about workers and visitors to the premises during the avian influenza event

More information:

BC Centre for Disease Control: bccdc.ca/health-info/diseases-conditions/avian-influenza

WorkSafeBC: https://www.worksafebc.com/en/health-safety/injuries-diseases/infectious-diseases/types/avian-flu

AgSafe BC: https://agsafebc.ca/download-category/avian-influenza/

TO OWNERS OF PREMISES THAT HAVE BEEN IDENTIFIED AS POSITIVE FOR AVIAN INFLUENZA

Your premises is a "Declared an infected place" 1 so that means that you are legally required to follow certain rules, outlined below, in order to help the Canadian Food Inspection Agency (CFIA) stop the spread of the avian influenza virus. A phone number is listed below for your inquiries. Your cooperation is appreciated.

The avian flu virus can survive outside of the host, and birds can get the virus from contact with other birds, or from vehicles or people travelling between farms, markets, abattoirs, and other places. The virus can also survive in organic matter (manure, mud, etc.) for a period of time. Following these guidelines will minimize the risk of spreading the virus:

- Restrict access to your premises to one entrance/exit. Provide a means to contact you at this point (i.e. cell phone number, etc.) so that you have control of people entering or leaving your premises. Access to your premises is limited to residents of the property until further notice.

- A sign will be posted in a highly visible location at the entrance to your premises in order to prevent unauthorized people from entering. Signs must remain where they were put until your property is declared free of avian influenza. If posted signs become damaged or go missing, it is your responsibility to contact the Biocontainment Unit Office.

- Park your vehicle away from the barns. Before leaving the premises, ensure your vehicle (especially tires and undercarriage) has been cleaned and afterwards, thoroughly sprayed with disinfectant. This applies every time you leave your property. Only your own vehicle is allowed to enter the premises.

- Do not remove any equipment or machinery from your premises unless you have obtained a license for removal from CFIA. All equipment or machinery leaving the premises must be fully washed and decontaminated with an approved disinfectant. *Removal of birds, bird products, manure and litter from your property, without a license, is strictly forbidden.*

- You and other people working or living on your property are not to go onto other premises where birds are kept.

□ Try to establish a "dirty" and "clean" zone on your property between the barn(s) (most contaminated) and your house/office (less contaminated) in order to reduce contamination in your working/living area.

□ Use disposable or clean cloth coveralls and rubber boots while working on the premises. When your work is done and you are leaving the "dirty" zone, remove the coveralls and clean and disinfect the rubber boots. Keep these items in a designated area for disposal or washing. Before leaving the premises, change into clean clothes in your "clean" zone.

□ Use designated boots for each barn or a foot dip containing disinfectants when you need to pass between the barn(s) (dirty) and the house/office (clean) areas. Please use the foot dip each time you exit the premises. Disinfectant in the foot dip must be changed every 2 3 days.

□ Put an effective rodent control program in place.

□ Bird proof your barn/poultry house. Ensure that wild migrating birds cannot be contaminating your poultry pens, feed, and poultry drinking water.

1 : A "Declared an Infected Place" means that your premises and animals are under quarantine

Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

LETTER OF DIRECTION

COMPENSATION FOR DESTRUCTION AND DISPOSAL OF ANIMALS/THINGS

I, _____
(Legal Name)

Of _____
(Civic Address)

_____ _____ _____
(City) (Province) (Postal Code)

Owner of _____
(Farm Name)

hereby direct and authorize the Canadian Food Inspection Agency (CFIA), to pay directly to service providers for the cost of disposal and destruction of animals and/or things as well as appropriate taxes (if applicable), ordered disposed of as per Notice of Requirement to Dispose/Destroy animals delivered by CFIA, pursuant to section 51(4) of the *Health of Animals Act*, as a result of costs incurred with respect to disposal required under subsection 48(1).

_____ _____
Name and signature of Owner of Animal(s) Date

_____ _____
Name and signature of Witness[1] Date

[1] The witness could be a family member, business partner or neighbor willingly signing the template.

BRITISH COLUMBIA

Joint message from BC Offices of the Provincial Health Officer and Chief Veterinarian: Detection of important mutation in avian influenza A(H5N1) viruses affecting some poultry premises in BC

December 10, 2024

Summary

In the past month, about ten of the poultry premises in the Fraser Valley of British Columbia (BC) infected with avian influenza A(H5N1) viruses have an important viral change (mutation) in their genetic code.

The mutation is called "H275Y". This mutation is known to reduce how well the drug oseltamivir (also known as Tamiflu) works against avian influenza viruses. Oseltamivir is the main anti-viral medication we use to treat and prevent influenza infections in people. This mutation is not expected to directly increase the risk of acquiring or transmitting the virus.

Although it has been found before in human and animal influenza viruses, the H275Y mutation is currently rare. It is very important we take steps to prevent viruses with the mutation from spreading to more farms or to people because it could seriously limit our ability to use oseltamivir to treat human influenza cases.

This is what we are doing in response:

- We are monitoring avian influenza infections and working with partners to prevent spread.
- The CFIA, with the support of the poultry industry and other partners, continues to take measures to remove infected flocks quickly and apply measures to prevent spread between farms.
- Public and animal health agencies in BC, together with the CFIA, are determining the genetic code (sequencing) of avian influenza viruses in poultry and wild birds to learn as much as we can about the virus, how it is spreading, and the risk to animals and humans.
- At the moment, we have not seen spread from birds to people at these farms or seen human H5N1 cases with this mutation but will continue to monitor closely.
- We are sharing this information for awareness as it is yet another reason to consistently use the strongest possible biosecurity and personal protective measures to prevent spread of avian influenza.

This is what we are asking you to do in response:

- **Limit direct contact** with sick or dead birds, their droppings and their environments, and work in **well-ventilated spaces,** whenever possible.
- Follow WorkSafeBC and AgSafe guidance when in a potentially infected environment or handling potentially infected animals or their droppings, including **personal protective equipment (PPE)** such as:
    - N95 respirator and rubber or disposable gloves.
    - Eye protection (e.g., goggles, face shields, safety glasses).
    - Disposable gown or coveralls and disposable protective shoe/boot covers or rubber boots.
- **Do not** eat, drink, chew gum, smoke, vape, or use the bathroom when wearing PPE.
- **Wash your hands** regularly with soap and water and **clean, disinfect or dispose** any potentially contaminated clothing, equipment, or surfaces.

BRITISH COLUMBIA

- If you feel sick within 10 days after being exposed to sick or dead animals such as with irritated or red eyes, fever, headache, sore throat, runny nose cough, muscle pain or feeling very tired:
    - **Stay home** and away from others while you have symptoms until 24 hours after your symptoms are gone. If you have to be near others, **wear a mask and wash your hands** often.
    - **Tell your health care provider** that you have been in contact with sick or dead animals and are concerned about avian influenza. This will help them take appropriate precautions and give you appropriate advice on testing and treatment.
- Please get your annual flu shot. This will help prevent you from being co-infected with human and avian influenza viruses at the same time. Preventing co-infections helps prevent avian and human influenza viruses from sharing their genetic codes. This helps reduce the chances of avian influenza viruses adapting to humans.

Theresa Burns, Chief Veterinarian
Ministry of Agriculture and Food

Bonnie Henry, OBC, MD, MPH, FRCPC
Provincial Health Officer

Resources:

BC Ministry of Agriculture: https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/animal-health/reportable-notifiable-diseases/avian-influenza-ai

BC Centre for Disease Control: bccdc.ca/health-info/diseases-conditions/avian-influenza

WorkSafeBC: https://www.worksafebc.com/en/health-safety/injuries-diseases/infectious-diseases/types/avian-flu

AgSafe BC: https://agsafebc.ca/download-category/avian-influenza/

Privacy Notice Statement for Animal Disease Investigations

The Canadian Food Inspection Agency (CFIA) is committed to protecting the privacy rights of individuals, including safeguarding the confidentiality of information provided by individuals and institutions.

This information is being collected and used under this Agency's legislative authority for the following purpose: to support the eradication and/or control of livestock diseases in Canada which are reportable in accordance with the *Health of Animals Act*. This information will be retained in accordance with the Agency's retention and disposition policies.

The personal information collected appears in Personal Information Bank Monitoring and Enforcement for the Canadian Food Inspection Agency, which is described within InfoSource.

Personal information collected by CFIA and the Government of Canada is protected from disclosure to unauthorized persons and/or agencies pursuant to the provisions of the Privacy Act. Individuals to whom the personal information pertains have the right to the protection of and access to their personal information under the *Privacy Act*, subject to certain exceptions and exemptions.

For inquiries, concerning the treatment of personal information in the custody of CFIA, individuals may contact the Canadian Food Inspection Agency's Access to Information and Privacy Office at cfia.atip-aiprp.acia@canada.ca or located at 1400 Merivale Road, Tower 1, Room 0-149 Ottawa, ON K1A 0Y9, Canada, for access to their personal information pursuant to the provisions of the *Privacy and Access to Information Acts*.

Owner or person having the care of the animals /things Information Sheet

☐Requirement to Quarantine

If animals are suspected of being infected with a contagious Reportable animal disease, a CFIA staff member (usually the district veterinarian) will visit the premises to meet with you. At that time, the animals and things present on your premises will be "quarantined" and precautionary movement restrictions will be put in place. The CFIA employee will provide you with documentation outlining the rules of the "Requirement to quarantine" and discuss your responsibilities. He or she will also answer any questions you may have.

Movement restrictions are necessary to control the potential spread of the disease. Some diseases are highly contagious and can spread rapidly through close contact between animals, as well as on contaminated equipment, clothing and footwear, on contaminated material such as hay and feed, or deadstock that could be accessed by susceptible animals. In addition, some diseases can spread by the air (virus excreted in the breath of an infected animal then carried through the air to other livestock).

During the quarantine period, you are not authorized to:

- remove animals or things (e.g. animal products and by-products, feed, manure, hay, straw, vehicles and equipment) from the place of quarantine;
- let the animals or things (e.g. animal products and by-products, feed, manure, hay, straw, vehicles and equipment) come into contact with an animal that is not quarantined under the same quarantine order;
- destroy the animal or thing;
- treat or test the animal or thing for a communicable disease;
- do the following, unless you have obtained prior authorization of a CFIA inspector:
    - Move a thing or alter its appearance, remove any tag, sign or notice indicating that the thing is under quarantine.
- transport or cause to be transported an animal or thing under quarantine unless a license for its transport has been issued by an inspector and a copy of the license has been provided to the transporter.

During the quarantine period, you must:

- Maintain signage indicating that the animals /things are under "Quarantine";
- Notify, without delay, a veterinary inspector of any quarantined animal that appears sick;
- If authorized, transport animals / things directly to location stated in the license.

What to expect – Steps on how CFIA will work through process on your farm.

*Note that this is a fluid process and some of these items may overlap.

1. **Case officer** discussion - explanation of the process. The **Case Officer is your dedicated connection into the various CFIA teams** that are responding to the positive test result. There is a chance that your case officer may change throughout the response, but every effort will be made to ensure a smooth transition. The case officer will provide you with 3 official documents.
    - **Order to dispose** (Form #4202)- This is the order stating that CFIA has confirmation that your flock is infected with Avian Influenza, and this is an order to depopulate and dispose of all material. This may include birds, eggs, feed, bedding, manure, etc..
    - **Declaration of Infected Place** (From #4204)- this states that Avian Influenza has been detected, and declaring that your premises is infected, and subject to the appropriate control mechanisms that will be placed to control the disease
    - **Movement Controls** (Form #4206Q- –Quarantine) - this provides instruction that any material related to poultry cannot be brought on or off the farm. If there are welfare concerns (i.e., a feed delivery is scheduled for the next day), we can permit movement and assist with cleaning the truck before it leaves the premises (Form #1509 and Specific Movement permits).
        - Note: This may have been applied based on suspicion of disease, before this process started.

2. **Premises investigation questionnaire** – This is a **fairly long interview** that will be scheduled with you and our **Field Epidemiology** team. Your **case officer** will usually also be present. The purpose of this is for our team to try to understand how the virus may have entered your facility, and to see if there are risks that it may have spread to other locations. They will ask you for quite a bit of information, so it may be beneficial to have things like your production records and delivery schedules available. It is also beneficial to have access to video conferencing either with smart phone or laptop

3. **Biocontainment site assessment** - Our Biocon team is typically the first group that you will see come out to the farm. They will be setting up what we call "Hot", "warm", and "cold" zones. These zones are related to the risk of the virus being present. The Hot zone will encompass the barns and poultry related areas. The Warm zone will be a transition area for our staff to move in and out through. The Cold zone will be the rest of the premises, where there is minimal risk of moving the virus by moving within this zone. They will map your premises to guide the future actions of our teams that will be coming to the site.

4. **Depopulation** - This will be the busiest day on your premises. Depending on the size of the farm, there will typically be anywhere from 5-20 CFIA staff coming out to your premises. Either your Case officer, or a site manager will also be there. This will be your contact

throughout the day's activities. If you have any questions or concerns, they should be raised to this person. They will introduce themselves to you, so you know who they are.

- What the day looks like
  - A Porta-Potty and a dumpster will be delivered to the site, typically in the morning of. CFIA will provide them with directions as to where these should be placed. (This is determined during the biocontainment site assessment)
  - **Site Manager/Case officer** arrival, usually at the same time as the biocontainment team
  - Biocontainment team will usually be the first team on the premises. They will set up the zones described above and they are there to ensure we do not carry the virus out of the barns. They will support our teams moving in and out of the barns to ensure that the virus does not leave the hot zone.
  - Depopulation team will be there at the same time, or a bit after the Biocon team. They are the group responsible for the euthanasia of the birds. There are various options for this, and the depopulation method will be discussed with you through the case officer, prior to this date. For large barns, this is typically done with CO_2 gas.
  - Depending on the method used, the teams may request your assistance to lift feed and water lines, and assist with turning off fans at the appropriate times. **You will be provided with PPE from our team for this activity.**
  - The teams will be using full personal protective equipment for a couple of reasons.
    - To ensure they do not carry the virus off of the premises
    - For their personal protection - Avian Influenza can be contracted by humans **(please consult public health, or your doctor if you have any flu like symptoms).**
  - If CO_2 is used, the team will let the barns sit with the gas inside the barns for a period of time. After this, they will go back to the barns to vent them, and allow the gas to disperse. **It is not safe to enter the barns during this time.**
  - Once CFIA has verified that the birds on the premises have been euthanized, they will work to take down the equipment we have placed and to get all people and items out of the area.
  - **The site manager/case officer will continue being in contact with you, and they will provide information and answer any questions before leaving the site.**

5. **Disposal** - Our Disposal team is responsible for ensuring that material that may be contaminated with the virus is all disposed of in an appropriate method. There are various methods that can be utilized, and this decision will be made in discussion with the **case officer and the disposal lead. Ultimately it is up to you, as the producer, to come up with a plan for this step,** but our CFIA staff are able to assist in this process. If you already have a disposal plan in place, our disposal team can review and approve or provide comments. Some of the disposal options include: composting, burial, incineration, bio digestion and above ground burial (just to name a few). If you prefer - CFIA can take over and control this step. For this to happen, we will ask you to sign a form that authorizes us to undertake this task on your

behalf. This form is known as a letter of Direction. Regardless of the approach, our disposal team will be involved in overseeing and verifying disposal activities. Any disposal activities need to be approved by CFIA prior to occurring, so please start working with your case officer on this as soon as possible.

6. **Cleaning and disinfection (C&D)**- This is the final step in on-farm activities. The disposal step removed the infected Material. The cleaning and disinfection is the step to go through and ensure the barns and poultry production areas are now free of the virus. Again, there are various ways that this can be completed, and this will be discussed with the **case officer and the cleaning and disinfection lead. Again, it is up to you to present a plan for this step**, and CFIA is able to assist and provide guidance. There are milestones in this step:
    - **Primary Decontamination** - this is a basic step that includes ensuring that all material that may have been missed in disposal is removed (i.e., Feathers, minor bits of manure on floors/walls etc.)
    - **Cleaning** - This is the wet clean - hosing out the barns, making sure no organic material is present
    - **Disinfection** - this is application of an approved disinfectant that is used to kill the virus that may be present on remaining cleaned surfaces.
    - CFIA will visit to verify each of these steps individually. **Please do not move from one step to the next without talking to CFIA, as there may be a risk of having to repeat steps.** Once CFIA has signed off on the final disinfection step, your farm will enter what is called a **14-day vacant period**. You are allowed to place chicks in this period, however, if you do, they will be subject to 2 weeks of enhanced surveillance. At the end of this vacant period, CFIA will revoke the Declaration of Infected premises and the movement controls that were placed at the beginning.
        - Note: There may still be a **Primary Control Zone** around your premises that would still subject you to lesser controls. These should be discussed with your industry rep, or the case officer.

7. **Compensation**
    - Within the first week of this process, you will likely receive information from our Compensation team walking you through the process. **Note that this is going to be heavy on information, and there will be a large number of various documents requested so that we can ensure that you are compensated as fairly as possible.**
    - Important Notes:
        - You are **only eligible for compensation for birds that are lost or euthanized AFTER** CFIA has issued you an order to dispose.
        - You will **only be eligible for compensation for items listed in the disposal plan**. This is the importance of a disposal plan being approved prior to your taking action on it. Once CFIA has approved the plan, that is also an agreement that you are entitled to compensation for the costs associated with the implementation of the plan, as well as for the things that will be disposed of as a result of that plan.
        - You will be compensated for the value of the birds on the date that the order to dispose is issued.

- Compensation is **not available for the cleaning and disinfection costs**. There may be options for insurance, or provincial programs to support this, but CFIA is unable to compensate for this.
    - In the event you do not wish to complete cleaning and disinfection, a 120-day **Fallow period** is an option. In this situation, the declaration of infected premises and the movement controls will remain in place for 120 days after primary decontamination. During this time, you are not allowed to place birds, or disrupt the area that is subject to the fallow. You will also be contacted or visited approximately once a month until this is completed for CFIA to verify that the fallow is being maintained.
- Your **key contact through this process will be a member of the compensation team**. Your case officer can still be involved, but as this is a bit more involved process, direct communication with the compensation team is important.

Michael Carter

[redacted]

From: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Sent: Thursday, January 2, 2025 12:31 PM
To: universalostrich@hotmail.com
Cc: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Subject: Exemption from Depopulation Required Documents

This is Exhibit " G " referred to in the affidavit of David Bilinski sworn before me at Vernon this 29 day of January 2025

Hello Again,

Sorry for the multiple emails!

This process is document heavy, but I'm here to help you navigate the process!

Based on the information we've gathered, you fall into the "birds classified as having rare and valuable genetics" category. I've copied CFIA's description here:

*Rare and valuable genetics in poultry refers to **uncommon** genetic lines of poultry that hold a **high economic value**. Genetic **breeding** of poultry involves the creation of multi-generation genetically diverse populations on which **selection is practiced** to create adapted animals with new combinations of **specific desirable traits**. It is this combination of an uncommon breed or line of poultry, which undergoes a selection process to create specific desirable traits which leads to its high economic value.*

3.1 Initial screening to classify birds as having rare and valuable genetics

The genetics of the flock can be demonstrated to be distinctive from standard commercial flocks with criteria such as but not limited to the following:

- *There is historical evidence of genetic investment (e.g. breeding books, use of closed flocks of breeding pure line birds for a prolonged period, a selection program from trained geneticists is implemented);*
- *The flock consists of high quality pure-bred birds (e.g. are recognized by breed associations, 3rd party national/international organizations or by the poultry industry as top producers/prized genetics/suppliers of genetics);*
- *Genomics testing for specific traits has been undertaken*

Here's what we need from you at this time to get started:

- We need documented proof that these birds are distinctive from standard commercial flocks. The highlighted section above gives good examples of the types of documents we're looking for.
    - If you have any documentation of the agreement between you and the university – that'd be really helpful to send to us.
- I'll also need you guys to fill out the attached document Distinct Unit Package that will need to be completed and sent back to me.

Thanks,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Compensation / Ouest IA La Rémunération (CFIA/ACIA)** <cfia.WestAICompensation-OuestIALaremuneration.acia@inspection.gc.ca>
Date: Fri, Jan 3, 2025 at 6:05 AM
Subject: BC-IP-233 Compensation Information
To: universalostrich@gmail.com <universalostrich@gmail.com>
Cc: West AI Compensation / Ouest IA La Rémunération (CFIA/ACIA) <cfia.WestAICompensation-OuestIALaremuneration.acia@inspection.gc.ca>, West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Hello Dave Bilinski,

You are receiving this email on behalf of the CFIA Compensation Unit. We will be working alongside your Case Officer and we will be your point of contact for compensation-related questions.

- **Please contact your Case Officer to arrange a call with us.**
- **If you do not wish to proceed with the Compensation process please contact us promptly.**

We understand your farm had ostriches. In order for compensation to be completed, we will need to request information regarding your animals, facility and operations.

This is Exhibit " H " referred to in the affidavit of David Bilinski
sworn before me at Vernon
this 29 day of January 2025

What is **covered?**

The CFIA may compensate producers for:

- the **market value of animals ordered destroyed by CFIA**; and
- costs related to the **disposal of these animals** (see A below).
- cleaning and disinfecting the equipment used for the **disposal of these animals**; and
- the **market value of other things ordered destroyed by the CFIA**, such as contaminated feed or animal products ordered destroyed by CFIA Disposal unit

For animals and things ordered destroyed, the CFIA bases compensation amounts on the animal's market value (up to a maximum amount as stipulated in the *Compensation for Destroyed Animals Regulations*) on the date of the order.

What is **not covered**?

CFIA's ability to pay compensation is limited by specific terms in the Health of Animals Act.

For example, **CFIA cannot offer compensation for:**

- income or production losses including costs associated with business disruptions
- costs associated with cleaning and disinfection of the premises
- costs associated with the disposal of things ordered destroyed, which are separate from the animals ordered destroyed

Next Steps:

A. **We strongly recommend before commencing any disposal activities, to submit your disposal estimates/quotes back to this compensation email address.**

- **Disposal costs may not be fully compensated without an approved quote for reasonable rates.**

This includes estimates for:

- Labour at a reasonable rate – Detailed list of the estimated hours and the hourly rate
- Personal protective equipment (PPE) – (ie Boot covers, Tyvek suits, gloves, masks)
- Mileage at a provincial rate (if applicable)
- Equipment usage – indicating if it's your own/rental equipment, if the hourly rate includes operator, fuel and delivery

- **Once disposal activities are completed, submit the DISPOSAL HOURS TRACKING LOG BACK TO YOUR CASE OFFICER.**

Disposal costs may not be fully compensated without a log of hours tracked.

B. **Please complete/sign and send the attached documents back to us via this email address as soon as possible, this will help expedite the compensation process:**

- Application for Compensation Form

- Premises questionnaire (with supporting documents where applicable) – Some questions may not apply to your situation (you can mark them as n/a) but please try to supply as much information as possible.

We understand there is a lot of information to gather. Please don't hesitate to contact us with questions or concerns about this process.

Sincerely,

Compensation WA - AI2022

Canadian Food Inspection Agency / Government of Canada

cfia.WestAICompensation-OuestIALaremuneration.acia@inspection.gc.ca

Agence Canadienne d'inspection des aliments / Gouvernement du Canada

cfia.WestAICompensation-OuestIALaremuneration.acia@inspection.gc.ca

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)**
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Sun, Jan 5, 2025 at 9:09 AM
Subject: FW: BC Small Flock Burial AI Infected Waste Guidance
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Cc: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Hi There,

Since you're considered a "small flock" operation by definition, I've attached the BC Provincial Guidance for burial on small flock premises. CFIA doesn't regulate the burial process itself, it's the BC Province.

Dave – I'll call you right after I send this.

Kind regards,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)**
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Sun, Jan 5, 2025 at 12:06 PM
Subject: Feed Permit Delivery Request
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Cc: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Hello Again,

So feed delivery permits require a bit of paperwork and disinfection measures since you're an infected premises.

Here's what I'm gonna need in order for the feed delivery:

1. I'm going to need the following details

    1. **Company (with contact number):**
    2. **Departing Address:**
    3. **Delivery Address:**
    4. **Material Being Moved:**
    5. **Licence(s) (Trucks, Trailers, etc.):**
    6. **Date of Delivery (Estimated Time of Delivery):**
    7. **Biocontainment plan:**

2. The attachment "Biocon SOP Template" will need to be filled out by either yourselves or the feed company. This is for the biocontainment measures that will be used during the delivery.
    1. This needs approval from CFIA before a permit can be issued for feed delivery. I cannot request a permit on your behalf without one.

I have no further updates on the other paperwork you've sent – I'm hoping for one sometime tomorrow afternoon at the latest. I will give you a call when I have something.

Thanks,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **Karen Espersen and Dave Bilinski** <universalostrich@gmail.com>
Date: Sun, Jan 5, 2025 at 12:02 AM
Subject: H5N1 antibodies
To: Berreth, Cassandra (CFIA/ACIA) <cassandra.berreth@inspection.gc.ca>

Hi Cassandra

Here is the scientific report regarding H5N1 antibodies from ostrich eggs.
This study and work was produced by Dr. Tsukamoto, our partner in Struthio Bioscience, and Dr. Adachi who visited the Universal Ostrich Farm at Edgewood in 2023. During this visit he showed us the protocols for immunization of the ostrich that Kyoto University in Japan uses.

On another note we should get the necessary paperwork in place for our feed supplier to deliver the next load feed.

We will have more detailed information to release this week after our Struthio Bioscience meeting. Much of our scientific and financial information is covered under NDA and we need consensus for what we can release.

Cheers
Dave and Karen

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)**
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Mon, Jan 6, 2025 at 11:19 AM
Subject: BC-IP-233 Follow Up Disposal Question
To: universalostrich@hotmail.com <universalostrich@hotmail.com>, Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Cc: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Hi There,

Here's the question my higher ups wanted answered as discussed with Dave on the phone:

"Can we have in writing what the disposal plan is currently for any birds that have died or die?"

Thank you in advance!

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)**
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Mon, Jan 6, 2025 at 1:47 PM
Subject: RE: Movement Permit Request Between Houses & Ostriches
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>, Karen Espersen and Dave Bilinski <universalostrich@gmail.com>

I should specify – the company name would be you guys.

Cassandra Berreth

Case Officer Lead

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficer-OuestIAChefdecas.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

From: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Sent: Monday, January 6, 2025 2:37 PM
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>; Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Subject: Movement Permit Request Between Houses & Ostriches

Hi There,

As discussed with Dave this afternoon, here's what I need for a movement permit between your houses and the ostriches:

1. I'm going to need the following details

    1. **Company (with contact number):**
    2. **Departing Address:**
    3. **Delivery Address**:
    4. **Material Being Moved:**
    5. **Licence(s) (Trucks, Trailers, etc.):**
    6. **Date of Delivery (Estimated Time of Delivery):**
    7. **Biocontainment plan:**

2. The attachment "Biocon SOP Template" will need to be filled out by either yourselves or the feed company. This is for the biocontainment measures that will be used during the delivery.
    1. This needs approval from CFIA before a permit can be issued for feed delivery. I cannot request a permit on your behalf without one.

I need you guys to do this ASAP! So you don't break the quarantine.

Thanks,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)**
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Mon, Jan 6, 2025 at 1:41 PM
Subject: RE: BC-IP-233 Follow Up Disposal Question & INFO
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>, West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Hi Dave,

Thanks for your answers. I'll wait for Dave to confirm when the contractor came onsite and contact details before I send this up the chain of command.

To summarize our conversation we just had over the phone- I got some clarification on the quarantine specifications. Your quarantine is for the area the birds are contained in. I will be sending you amended quarantine paperwork to reflect this as the original didn't specify the area exactly later tonight.

What this means for you –

1. We need to get a permit and CFIA approved biocontainment plan for the movements between your homes and the bird area, As your homes are not part of the quarantine. I can help you with this – I sent you another email on this, exact same process as getting a feed delivery permit. (In fact, every movement on and off the ostrich premise needs to be permitted)

I need the permit details and biocontainment plan by the END OF TODAY – to ensure you keep within the quarantine guidelines. I've attached templates to the email described above to help quicken the process.

Thank you,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

From: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Sent: Monday, January 6, 2025 1:57 PM
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Subject: Re: BC-IP-233 Follow Up Disposal Question

EXTERNAL EMAIL – USE CAUTION / COURRIEL EXTERNE – FAITES PREUVE DE PRUDENCE

Hi Cassandra.

Since we found out that we have AI our initial handling of mortality was stored in a barn under a tarp as per what we read on the AI protocol website.

This was not to our liking as we needed to get the dead ostrich away from the live ones.

As soon as you were appointed our case worker we discussed how we should hande the mortality situation. It was decided that we should bury them as soon as possible. We took the dead to an area where we have in the past used as a burial disposal site and covered them with a tarp. Live ostrich do not have access to this site. We hired a contractor with an excavator to dig 2 burial pits for the carasses approx. 3 meters deep. The contractor then washed his machine with a fire hose and sprayed it with a bleach solution and left.

After that I used a frontend loader to put approx 1.5 to 2 meters fill over the 24 carcasses. As of this time we have 2 unburied morts.

Any dead birds before Dec. 28 were previously buried in another pit.

The pits meet the BC standards for AI disposal.

Hope this answers your questions .

Dave

On Mon, Jan 6, 2025 at 11:19 AM West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca> wrote:

Hi There,

Here's the question my higher ups wanted answered as discussed with Dave on the phone:

"Can we have in writing what the disposal plan is currently for any birds that have died or die?"

Thank you in advance!

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)** <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Mon, Jan 6, 2025 at 1:45 PM
Subject: RE: BC-IP-233 Follow Up Disposal Question & INFO
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>, Karen Espersen and Dave Bilinski <universalostrich@gmail.com>

Hi again,

One more thing – I need you to confirm what's the plan for the 2 unburied morts? Need to figure a plan for that ASAP.

Thanks,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

From: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Sent: Monday, January 6, 2025 2:42 PM
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>; West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Subject: RE: BC-IP-233 Follow Up Disposal Question & INFO

Hi Dave,

Thanks for your answers. I'll wait for Dave to confirm when the contractor came onsite and contact details before I send this up the chain of command.

To summarize our conversation we just had over the phone- I got some clarification on the quarantine specifications. Your quarantine is for the area the birds are contained in. I will be sending you amended quarantine paperwork to reflect this as the original didn't specify the area exactly later tonight.

What this means for you –

1. We need to get a permit and CFIA approved biocontainment plan for the movements between your homes and the bird area, As your homes are not part of the quarantine. I can help you with this – I sent you another email on this, exact same process as getting a feed delivery permit. (In fact, every movement on and off the ostrich premise needs to be permitted)

I need the permit details and biocontainment plan by the END OF TODAY – to ensure you keep within the quarantine guidelines. I've attached templates to the email described above to help quicken the process.

Thank you,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

From: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Sent: Monday, January 6, 2025 1:57 PM
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Subject: Re: BC-IP-233 Follow Up Disposal Question

EXTERNAL EMAIL – USE CAUTION / COURRIEL EXTERNE – FAITES PREUVE DE PRUDENCE

Hi Cassandra.

Since we found out that we have AI our initial handling of mortality was stored in a barn under a tarp as per what we read on the AI protocol website.

This was not to our liking as we needed to get the dead ostrich away from the live ones.

As soon as you were appointed our case worker we discussed how we should hande the mortality situation. It was decided that we should bury them as soon as possible. We took the dead to an area where we have in the past used as a burial disposal site and covered them with a tarp. Live ostrich do not have access to this site. We hired a contractor with an excavator to dig 2 burial pits for the carasses approx. 3 meters deep. The contractor then washed his machine with a fire hose and sprayed it with a bleach solution and left.

After that I used a frontend loader to put approx 1.5 to 2 meters fill over the 24 carcasses. As of this time we have 2 unburied morts.

Any dead birds before Dec. 28 were previously buried in another pit.

The pits meet the BC standards for AI disposal.

Hope this answers your questions .

Dave

On Mon, Jan 6, 2025 at 11:19 AM West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca> wrote:

Hi There,

Here's the question my higher ups wanted answered as discussed with Dave on the phone:

"Can we have in writing what the disposal plan is currently for any birds that have died or die?"

Thank you in advance!

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **Karen Espersen and Dave Bilinski** <universalostrich@gmail.com>
Date: Mon, Jan 6, 2025 at 12:57 PM
Subject: Re: BC-IP-233 Follow Up Disposal Question
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Hi Cassandra.

Since we found out that we have AI our initial handling of mortality was stored in a barn under a tarp as per what we read on the AI protocol website.
This was not to our lliking as we needed to get the dead ostrich away from the live ones.

As soon as you were appointed our case worker we discussed how we should hande the mortality situation. It was decided that we should bury them as soon as possible. We took the dead to an area where we have in the past used as a burial disposal site and covered them with a tarp. Live ostrich do not have access to this site. We hired a contractor with an excavator to dig 2 burial pits for the carasses approx. 3 meters deep. The contractor then washed his machine with a fire hose and sprayed it with a bleach solution and left.

After that I used a frontend loader to put approx 1.5 to 2 meters fill over the 24 carcasses. As of this time we have 2 unburied morts.

Any dead birds before Dec. 28 were previously buried in another pit.

The pits meet the BC standards for AI disposal.

Hope this answers your questions .

Dave

On Mon, Jan 6, 2025 at 11:19 AM West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca> wrote:

Hi There,

Here's the question my higher ups wanted answered as discussed with Dave on the phone:

"Can we have in writing what the disposal plan is currently for any birds that have died or die?"

Thank you in advance!

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)**
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Mon, Jan 6, 2025 at 1:37 PM
Subject: Movement Permit Request Between Houses & Ostriches
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>, Karen Espersen and Dave Bilinski <universalostrich@gmail.com>

Hi There,

As discussed with Dave this afternoon, here's what I need for a movement permit between your houses and the ostriches:

1. I'm going to need the following details

    1. **Company (with contact number):**
    2. **Departing Address:**
    3. **Delivery Address:**
    4. **Material Being Moved:**
    5. **Licence(s) (Trucks, Trailers, etc.):**
    6. **Date of Delivery (Estimated Time of Delivery):**
    7. **Biocontainment plan:**

2. The attachment "Biocon SOP Template" will need to be filled out by either yourselves or the feed company. This is for the biocontainment measures that will be used during the delivery.
    1. This needs approval from CFIA before a permit can be issued for feed delivery. I cannot request a permit on your behalf without one.

I need you guys to do this ASAP! So you don't break the quarantine.

Thanks,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **Karen Espersen and Dave Bilinski** <universalostrich@gmail.com>
Date: Wed, Jan 8, 2025 at 8:59 AM
Subject: Avian Flu Proposal for the Government of Canada
To: Berreth, Cassandra (CFIA/ACIA) <cassandra.berreth@inspection.gc.ca>

We just talked with Sid Burch in the US and he is originally from South Africa and owned 4000 ostriches. He had the Avian flu and he lost some of his flock and then the immune system kicked in and the deaths stopped. He has been in the ostrich industry for 43 years. He was instrumental in aiding a new policy in the US to NOT depopulate Ostrich. Sid Burch said this new policy has already stopped an ostrich farm from depopulation.

He is saying exactly what we are saying that the ostrich immune system will kick in and herd immunity will happen. Nature takes its course and we will lose some but they will stop dying and then have an immunity to that strain. The new policy we are going to find as Sid is getting on a plane right now. He will send a letter as soon as he lands to confirm all that we are saying to you and the new policy in the US to NOT depopulate ostrich. He also says they already have an ostrich farm that is utilizing this policy. The policy implements a quarantine and protocols to follow until the flock get herd immunity and test negative to the virus. We will also look for this policy to be added in the paperwork. If we did not have such a busy and unfortunate day yesterday with CFIA and my husband we would have had this already to you. We now have many higher profile people writing letters on our behalf to MLAs and we will forward on your email address as well for them to send to. Time is of the essence and the chance of an extension for a day's decision would be very much appreciated as we gather all our findings and complete all the paperwork you have provided us to complete.

Our Struthio BioScience Inc. Partners, Dr. Tsukamoto, Dr. Stu Greenberg and Dave and I have a proposal for the Government of Canada for our company to implement an antibody project for Avian Flu. We ask and encourage our Government to support us in this time of need and support the efforts to stop the Avian flu and look for a resolution rather than destroy research and solutions.

Kind regards,
Karen and Dave

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **Karen Espersen and Dave Bilinski** <universalostrich@gmail.com>
Date: Wed, Jan 8, 2025 at 9:48 AM
Subject: Re: BC-IP-233 Follow Up Disposal Question & INFO
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

The birds that you are speaking about have been put into the new disposal site with a tarp over them to prevent any predator access, we lost another one yesterday and will also be adding it to the new disposal site as well. We expect that we might lose a few more yet so we want to utilize the new disposal site to accommodate any more losses this week. Please let us know if this is satisfactory.

Kind regards,
Karen and Dave

On Mon, Jan 6, 2025 at 1:45 PM West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca> wrote:

Hi again,

One more thing – I need you to confirm what's the plan for the 2 unburied morts? Need to figure a plan for that ASAP.

Thanks,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

From: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Sent: Monday, January 6, 2025 2:42 PM
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>; West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Subject: RE: BC-IP-233 Follow Up Disposal Question & INFO

Hi Dave,

Thanks for your answers. I'll wait for Dave to confirm when the contractor came onsite and contact details before I send this up the chain of command.

To summarize our conversation we just had over the phone- I got some clarification on the quarantine specifications. Your quarantine is for the area the birds are contained in. I will be sending you amended quarantine paperwork to reflect this as the original didn't specify the area exactly later tonight.

What this means for you –

1. We need to get a permit and CFIA approved biocontainment plan for the movements between your homes and the bird area, As your homes are not part of the quarantine. I can help you with this – I sent you another email on this, exact same process as getting a feed delivery permit. (In fact, every movement on and off the ostrich premise needs to be permitted)

I need the permit details and biocontainment plan by the END OF TODAY – to ensure you keep within the quarantine guidelines. I've attached templates to the email described above to help quicken the process.

Thank you,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

From: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Sent: Monday, January 6, 2025 1:57 PM
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Subject: Re: BC-IP-233 Follow Up Disposal Question

EXTERNAL EMAIL – USE CAUTION / COURRIEL EXTERNE – FAITES PREUVE DE PRUDENCE

Hi Cassandra.

Since we found out that we have AI our initial handling of mortality was stored in a barn under a tarp as per what we read on the AI protocol website.

This was not to our liking as we needed to get the dead ostrich away from the live ones.

As soon as you were appointed our case worker we discussed how we should hande the mortality situation. It was decided that we should bury them as soon as possible. We took the dead to an area where we have in the past used as a burial disposal site and covered them with a tarp. Live ostrich do not have access to this site. We hired a contractor with an excavator to dig 2 burial pits for the carasses approx. 3 meters deep. The contractor then washed his machine with a fire hose and sprayed it with a bleach solution and left.

After that I used a frontend loader to put approx 1.5 to 2 meters fill over the 24 carcasses. As of this time we have 2 unburied morts.

Any dead birds before Dec. 28 were previously buried in another pit.

The pits meet the BC standards for AI disposal.

Hope this answers your questions .

Dave

On Mon, Jan 6, 2025 at 11:19 AM West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca> wrote:

Hi There,

Here's the question my higher ups wanted answered as discussed with Dave on the phone:

"Can we have in writing what the disposal plan is currently for any birds that have died or die?"

Thank you in advance!

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **Karen Espersen and Dave Bilinski** <universalostrich@gmail.com>
Date: Wed, Jan 8, 2025 at 10:55 AM
Subject: H5N1 Universal Ostrich
To: Berreth, Cassandra (CFIA/ACIA) <cassandra.berreth@inspection.gc.ca>

Hi Cassandra

Here is a support letter from vet.

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **Karen Espersen and Dave Bilinski** <universalostrich@gmail.com>
Date: Wed, Jan 8, 2025 at 12:05 PM
Subject: Re: Movement Permit Request Between Houses & Ostriches
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Company : Universal Ostrich Farms Inc / Struthio BioScience Inc.
Dave Bilinski 778-692-9389
Karen Espersen 250-938-7447
Departing Address:
301 Langille Rd, Edgewood, BC V0G 1J0
Delivery Address:
9407 Highway 6, Edgewood, BC V0G 1J0
Material Being Moved:
Feed - whole grain, hay and bedding bales
Licence Truck
Unlicensed farm vehicle
Date of Delivery
Twice daily - morning and afternoon

We have been implementing these protocols already but we are so sorry for the delay in response to filling it out
See attached SOP plan and protocols followed on farm presently.
Kind regards,
Karen and Dave

On Mon, Jan 6, 2025 at 1:37 PM West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca> wrote:

Hi There,

As discussed with Dave this afternoon, here's what I need for a movement permit between your houses and the ostriches:

1. I'm going to need the following details

1. **Company (with contact number):**
2. **Departing Address:**
3. **Delivery Address:**
4. **Material Being Moved:**
5. **Licence(s) (Trucks, Trailers, etc.):**
6. **Date of Delivery (Estimated Time of Delivery):**
7. **Biocontainment plan:**

2. The attachment "Biocon SOP Template" will need to be filled out by either yourselves or the feed company. This is for the biocontainment measures that will be used during the delivery.
    1. This needs approval from CFIA before a permit can be issued for feed delivery. I cannot request a permit on your behalf without one.

I need you guys to do this ASAP! So you don't break the quarantine.

Thanks,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)**
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Thu, Jan 9, 2025 at 12:32 PM
Subject: Re: BC-IP-233 Movement Permit Request Between Houses & Ostriches
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>

Hi,

I see one line (I attached a screenshot) where your text got jumbled up with some of the original text, can you please fix and resubmit?

Thanks!

Cassandra

Get Outlook for iOS

From: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Sent: Thursday, January 9, 2025 1:03:39 PM
To: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Subject: Re: FW: BC-IP-233 Movement Permit Request Between Houses & Ostriches

EXTERNAL EMAIL – USE CAUTION / COURRIEL EXTERNE – FAITES PREUVE DE PRUDENCE

Hi Cassandra,

I am attaching our comment and upgrades to the SOP for review.

Kind regards,
Karen and Dave

On Thu, Jan 9, 2025 at 9:38 AM West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca> wrote:

Hi Guys,

Kindly find attached SOP with CFIA comments. I've listed them below as well too for your reference:

- The Concentration, contact time, and DIN # needs to be stated directly on the SOP
- The PPE section is for anyone else coming onto the farm, not the producers themselves. Needs to be rewritten with the typical disposable suits, masks, gloves, tape etc. I know that they state they wont be brining others onto the premise but if we put this in place now, they don't have to do it later.
- Tires MUST be cleaned at EACH exit EACH time the truck moves off of the premise, if they're using multiple gates, they will need multiple stations set up
- Mud and organic material is to be removed before sanitization

When you've re-vamped the SOP, send it to me we can go from there!

Kind regards,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)**
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Thu, Jan 9, 2025 at 9:38 AM
Subject: FW: BC-IP-233 Movement Permit Request Between Houses & Ostriches
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Cc: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Hi Guys,

Kindly find attached SOP with CFIA comments. I've listed them below as well too for your reference:

- The Concentration, contact time, and DIN # needs to be stated directly on the SOP
- The PPE section is for anyone else coming onto the farm, not the producers themselves. Needs to be rewritten with the typical disposable suits, masks, gloves, tape etc. I know that they state they wont be brining others onto the premise but if we put this in place now, they don't have to do it later.
- Tires MUST be cleaned at EACH exit EACH time the truck moves off of the premise, if they're using multiple gates, they will need multiple stations set up
- Mud and organic material is to be removed before sanitization

When you've re-vamped the SOP, send it to me we can go from there!

Kind regards,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)** <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Thu, Jan 9, 2025 at 10:55 AM
Subject: Follow Up Questions from Jan 3 Meeting
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Cc: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Hi Karen and Dave,

There few a few follow up questions from the Jan 3 meeting that I need some answers for. I've listed them below:

1. Which products do you have stored (oils, cosmetics, skin care etc.)?
2. When was the last time you sold any these products?
3. Do you keep records of your sales (ie. product sold, date, who it's sold to)?
4. If you have sold any products since mid-November, could you please provide us with the any records of sale you have?
5. Did you bring any products (oils, cosmetics, skin care, egg shells etc.) with you to Mexico (for personal use, for sale, or gifting)?
6. Have any other products left the premises since mid-November (like eggs or egg shells)?

Thanks in advance,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

This is Exhibit " I " referred to in the
affidavit of David Rylinski
sworn before me at Vernon
this 29 day of January 2025

CFIA Highly Pathogenic Avian Influenza (HPAI) Event 2022 - Western HPAI Response

10 January 2025

Re: Distinct Unit Evaluation and request for exemption from destruction order issued on December 31 2024 for Ostriches on BC-820-IP-233 (Universal Ostrich Farms Inc., Edgewood, B.C.)

To Whom It May Concern,

Thank you for submitting the Distinct Unit Assessment request package for the HPAI infected premises of Universal Ostrich Farms Inc.

It is critical that, in honouring requests for exemptions from depopulation, we at CFIA remain aligned with our World Organisation for Animal Health (WOAH) obligations to Canada's stamping-out policy with regards to the detection of HPAI. We take these requests seriously and give each request that meets our initial screening criteria due consideration. Conclusions reached in reviewing these applications are final and will not be re-evaluated.

WOAH considers the genus *Struthio spp.* (Ostrich) as "poultry" in their definition of poultry and they are not exempt from a stamping-out policy. This stamping-out policy reflects the risks posed by HPAI infected poultry flocks to humans, domestic animals, and wildlife. As part of the stamping-out policy, the CFIA does not consider individual bird test results when evaluating the epidemiological unit on an HPAI infected premises. In order for Canada to mitigate the risks posed by HPAI infected poultry, maintain its international obligations and the expectation of our trading partners, all birds within the HPAI infected epidemiological unit of a non-commercial poultry infected premises must be destroyed and appropriately disposed.

All criteria listed in the Distinct Unit Assessment must be adequately addressed in order to be granted an exemption from depopulation.

The CFIA defines a Distinct Epidemiological Unit as a group of animals on an infected premises that are separated from an infected susceptible population such that they are not considered exposed to the pathogenic agent. After reviewing all the information provided, including, but not limited to, email communications from Universal Ostrich Inc., an on-site visit conducted by CFIA staff as well as all communications for the purposes of completing the premises investigation questionnaire, we did not find that this proposed distinct unit adequately met the criteria for:

- *A distinct epidemiological unit*. There is no evidence that a subset of animals are a distinct unit or at a different level of risk; all animals on the infected premises are under the same risk of HPAI exposure.

The CFIA may grant an exemption to depopulation for select flocks that meet the requirement of having rare and valuable poultry genetics. This consideration requires a significant burden of proof to demonstrate the high economic value the flock provides to the broader poultry industry. Robust processes must be in place (ex. genomic testing) to actively select and breed for specific desirable traits, with subsequent evidence that this genetic value is critical to the Canadian poultry industry. An evaluation of the information provided was conducted to determine if the genetics of the flock were demonstrated to be of uncommon genetic lines that hold a high economic value to the poultry industry; in conjunction with information available at Animal Genetic Resources of Canada, the material provided for evaluation of the birds present at Universal Ostrich Farms Inc. failed to meet the above definition of rare and valuable poultry genetics. After reviewing all of the information provided, including, but not limited to, email communications from Universal Ostrich Inc. and Yasuhiro Tsukamoto, as well as Struthio Biosciences Inc. business plans, the request for an exemption to depopulation based on rare and valuable poultry genetics is denied. This decision is final and is not subject to appeal.

The CFIA/ACIA 4202-Requirement to Dispose of Animals or Things was delivered on December 31, 2024, and must be completed by February 01, 2025. A draft plan for the destruction and disposal of all birds and things listed on the 4202 can be provided to your case officer for subsequent CFIA review and approval. We appreciate that this is a difficult decision, and should you need support regarding a plan for destruction and /or disposal please let your case officer know. We have also provided the link for the AgSafe mental health website. They have valuable resources that you may find helpful.

Sincerely,

Bourque, TroyBourque
Digitally signed by Bourque, TroyBourque
Date: 2025.01.10 14:54:30 -07'00'

Troy Bourque B.Sc.,D.V.M.

Planning Chief, Western HPAI Response

Fotheringham, Cortnie
2025.01.10 13:57:52 -08'00'

Cortnie Fotheringham

Incident Commander, Western HPAI Response

Katrina Jones

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)**
<cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Tue, Jan 14, 2025 at 12:43 PM
Subject: FW: BC-IP-233 Amended Legal Docs, Feed Delivery, Biocontainment Plan, Future Plans
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Cc: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Hello,

This is Exhibit " J " referred to in the affidavit of David Bilinski sworn before me at Vernon this 29 day of January 2025

Thanks again for chatting with me this afternoon.

As discussed last week, please see attached amended legal documentation to reflect the ostrich enclosure with GPS coordinates.

Dave mentioned earlier last week that you guys may need a feed delivery or straw soon. Because your feed and straw are not stored within the quarantined area, the delivery of feed and straw itself will not require a movement permit or biocontainment plan. **However, a movement permit and biocontainment plan will be required for any movement to or from the ostrich pen/quarantine.**

I have your details for your truck, but I still need your revised biocontainment SOP in order to apply for the movement permit between your houses and quarantined area. As discussed in the call, here's what the CFIA Biocontainment team had for feedback. They have asked that you please include the following in your SOP:

- *Section 6 – Disinfectants - They need to state explicitly what concentration, DIN, and contact time of the chemicals they will be using. I do not need any other information in this section. If they wish to increase the concentration of chemicals, that's their choice, but if it is stated in the SOP that is what they are expected to do at all times. (Example: XYZ Disinfectant (DIN 123456) at 2.5% concentration, contact time 10 minutes)*
- *Section 7 – Material + Equipment – Please include this comment on body of document. Include extra page if necessary.*
- *Section 2 – PPE - This SOP needs to be put in place in the case that they need to bring third party operators on. We do not rewrite them when needed, they need to be up to the standard from the start. I need a list of the PPE they will provide, and nothing more in this section. They need to have a plan in place before the SOP can be approved. Disposable PPE is the only acceptable method for outside personal and "clean coveralls" are not acceptable. Remove text that is currently on the page and rewrite.*
- *Additionally, please make sure that all text is in the body of the document and all is legible. They can add extra pages if necessary, but it must be clear what section they are discussing.*

When you have corrected your SOP, please send to CFIA for approval. Once approved, I will be able to get the movement permit issued.

Moving forward as discussed in our phone call, as per the attached legal documents we ask that you provide a mortality update twice weekly on Tuesday and Fridays as well as send photos of the buried mortalities to me via email or text. In accordance with the attached documents, If possible confine the herd to a smaller area of the property away from public fence lines. I will look into this as discussed on our call and see what options are available.

For burial of current mortalities, please continue to follow and coordinate with BC Environment (Protocol for Small Flock Burial of Avian Influenza Infected Waste). To determine on-site burial as a disposal method for all animals, BC Environment can be contacted at envcia@gov.bc.ca. In the meantime, we can request from the province to determine if a contact can be provided.

Thank you for the update on the depopulation and disposal plans. I will forward this along to the appropriate CFIA personnel.

I will be on the road for the next 5 hours, but will have someone monitoring my email account if you require immediate assistance. I'll also send those questions you asked on our call to our team and hopefully we have answers for you tonight or tomorrow.

Kind regards,

Cassandra Berreth

Case Officer 007

Western Area Avian Influenza Response

Canadian Food Inspection Agency

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Call or Text: 403-795-9461

Government of Canada / Gouvernement du Canada

Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments

LICENSE FOR REMOVAL OF ANIMALS OR THINGS

Under the authority of The Health of Animals Act

PERMIS D'ENLÈVEMENT D'ANIMAUX OU DE SUBSTANCES

En vertu de la Loi sur la santé des animaux

Name / Nom	Address / Adresse
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 301 Langille Road, Edgewood, BC, V0G 1J0V	Starting from the SW corner moving counter clock-wise: 49.862388N 118.152837W,49.864145N 118.154210W,49.865251N 118.150970W,49.863702N 118.148781W,49.863301N 118.149275W,49.862402N 118.149296W

Is hereby permitted to Est autorisé par les présentes à	☒ Remove out of: enlever des :	Starting from the SW corner moving counter clock-wise: 49.862388N 118.152837W,49.864145N 118.154210W,49.865251N 118.150970W,49.863702N 118.148781W,49.863301N 118.149275W,49.862402N 118.149296W
	☒ Remove to: ajouter aux :	Starting from the SW corner moving counter clock-wise: 49.862388N 118.152837W,49.864145N 118.154210W,49.865251N 118.150970W,49.863702N 118.148781W,49.863301N 118.149275W,49.862402N 118.149296W

The following animals and or things: / Les animaux ou substances suivantes :

*Under the authority of the Health of Animals Act section 25. (1), no person shall, without a licence issued by an inspector or officer, remove from or take into an infected place any animal or thing.

The entry / removal of the following animals / things may occur in accordance with these conditions:

a) All family private vehicles (cars, vans, bicycles, etc) not used for animal transport following CFIA approved biocontainment procedures listed in the RDIMS 16386266 document.

b) Any outerwear that may have been exposed to, or used in respect of avains, including clothing and footwear, which has been properly cleaned and disinfected according to CFIA approved biocontainment procedures.

c) Anything can move EXCEPT those animals and things prohibited and declared infected under form CFIA/ACIA 4204, that is: all live and dead avains, avian products, avian by products and other animals and things exposed to or used in respect of avains, including but not limited to eggs, feed, manure and litter. This declaration applies to, but is not limited to the above.

d) No visitors shall be allowed access to any barn or any place where avians are confined. No visitor shall be allowed in the immediate vicinity of said barns, or said place of confinement except as authorized by an inspector of the CFIA.

e) All conditions apply until further notified by an inspector of the CFIA.

f) For anything other than those items listed above, a specific license is required to be moved off or on premises. A copy of the license must accompany shipment.

g) CFIA approved biocontainment procedures are to be followed.

This revokes and replaces the1509Gen issued on 2024-12-31 by Ian Zhang.Reason for amendment of original: corret quarantine location with GPS. Original 1509Gen is attached to this amendment. The date of issue of the 1509Gen referenced above is not changed by thisamendment.

File Number:BC-820 23297

Inspector Name / Nom de l'inspecteur	Inspector - Signature - Inspecteur	Date
Ian Zhang	Digitally signed by ZHANG, XIANG Date: 2025.01.12 14:49:49 -08'00'	2025-01-12

Information may be accessible or protected as required under the provisions of the *Access to Information Act*.

Les renseignements peuvent être accessibles ou protégés selon ce que prescrit la *Loi sur l'accès à l'information*.

CFIA / ACIA 1509 (2000/07)

Canada

Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments

HEALTH OF ANIMALS ACT
NOTICE
REQUIREMENT TO DISPOSE OF ANIMALS OR THINGS

LOI SUR LA SANTÉ DES ANIMAUX
AVIS
ORDRE DE DISPOSITION DES ANIMAUX OU DES CHOSES

Owner or occupier Propriétaire ou occupant	Location of animal(s)/thing(s) Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 301 Langille Road, Edgewood, BC, V0G 1J0V	Starting from the SW corner moving counter clock-wise: 49.862386N 118.152837W 49.864145N 118.154210W 49.865251N 118.150970W 49.863702N 118.148781W 49.863301N 118.149275W 49.862402N 118.149290W

I have determined or suspect that the animal(s)/thing(s) described below is (are) affected or contaminated by

Je constate ou soupçonne que les animaux ou les choses décrits(es) ci-dessous sont atteints(es) ou contaminés(es) par

Avian Influenza

and pursuant to 48.(1) of the *Health of Animals Act*, I hereby require you, the owner or person having the possession, care or control of the animal(s)/thing(s) to dispose of them during the period commencing on the date of this notice and ending on

et, en vertu du paragraphe 48.(1) de la *Loi sur la santé des animaux*, j'exige que vous, le(la) propriétaire ou la personne qui a la possession, la responsabilité ou la charge de ces animaux ou de ces choses, preniez à leur égard, d'ici le

2025-02-01 ,

and in the following manner:
Method of Destruction to be communicated by CFIA

les mesures décrites ci-dessous :

Digitally signed by ZHANG, XIANG
Date: 2025.01.12 14:41:07 -08'00'

Inspector / Inspecteur	Date	Telephone / Téléphone
Ian Zhang	2025-01-12	

Identification Number Numéro d'identification	Age Âge	Sex Sexe	Description of Animal(s) or Thing(s) Description de l'(des) animal(aux) ou de la(des) chose(s)
1			All poultry and poultry carcasses along with other material
2			approved by CFIA disposal crew from the above noted poultry
3			production premises.
4			This revokes and replaces the 4202 issued on 2024-12-31 by Ian Zhang.
5			Reason for amendment of original: corret quarantine location with GPS
6			Original 4202 is attached to this amendment.
7			The date of issue of the 4202 referenced above is not changed by this
8			amendment.
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			File Number: BC-820 23296

The information on this document is collected by the Canadian Food Inspection Agency under the authority of the Health of Animals Act for the purpose of protecting human and animal health. Information may be accessible or protected as required under the provisions of the *Access to Information Act*.

Les renseignements figurant dans le présent document sont recueillis par l'Agence canadienne d'inspection des aliments en vertu de la loi sur la santé des animaux afin de protéger la santé des personnes et des animaux. Les renseignements peuvent être accessibles ou protégés selon ce que prescrit la *Loi sur l'accès à l'information*.

Canada

Disposal

Subsection 48 (1) of the Health of Animals Act:

48.(1) The Minister may dispose of an animal or thing, or require its owner or any person having the possession, care or control of it to dispose of it, where the animal or thing

a) is, or is suspected of being, affected or contaminated by a disease or toxic substance;
b) has been in contact with or in close proximity to another animal or thing that was, or is suspected of having been, infected or contaminated by a disease or toxic substance at the time of contact or close proximity; or
c) is, or is suspected of being, a vector, the causative agent of a disease or a toxic substance.

Mesures de dispositions

Le paragraphe 48(1) de la Loi sur la santé des animaux :

48.(1) Le ministre peut prendre toute mesure de disposition, notamment de destruction, - ou ordonner à leur propriétaire, ou la personne qui en a la possession, la responsabilité ou la charge des soins, de le faire - à l'égard des animaux ou choses qui :

a) soit sont contaminés par une maladie ou une substance toxique, ou soupçonnés de l'être;
b) soit ont été en contact avec des animaux ou choses de la catégorie visée à l'alinéa a) ou se sont trouvés dans leur voisinage immédiat;
c) soit sont des substances toxiques, des vecteurs ou des agents causant des maladies, ou sont soupçonnés d'en être.

Penalty

Section 66 of the Health of Animals Act:

66. Every person who fails to comply with a notice delivered to the person under section 18, 25, 27, 37, 43 or 48 or the regulations is guilty of

a) an offence punishable on summary conviction and liable to a fine not exceeding fifty thousand dollars or to imprisonment for a term not exceeding six months, or to both; or
b) an indictable offence and liable to a fine not exceeding two hundred thousand dollars or to imprisonment for a term not exceeding two years, or to both.

Pénalité

L'article 66 de la Loi sur la santé des animaux:

66. Quiconque contrevient à l'avis qui lui a été signifié au titre des articles 18, 25, 27, 37, 43 ou 48 ou des règlements commet une infraction et encourt, sur déclaration de culpabilité :

a) par procédure sommaire, une amende maximale de cinquante mille dollars et un emprisonnement maximal de six mois, ou l'une de ces peines; ou
b) par mise en accusation, une amende maximale de deux cents mille dollars et un emprisonnement maximal de deux ans, ou l'une de ces peines.

Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

HEALTH OF ANIMALS ACT
ATTACHMENT TO FORM

LOI SUR LA SANTÉ DES ANIMAUX
ANNEXE AU FORMULAIRE

Owner or occupier Propriétaire ou occupant	Location of animal(s)/thing(s) Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 ~~291 Lannille Road, Edgewood, BC, V0G 1J0V~~	Starting from the SW corner moving counter clock-wise: 49.862388N 118.152837W 49.864145N 118.154210W 49.865251N 118.150970W ~~49.863706N 118.149701W~~

Identification Number Numéro d'identification	Age Âge	Sex Sexe	Description of Animal(s) or thing(s) Description de l'(des) animal(aux) ou de la(des) chose(s)
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			

Inspector Name / Nom de l'inspecteur	Inspector (Signature) Inspecteur	Date
Ian Zhang		2025-01-12

Note: When this form is used to describe additional animals, the original of any form it is used with should have the following statement placed on it:

The description of animals/things to which this form applies is on the attached copy(ies) of form CFIA/ACIA 4209 which bear the name and date above.

Nota : Lorsque ce formulaire sert à décrire d'autres animaux, l'original de tout formulaire qui l'accompagne devrait porter la mention suivante :

La description d'animaux/de choses auxquels s'applique le présent formulaire figure sur la(les) copies annexée(s) des formulaires CFIA / ACIA 4209 qui portent le nom et la date ci-haut.

Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments

HEALTH OF ANIMALS ACT
DECLARATION OF AN INFECTED PLACE

LOI SUR LA SANTÉ DES ANIMAUX
DÉCLARATION DE LIEU CONTAMINÉ

Owner or occupier Propriétaire ou occupant	Location of animal(s)/thing(s) Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 301 Langille Road, Edgewood, BC, V0G 1J0	Starting from the SW corner moving counter clock-wise: 49.862388N 118.152837W 49.864145N 118.154210W 49.865251N 118.150970W 49.863702N 118.148781W 49.863301N 118.149275W 49.862402N 118.149296W

I have determined or suspect that the disease / J'ai constaté ou soupçonné que la maladie

Avian Influenza

exists in the place described above and pursuant to Section 22 of the Health of Animals Act, I therefore declare the place to be infected.

est présente dans le lieu décrit ci-dessus. Pour ce motif, conformément à l'article 22 de la Loi sur la santé des animaux, je déclare ce lieu contaminé.

Ian Zhang
Inspector Name / Nom de l'inspecteur

Digitally signed by ZHANG, XIANG
Date: 2025.01.12 14:30:05 -08'00'
Inspector (Signature) Inspecteur

2025-01-12
Date

Identification Number Numéro d'identification	Age Âge	Sex Sexe	Description of Animal(s) or thing(s) Description de l'(des) animal(aux) ou de la(des) chose(s)
1			"All animals of susceptible species on-site (see below) and any related
2			animal products, by-products and things along with any animals,
3			products, by-products and things having contact with them".
4			
5			Description of susceptible species present on-site:
6			
7			All avian species in premise
8			
9			All birds/carcasses are kept indoors or in the barn. Any movement on or
10			off the above-mentioned premises will require a License for Removal of
11			Animals or Things from CFIA in order to be removed from the site.
12			
13			This revokes and replaces the 4204 issued on 2024-12-30
14			by Ian Zhang.
15			Reason for amendment of original: corret quarantine location with GPS
16			Original 4204 is attached to this amendment.
17			The date of issue of the 4204 referenced above is not
18			changed by this amendment.
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			File Number: BC-820 23295

The information on this document is collected by the Canadian Food Inspection Agency under the authority of the Health of Animals Act for the purpose of protecting human and animal health. Information may be accessible or protected as required under the provisions of the *Access to Information Act*.

Les renseignements figurant dans le présent document sont recueillis par l'Agence canadienne d'inspection des aliments en vertu de la loi sur la santé des animaux afin de protéger la santé des personnes et des animaux. Les renseignements peuvent être accessibles ou protégés selon ce que prescrit la *Loi sur l'accès à l'information*.

Sections of the Health of Animals Act:

22.(1) Where an inspector or officer suspects or determines that a disease or toxic substance exists in a place and is of the opinion that it could spread or that animals or things entering the place could become affected or contaminated by it, the inspector or officer may in writing declare that the place is infected and identify the disease or toxic substance that is believed to exist there, and such a declaration may subsequently be amended by the inspector or officer.

(2) When the declaration is delivered to that occupier or owner of the place to which it relates, the place, together with all contiguous lands, buildings and other places occupied or owned by the occupier or owner, constitutes an infected place.

23.(1) For the purpose of preventing the spread of a disease or toxic substance, an inspector or officer may in writing declare that any land, building or other place, any part of which lies within five kilometres of the limits of a place declared to be infected under section 22, is infected and identify the disease or toxic substance that could spread there.

(2) When the declaration has been delivered to the occupier or owner of any land, building or other place, mentioned in subsection(1), the land, building or other place, together with all contiguous lands, buildings and other places occupied or owned by the same occupier or owner, constitutes an infected place.

24. Where an inspector or officer cannot, after the exercise of due diligence, find the occupier or owner of any land, building or other place, delivery of a declaration may be effected by posting it on the building or on any building or conspicuous object on the land or at the place.

25.(1) Subject to any regulations made under paragraph 64(1)(k), no person shall, without a licence issued by an inspector or officer, remove from or take into an infected place any animal or thing.

Articles de la Loi sur la santé des animaux:

22.(1) L'inspecteur ou l'agent d'exécution peut par écrit, déclarer contaminé tout lieu où il soupçonne constate la présence d'une maladie ou d'une substance toxique qu'il estime susceptibles soit de se propager soit de contaminer les animaux qui s'y rendent ou les choses qui y sont apportées; il doit alors préciser la nature de la maladie ou de la substance. Il peut ensuite, de la même manière, modifier la déclaration.

(2) Sur remise de la déclaration au propriétaire ou à l'occupant, le lieu visé par celle-ci et les terrains bâtiments et autres lieux qui lui sont contigus et sont occupés par la même personne, ou dont celle-ci est propriétaire, constituent des lieux contaminés.

23.(1) Après avoir fait la déclaration prévue à l'article 22 et afin d'empêcher toute propagation, l'inspecteur ou l'agent d'exécution peut, par écrit, déclarer contaminés les terrains, bâtiments ou lieux situés - même en partie dans un rayon de cinq kilomètres du lieu visé par la déclaration originale et auxquels la maladie ou la substance toxique - dont il précise la nature - risquent de se propager.

2) Sur remise au propriétaire ou à l'occupant de la déclaration faite au titre du paragraphe (1), le lieu visé par celle-ci et les terrains, bâtiments ou autre lieux qui lui sont contigus et sont occupés par la même personne, ou dont celle-ci est propriétaire, constituent une partie du lieu contaminé.

24. L'inspecteur ou l'agent d'exécution peut, s'il n'a pu trouver le propriétaire ou l'occupant du lieu après avoir pris les mesures nécessaires en ce sens, afficher la déclaration sur un bâtiment ou un objet en vue situé sur le lieu pour valoir remise au propriétaire ou à l'occupant.

25.(1) Sauf en conformité avec les règlements d'application de l'alinéa 64(1)(k), il est interdit, sans permis signé par un inspecteur ou un agent d'exécution, de sortir tout animal ou toute chose d'un lieu contaminé ou de l'y introduire.

Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

HEALTH OF ANIMALS ACT
ATTACHMENT TO FORM

LOI SUR LA SANTÉ DES ANIMAUX
ANNEXE AU FORMULAIRE

Owner or occupier Propriétaire ou occupant	Location of animal(s)/thing(s) Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 ~~901 Lapcille Road, Fraserwood, BC, V0C 1J0~~	Starting from the SW corner moving counter clock-wise: 49.862388N 118.152837W 49.864145N 118.154210W 49.865251N 118.150970W ~~49.863702N 118.148781W~~

Identification Number Numéro d'identification	Age Âge	Sex Sexe	Description of Animal(s) or thing(s) Description de l'(des) animal(aux) ou de la(des) chose(s)
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			

Inspector Name / Nom de l'inspecteur	Inspector (Signature) Inspecteur	Date
Ian Zhang		2025-01-12

Note: When this form is used to describe additional animals, the original of any form it is used with should have the following statement placed on it:

The description of animals/things to which this form applies is on the attached copy(ies) of form CFIA/ACIA 4209 which bear the name and date above.

Nota : Lorsque ce formulaire sert à décrire d'autres animaux, l'original de tout formulaire qui l'accompagne devrait porter la mention suivante :

La description d'animaux/de choses auxquels s'applique le présent formulaire figure sur la(les) copies annexée(s) des formulaires CFIA / ACIA 4209 qui portent le nom et la date ci-haut.

Canada

Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

File Number / Numéro de dossier
BC-820 23294

HEALTH OF ANIMALS ACT
NOTICE
REQUIREMENT TO QUARANTINE AND/OR LICENSE TO TRANSPORT ANIMALS OR THINGS

LA LOI SUR LA SANTÉ DES ANIMAUX
AVIS
OBLIGATION DE METTRE EN QUARANTAINE ET/OU PERMIS DE TRANSPORTER DES ANIMAUX OU DES CHOSES

To: / À :
Universal Ostrich
Owner Name (legal owner of premise): Dave Bilinski
Email: universalostrich@gmail.com
Phone #: 778-692-9389
301 Langille Road, Edgewood, BC, V0G 1J0V

Location of Animal(s)/Thing(s) - Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
Starting from the SW corner moving counter clock-wise:
49.862388N 118.152837W
49.864145N 118.154210W
49.865251N 118.150970W
49.863702N 118.148781W
49.863301N 118.149275W
49.862402N 118.149296W

The requirement must be met in the following manner during the period commencing on the date of this notice

I find or suspect that the animals/things described below are affected or contaminated by AVIAN INFLUENZA

Pursuant to section 6/9/59 of the Health of Animals Regulations, I therefore require you as the owner or person having the possession, care or control of the animals/things described below to quarantine the animals/things described below.

All birds/carcasses are kept indoors or in the barn. Confine to the above described premises in such manner that there is no contact with any birds, animals, humans (other than humans involved in the care or disposal of birds), and other things exposed to birds including things related to the conveyance, care and maintenance of avians and the care and maintenance of the premises which may result in transmission of the disease.

Report any signs of avian influenza or increased mortality to the Canadian Food Inspection Agency (CFIA) immediately. Complete the flock health questionnaire provided and return to the CFIA at the specified times. Quarantine conditions must remain in effect until released by an inspector of the Canadian Food Inspection Agency.

Any of the above-mentioned animals or things will require a License to Transport Animals or Things from CFIA in order to move or to be removed from the site.

L'obligation imposée doit être remplie de la façon suivante à compter de la date du présent avis

Je constate ou soupçonne que les choses ou les animaux visés ci-dessous sont atteints ou contaminés par _____

Conformément aux articles 6, 9 et 59 du Règlement sur la santé des animaux, vous êtes tenu, en qualité de propriétaire ou de personne qui a la possession, la responsabilité ou la charge des soins des choses ou des animaux visés ci-dessous, de mettre en quarantaine les choses ou les animaux en question.

2025-01-12
Date

Digitally signed by ZHANG, XIANG
Date: 2025.01.12 14:33:48 -08'00'
Signature

Ian Zhang
Name of Inspector / Nom de l'inspecteur

Telephone / Téléphone

TERMINATION OF QUARANTINE
TERMINAISON DE QUARANTAINE

Date

Signature

Name of Inspector / Nom de l'inspecteur

Telephone / Téléphone

	Identification Number / Numéro d'identification	Age / Âge	Sex / Sexe	Description of Animal(s) or Thing(s) / Description de l'(des) animal(aux) ou de la(des) chose(s)
1				"All animals of susceptible species on-site (see below) and any related
2				animal products, by-products and things along with any animals,
3				products, by-products and things having contact with them".
4				
5				Description of susceptible species present on-site:
6				All Avian species on this premise.
7				Sick bird Call Log#:773
8				This revokes and replaces the amended 4206Q issued on 2025-01-02
9				by Meghan Koetsier.
10				Reason for amendment of original: corret quarantine location with GPS
11				Original amended 4206 Q is attached to this amendment.
12				The date of issue of the amended 4206Q referenced above is not
13				changed by this amendment.
14				

The information on this document is collected by the Canadian Food Inspection Agency under the authority of the Health of Animals Act for the purpose of protecting human and animal health. Information may be accessible or protected as required under the provisions of the *Access to Information Act*.

Les renseignements figurant dans le présent document sont recueillis par l'Agence canadienne d'inspection des aliments en vertu de la loi sur la santé des animaux afin de protéger la santé des personnes et des animaux. Les renseignements peuvent être accessibles ou protégés selon ce que prescrit la *Loi sur l'accès à l'information*.

Quarantine

The following provisions of the Health of Animals Regulations relate to the requirement to quarantine animals or things:

6. Where an inspector finds or suspects that:

a) a thing is a disease agent,
b) an animal or thing is affected by or contaminated with a communicable disease, or
c) any record or document required by or under the Act and these Regulations to prevent the spread of any disease within Canada, or to any other country from Canada, by an animal or thing is not produced for inspection by an inspector,

the inspector may order the person who owns or has possession, care or control of the animal or thing, to quarantine the animal or thing, and the provisions of section 91.4 apply.

9. Where an inspector finds or suspects that:

a) a thing is a disease agent,
b) an animal or thing imported into Canada is affected by or contaminated with a communicable disease, or
c) any information or documentation required by or under the Act and these Regulations to prevent the introduction of Any disease into Canada by an animal or thing is not presented to an inspector,

the inspector may order the person who owns or has possession, care or control of the animal or thing to quarantine the animal or thing, and the provisions of section 91.4 apply.

59. The Minister may, for the purpose of preventing the introduction of communicable disease into Canada or into any other country from Canada, require any animal imported into Canada to be quarantined, and the provisions of section 91.4 apply.

91.4(1) Where an inspector orders a quarantine of a disease agent, animal or thing, the notice of quarantine shall be communicated by personal delivery to the person who owns or has possession, care or control of the disease agent, animal or thing and the notice may specify the manner, condition, place or places and time of quarantine, necessary to prevent the spread of the communicable disease.

2) In respect of a disease agent, animal or thing quarantined pursuant to these Regulations, no person shall do or permit to be done any of the following actions, without the authorization of an inspector:
a) remove the disease agent, animal or thing from the place of quarantine;
b) allow the disease agent, animal or thing to come into contact with an animal that is not quarantined under the same quarantine order;
c) destroy the disease agent, animal or thing; or
d) treat or test the disease agent, animal or thing for a communicable disease.

(3) Every person who owns or has the possession, care or control of an animal quarantined pursuant to these Regulations shall immediately notify a veterinary inspector of any quarantined animal that appears sick.

(4) In respect of a disease agent or thing quarantined pursuant to these Regulations, no person shall do or permit to be done any of the following actions, without the authorization of an inspector:
a) move the disease agent or thing;
b) alter the appearance of the disease agent or thing;
c) remove of any tag, sign or other notice that the disease agent or thing is under quarantine; or
d) open any container or remove any wrapping or cover around the disease agent or thing.

(5) No person shall transport or cause to be transported a disease agent, animal or thing quarantined pursuant to these Regulations unless:

a) a licence for its transportation has been issued by an inspector;
b) a copy of the licence issued pursuant to paragraph (a) has been provided to the person in charge of the conveyance transporting the disease agent, animal or thing;
c) and the disease agent, animal or thing is transported directly to the location stated in the licence.

(6) Every person who receives a notice referred to in subsection (1) shall comply with the notice.

Penalty

Section 65 of the *Health of Animals Act*:

66. Every person who fails to comply with a notice delivered to the person under section 16, 25, 27, 37, 43 or 48 or the regulations is guilty of:

a) an offence punishable on summary conviction and liable to a fine not exceeding fifty thousand dollars or to imprisonment for a term not exceeding six months, or to both; or
b) an indictable offence and liable to a fine not exceeding two hundred thousand dollars or to imprisonment for a term not exceeding two years, or to both.

Quarantaine

Les dispositions suivantes du Règlement sur la santé des animaux ont trait à l'obligation de mettre en quarantaine des animaux ou des choses :

6. L'inspecteur peut ordonner au propriétaire d'un animal ou d'une chose ou à la personne en ayant la possession, la responsabilité ou la charge des soins de le mettre en quarantaine, auquel cas les dispositions de l'article 91.4 s'appliquent, lorsqu'il constate ou soupçonne que :
a) la chose est un agent causant une maladie;
b) l'animal ou la chose est affecté ou contaminé par une maladie transmissible;
c) tout registre ou documentation exigé en vertu de la Loi ou du présent règlement afin de prévenir la propagation de toute maladie au sein du Canada, ou du Canada à un autre pays, par l'animal ou la chose, ne lui est pas fourni aux fins d'inspection.

9. L'inspecteur peut ordonner au propriétaire d'un animal ou d'une chose ou à la personne en ayant la possession, la responsabilité ou la charge des soins de la mettre en quarantaine, auquel cas les dispositions de l'article 91.4 s'appliquent, lorsqu'il constate ou soupçonne que :
a) la chose est un agent causant une maladie;
b) l'animal ou la chose est importé et est affecté ou contaminé par une maladie transmissible;
c) tout renseignement ou documentation exigé en vertu de la Loi ou du présent règlement afin de prévenir l'introduction de toute maladie au Canada, par l'animal ou la chose, ne lui est pas fourni.

59. Le ministre peut, afin de prévenir l'introduction de maladies transmissibles au Canada, ou dans un autre pays depuis le Canada, exiger que tout animal importé au Canada soit mis en quarantaine, auquel cas les dispositions de l'article 91.4 s'appliquent.

91.4(1) Lorsqu'un inspecteur ordonne la mise en quarantaine d'un agent causant une maladie, d'un animal ou d'une chose, l'avis de mise en quarantaine doit être remis en main propre au propriétaire de l'agent, de l'animal ou de la chose ou à la personne en ayant la possession, la responsabilité ou la charge des soins, et cet avis peut préciser les modalités, les conditions, le ou les lieux et le délai de quarantaine nécessaires pour prévenir la propagation de la maladie transmissible.

(2) En ce qui concerne un agent causant une maladie, un animal ou une chose mis en quarantaine aux termes du présent règlement, il est interdit, sans l'autorisation d'un inspecteur, de prendre les mesures suivantes ou de permettre qu'elles soient prises :
a) retirer l'agent, l'animal ou la chose du lieu de quarantaine;
b) laisser l'agent, l'animal ou la chose entrer en contact avec un animal qui n'est pas mis en quarantaine en vertu de la même ordonnance;
c) détruire l'agent, l'animal ou la chose;
d) traiter l'agent, l'animal ou la chose pour une maladie transmissible ou mener des tests de dépistage à cet égard.

(3) Le propriétaire d'un animal mis en quarantaine aux termes du présent règlement, ou la personne en ayant la possession, la responsabilité ou la charge des soins, doit sans délai aviser un vétérinaire-inspecteur lorsque l'animal semble malade.

(4) En ce qui concerne un agent causant une maladie ou une chose mis en quarantaine aux termes du présent règlement, il est interdit, sans l'autorisation d'un inspecteur, de prendre les mesures suivantes ou de permettre qu'elles soient prises :
a) déplacer l'agent ou la chose;
b) en modifier l'apparence;
c) enlever une étiquette, une indication ou un autre avis précisant que l'agent ou la chose est en quarantaine;
d) ouvrir un contentant ou enlever un emballage dans lequel se trouve l'agent ou la chose ou en enlever la couverture.

(5) Il est interdit de transporter ou de faire transporter un agent causant une maladie, un animal ou une chose mis en quarantaine aux termes du présent règlement, sauf si :

a) un permis pour son transport a été délivré par un inspecteur;

b) une copie du permis a été fournie à la personne chargée du véhicule qui transporte l'agent, l'animal ou la chose;

c) l'agent, l'animal ou la chose est transporté directement à l'endroit indiqué sur le permis.

(6) Quiconque reçoit l'avis visé au paragraphe (1) doit s'y conformer.

Pénalité

L'article 66 de la *Loi sur la santé des animaux*:

66. Quiconque contrevient à l'avis qui lui a été signifié au titre des articles 16, 25, 27, 37, 43 ou 48 ou des règlements commet une infraction et encourt, sur déclaration de culpabilité :

a) par procédure sommaire, une amende maximale de cinquante mille dollars et un emprisonnement maximal de six mois, ou l'une de ces peines; ou
b) par mise en accusation, une amende maximale de deux cents mille dollars et un emprisonnement maximal de deux ans, ou l'une de ces peines.

Michael Carter

[redacted]

---------- Forwarded message ---------
From: **West AI Case Officer Lead / Ouest IA Chef de cas (CFIA/ACIA)** <cfia.WestAICaseOfficer-OuestIAChefdecas.acia@inspection.gc.ca>
Date: Wed, Jan 15, 2025 at 1:57 PM
Subject: FW: BC-IP-233 Response to Questions
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Cc: West AI Case Officer Lead / Ouest IA Chef de cas (CFIA/ACIA) <cfia.WestAICaseOfficer-OuestIAChefdecas.acia@inspection.gc.ca>, West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

This is Exhibit " K " referred to in the affidavit of Daniel Bilinski sworn before me at Vernon this 29 day of January 20 25

Hi Karen/Dave, See the response to questions below for BC-IP-233.

1. Would Canada be considered Avian Influenza free if all wild birds were culled?

Canada's avian influenza status is based on the presence of highly pathogenic avian influenza in domestic poultry. While wild birds are often the source of individual outbreaks in domestic poultry, they are not a determining factor in the avian influenza status of a country. The ongoing presence of HPAI viruses in wild birds underscores the importance of biosecurity measures in domestic production.

To protect Canadians, the poultry industry, other livestock farms and wildlife in Canada from the ever-changing Highly Pathogenic Avian Influenza virus, we practise a stamping-out policy following detections of HPAI In accordance with the CFIA's policy and in alignment with our World Organisation for Animal Health (WOAH) obligations. Canada's emergency response strategy to an outbreak of avian influenza is to eradicate the disease and re-establish Canada's disease-free status as quickly as possible. The CFIA's AI emergency response strategy includes the following measures: the humane destruction of all infected and exposed domesticated birds, surveillance and tracing of potentially infected or exposed animals, strict quarantine and animal movement controls to prevent disease spread, strict decontamination of infected premises, and zoning to define infected and disease-free areas.

2. CFIA responded to the media that there is no evidence that ostriches have better immunity than other birds, the producer would like to know why they were not consulted? They believe this statement is untrue and misleading.

When asked by a media outlet, the CFIA indicated that there is currently no conclusive evidence to suggest that ostriches would have more immunity to the virus compared to other resistant species. (e.g. ducks).

It is recognized that ostriches may have lower mortality rates than chickens and turkeys but that does not mean individual birds are immune to the disease.

The CFIA does employ a number of leading scientists in the field of diagnostics and research in HPAI. They are in regular contact and collaboration with their international peers, participate in several working groups in the network of avian influenza expertise (OFFLU), World Organisation for Animal Health (WOAH), Food and Agriculture Organization (FAO), etc. For further information on the state of knowledge of HPAI antibodies research is published regularly in scientific journals by both Canadian and international scientists. CFIA decision makers take into consideration all existing evidence, including published research to arrive at the best decision to protect animal and public health and international trade.

A cursory search of online academic journals shows a number of papers discussing the impact of different avian influenza strains in ostriches.

https://www.tandfonline.com/doi/abs/10.1080/03079450020016913
Highly pathogenic avian influenza (H7N1) in ostriches (Struthio camelus)

- The findings reported indicate that ostriches are susceptible to highly pathogenic avian influenza.

https://meridian.allenpress.com/avian-diseases/article-abstract/56/4s1/865/199732/Molecular-Analysis-of-the-2011-HPAI-H5N2-Outbreak

Molecular Analysis of the 2011 HPAI H5N2 Outbreak in Ostriches, South Africa

- The third outbreak of highly pathogenic avian influenza (HPAI) H5N2 in less than seven years affected ostriches of South Africa's Western Cape during 2011. Twenty farms tested PCR positive for the presence of HPAI H5N2 between March and November 2011.

https://academic.oup.com/jid/article/216/suppl_4/S512/4162034

Risk of Human Infections With Highly Pathogenic H5N2 and Low Pathogenic H7N1 Avian Influenza Strains During Outbreaks in Ostriches in South Africa

- While measuring human health risk, the study was done because of the controlling and culling of 42000 ostriches during (HPAI)H5N2 outbreaks in ostriches (2011)

https://meridian.allenpress.com/avian-diseases/article-abstract/60/2/535/210334/Ostrich-Struthio-camelus-Infected-with-H5N8-Highly

Ostrich (Struthio camelus) Infected with H5N8 Highly Pathogenic Avian Influenza Virus in South Korea in 2014

- The findings indicate that ostriches are susceptible to H5N8 HPAI virus, but this virus does not spread efficiently among ratites.

3. Who's responsible for the wild bird/migratory bird population?

Environment and Climate Change Canada, and relevant provincial departments, have various roles in developing and implementing policies and regulations addressing wild and migratory bird populations. Nationally, the Canadian Wildlife Health Cooperative acts a coordinator for wild surveillance and reporting.

4. Why can't the producer appeal the decision made by CFIA for the DUR/exemption from depopulation?

Under the current HPAI stamping out policy and the authorities of the *Health of Animals Act*, all susceptible domesticated animals on an infected premises are depopulated. Producers are provided the opportunity to provide evidence that is a distinct epidemiological unit on the premises or there are animals that meet the criteria for rare or valuable poultry genetics. Those two elements constitute an appeal from the destruction order. As previously documented, the CFIA carefully evaluated all of the information you provided and unfortunately was not able to apply either exemption to your operation.

5. What was the basis of the initial testing?
Testing is initiated when the CFIA is aware that there is a suspect case of a reportable disease The mortalities and other signs in the flock were indicative of avian influenza.

Additionally, Section 5 of the Health of Animals Regulations requires that a person who owns or has the possession, care or control of an animal shall notify the nearest veterinary inspector of the presence of a reportable disease or toxic substance, or any fact indicating its presence, in or around the animal, immediately after the person becomes aware of the presence or fact.

a. Can CFIA provide the producer a copy of the test results? Yes, a copy can be provided.

b. Which tests were run? Samples taken from your premises were tested with the avian Influenza matrix and H5/H7 PCR (Polymerase Chain Reaction) tests. These are the same tests used for all poultry premises.

c. Why did they only test the two dead birds? Whenever possible, samples for testing target recently dead birds or birds showing clinical signs. A single confirmed positive test is sufficient to declare a premises infected.

Regards, Randy for Casey

Randy Keely

Case Officer-003

Canadian Food Inspection Agency

Tel: 604-302-6537

Government of Canada / Gouvernement du Canada

Michael Carter

[redacted]

tonight

---------- Forwarded message ---------
From: **West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA)** <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>
Date: Fri, Jan 24, 2025 at 4:26 PM
Subject: Amended control documents - BC IP 233 Universal Ostrich
To: Karen Espersen and Dave Bilinski <universalostrich@gmail.com>
Cc: West AI Case Officer Seven / Ouest IA Agent de cas sept (CFIA/ACIA) <cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca>

Good evening Karen and Dave,

Please find attached amended control documents for your premise that also include the parcel of land that the disposal pile with ostrich mortalities is located. Below is a map outlining in both pink and yellow the coordinates that are listed on the control documents for your reference.

This is Exhibit " L " referred to in the affidavit of David Bilinski sworn before me at Vernon this 29 day of January 2025



Additionally, there is a separate quarantine (4206Q) that has been placed on eggs collected from the ostriches under quarantine during the December 2024 critical period being stored in Karen's cellar at her residence. Please note that these eggs cannot be removed or handled under this movement control unless there is permission from CFIA.

If you have any questions about the control documents please let us know and we are happy to provide further explanation.

Thank you,

Case Officer Seven

403-338-5223
West AI Operations / Ouest IA Opérations (CFIA/ACIA)

cfia.WestAICaseOfficerSeven-OuestIAagentdecassept.acia@inspection.gc.ca

Action _____

FEDERAL COURT

BETWEEN

UNIVERSAL OSTRICH FARMS LTD.

APPLICANT

AND

CANADIAN FOOD INSPECTION AGENCY

RESONDENT

AFFIDAVIT

I, Karen Espersen, businesswoman, of 301 Langille Road, Edgewood, British Columbia, hereby AFFIRM AND SAY AS FOLLOWS:

1. I am a director of the Petitioner in this proceeding, and as such have personal knowledge of the facts and matters herein, except where I state they are based upon information and belief, in which case I believe them to be true.

2. I have read the Affidavit of David Bilinski made January 29, 2025 in this proceeding and confirm that the contents of that affidavit as it concerns myself and Universal Ostrich Farms Inc. are true and correct.

3. I started working with ostriches in 1990 together with my husband and his parents.

4. My father-in-law became the first president of the Alberta Ostrich Association and served in that capacity for a number of years. At that point I wanted to become a vet, but this new industry was so interesting that I learned everything I could about ostriches and the industry

5. In 1991 I started working with Esper Espersen in the Albert Ostrich Association. Over the years I have been a director of both the Alberta Ostrich Association and the Canadian Ostrich Association.

6. In 1995 my husband and I began managing quarantines for Rocky Mountain Ostrich. Subsequent to that we operated a farm with 200 breeding ostriches. We focused on the benefits of ostrich farming, and studied the psychology and physiology of the ostrich.

7. In 1999 I founded Universal Ostrich Farms Inc. ("UOF") and then David Bilinski ("Dave") joined UOF.

8. I initiated studies on ostrich oil with UBC, which demonstrated its benefits and determined how to achieve optimal omega ratios. I have attached as **Exhibit "A"** a true copy of a letter from Kim Cheng at the UBC Avian Research Centre.

9. I have also been involved in other studies with the University of British Columbia studying ostriches utilizing a protein mixture to retain ostrich weigh through transportation.

10. As with Dave, I have devoted my life to ostriches and in particular to UOF. If the UOF ostrich herd is culled we will not be able to recover, and this will have an irreversible financial impact on me.

11. As a director of UOF, I confirm that UOF undertakes to abide by any order the court may make as to damages in the event that CFIA sustains damages as a result of UOF seeking an injunction.

SWORN (OR AFFIRMED) BEFORE)
ME at Vernon British Columbia)
on January 29, 2025)
) KAREN ESPERSEN
.....)
A commissioner for taking)
affidavits for British Columbia)

RYAN IRVING
Barrister and Solicitor
#301 2706 - 30 Avenue
Vernon BC V1T 2B6
Telephone (250) 542-5353

THE UNIVERSITY OF BRITISH COLUMBIA

Faculty of Land and Food Systems

Avian Research Centre
2357 Main Mall,
Vancouver, BC. Canada V6T 1Z4

Tel: (604) 822-2480
Tel: (604) 822-4400
Web: http://www.landfood.ubc.ca/avian_research/

March 20, 2010

Karen Espersen
Universal Ostrich Farms, Inc.
Comp 4, Site 4, RR 1
Edgewood, BC V0G 1J0

Dear Karen,

This letter is a confirmation of our intention to extend our collaboration with Universal Ostrich Farm on ostrich research in ways to alleviate stress during transportation to market to satisfy animal welfare concerns. As you are aware, we are using the ostrich oil provided by Universal Ostrich Farm for research in fatty-acids composition, anti-oxidant properties, and anti-inflammatory efficacy of the oil. We also appreciate that you have allowed us access to your birds for obtaining blood samples for DNA analysis. Our collaboration in the past has been productive, and we hope to be able to gain more knowledge for ostrich production and management in the future with your collaboration.

Sincerely,

Kim Cheng
Professor and Director

This is Exhibit " A " referred to in the affidavit of KAREN ESPERSEN sworn before me at VERNON this 29 day of JANUARY 2025

Action _____

FEDERAL COURT

BETWEEN

UNIVERSAL OSTRICH FARMS LTD.

APPLICANT

AND:

CANADIAN FOOD INSPECTION AGENCY

RESPONDENT

AFFIDAVIT

I, Dr. Steven Pelech, of 5640 Musgrave Crescent, Richmond, British Columbia, hereby AFFIRM AND SAY AS FOLLOWS:

1. I am a professor at the University of British Columbia and as such have personal knowledge of the facts and matters herein, except where I state they are based upon information and belief, in which case I believe them to be true.

2. Attached to this Affidavit and marked as **Exhibit "A"** is a true copy of my opinion report with respect to this matter.

SWORN (OR AFFIRMED) BEFORE)
ME at Vancouver British Columbia)
on January 30, 2025)
) DR. STEVEN PELECH
.....)
A commissioner for taking)
affidavits for British Columbia)

Alyona Kokanova
Barrister & Solicitor
1321 Johnston Road
White Rock, BC V4B 3Z3
(604) 536-5002

THE UNIVERSITY OF BRITISH COLUMBIA

This is Exhibit "A" referred to in the affidavit of Dr. Steven Pelech sworn before me at Vancouver this 30 day of January 20 25

Dr. Steven Pelech
8755 Ash Street, Suite 1
Vancouver, B.C., Canada V6P 6T3
Tel: 604-323-2547 ext. 10 Fax: 604-323-2548
spelech@mail.ubc.ca

Date: 29 January 2025

Re: Expert Report – Risk of H5N1 influenza transmission from Ostriches located at Universal Ostrich Farms, Ltd.

For the case involving Universal Ostrich Farms Ltd. represented by Mr. Michael Carter of Cleveland & Doan Barristers & Solicitors

PART 1: DESCRIPTION OF SCOPE OF THE QUESTIONS TO BE ADDRESSED

1. I was asked by the firm of Cleveland & Doan to provide my expert opinion related to the flock of ostriches (Herd) located at the Universal Ostrich Farms Ltd. (UOF) near Edgewood, B.C. and the risks of transmission of the H5N1 strain of influenza, which is responsible for the current waves of avian flu. In addition, I was also requested to comment upon the value and applications of these birds with respect to the advancement of biomedical knowledge and production of diagnostics, vaccines and therapeutics.

2. In particular, in correspondence (Exhibit A) that I received in an e-mail from Mr. Carter on January 27th, 2025, I was requested to address the followings questions:

   i. What is the likelihood that the Herd presently is transmissible for H5N1 to each other and wild migratory birds such as ducks?

   ii. If the Herd has achieved herd immunity, is there anything rare and valuable about the Herd that would promote the advancement of biomedical research?

   iii. Is there any risk of transmitting the H5N1 virus from the yolk of the ostrich eggs if they were used for testing and research purposes?

iv. Would the testing for antibodies against the H5N1 virus from the egg yolks be a good measure of natural or vaccine-induced immunity?

v. Is there any evidence that vaccine-induced immunity for influenza is superior to natural immunity following recovery from an influenza infection?

3. I understand that having been named as an expert witness by Universal Ostrich Farms Ltd., and having read the Code of Conduct for Expert Witnesses set out in the schedule to the Federal Court Rules, that I am bound to these rules, including in the preparation of this report (see Exhibit B).

PART 2: COLLECTION OF FACTS IN THE PREPARATION OF THIS EXPERT REPORT

4. My opinion on these matters is informed in part on the following facts that were conveyed in Mr. Carter on January 27th, 2025 correspondence listed below:

i. Universal Ostrich Farms Ltd. ("UOF") is located at 301 Langille Road, Edgewood, British Columbia (the "Property").

ii. The Property is approximately 10 kilometres northwest of Edgewood, British Columbia.

iii. According to Statistics Canada, the 2021 Census Profile of Edgewood lists a total population of 235 people.

iv. The nearest population centres are Vernon, at over 90 kilometres by air, and Castlegar, at over 70 kilometres by air.

v. UOF raises ostriches at the Property.

vi. As of February 2020 UOF was raising about 250 ostriches on the Property.

vii. At that time some ostriches in the herd became sick. Tissue samples were taken from a deceased ostrich and were sent for analysis. A report from the BC Animal Health Centre returned positive results for "Proteus sp., *Pseudomonas aeruginosa* and *E. coli* (non-haemolytic)."

viii. Ten ostriches died around February 2020.

ix. In the following year UOF began increasing the size of the herd, including by purchasing some ostriches from other producers.

x. As of December 1, 2024 there were approximately 450 ostriches being raised at the Property (the "Herd").

xi. On about December 10, 2024 representatives from UOF began noticing some ostriches in the Herd were showing signs of illness.

xii In the following week ostriches began to die from apparent illness.

xiii. On December 29, 2024 representatives from the Canadian Food Inspection Agency ("CFIA") attended at the Property and took swab samples from two of the dead ostriches.

xiv. CFIA tested using the Avian Influenza matrix and H5H7 PCR test, and the test result was positive for the H5N1 type of Avian Influenza.

xv. On December 30, 2024 CFIA issued a written Requirement to Quarantine, which was amended on January 2, 2025, January 12, 2025 and January 24, 2025.

xvi. UOF has been complying with the requirements of the quarantine.

xvii. Between about December 12, 2024 and January 15, 2025, 69 ostriches died of the H5N1 type symptoms.

xviii. No ostriches have died of H5N1 symptoms since January 15, 2025.

xix. The only ostriches of the Herd that died of H5N1 type symptoms belonged to the group of ostriches that did not experience the pseudomonas infection in 2020.

xx. Four ostriches have died of non-H5N1 type symptoms in January 2025. Three of these ostriches slipped on the ice and injured themselves, and one ostrich was caught in a fence.

5. In addition to these facts, I have viewed several media interviews[1,2,3] with Ms. Katie Pasitney, who is the daughter of one of the owner of the UOF, and this has further informed me regarding their history and the use of these ostriches for biomedical research.

6. My own training in immunology and virology and personal experience and understanding of these fields affords me the ability to consider and weigh these issues in a knowledgeable way and offer a qualified expert opinion.

7. I have been actively involved in the study of coronaviruses for over 5 years, especially with respect to the SARS-CoV-2 virus, which is responsible for COVID-19, and the production of antibodies against this virus in people who have been infected by this virus and/or have been vaccinated against this virus. I have been involved in the development of serological tests for SARS-CoV-2 directed antibodies, and the application of these tests to evaluate natural and COVID-19 vaccine-induced immunity in a 4,500-person clinical study. My experience with SARS-CoV-2 is very applicable to influenza, which is caused by a similar respiratory virus. In Part 5 of my report, I will further elaborate on my experience in immunology and viral research to further establish my expertise in the matters under discussion.

8. Throughout this report, I have identified many of the key primary publications in the scientific literature and government websites as well as my own research that have influenced my conclusions about testing for the influenza virus, and the immune responses that the virus and influenza vaccines evoke.

9. The Canadian Food Inspection Agency has adopted a policy to test sick flocks of domesticated birds for the H5N1 influenza virus, and eradicate all the birds in the flock upon confirmation of an influenza infection. They have largely discounted the extent and effectiveness of natural immunity in the birds that have recovered to prevent future infections, and downplayed the

---

[1] https://www.ctvnews.ca/vancouver/article/bc-farm-fights-order-to-cull-ostrich-herd-after-2-birds-test-positive-for-avian-flu/

[2] https://www.rebelnews.com/power_hungry_feds_order_culling_of_ostrich_farm?utm_campaign=dh_ostrichupdate_012725&utm

[3] https://www.youtube.com/live/dM5xHTKSzV0

important role that serological testing for influenza virus antibodies has in tracking and controlling the avian flu pandemic to allow the Canadian livestock industry to move back towards normalcy. Wild birds, particularly migratory ducks, are commonly infected with the H5N1 strain of influenza, which produces a more virulent infection that can be lethal to birds. Therefore, it is likely that there will continue to be a high risk for future infections of domesticated birds and other livestock, especially if they have no previous immunity to the virus and there is no herd immunity established in the livestock. Various H5N1 influenza vaccine are currently in development to protect bird and other domesticated animals and people.[4] However, the influenza vaccines with attenuated, weakened forms of the virus have actually not been particularly efficacious in the past.

10. In Part 3 of my report, I will provide some background information about the influenza virus, testing for the virus and antibodies against this virus, and then in Part 4 specifically address the questions put forth by the firm of Cleveland & Doan.

PART 3 – BACKGROUND REVIEW OF INFLUENZA, NATURAL AND VACCINE INDUCED IMMUNITY

3.1. Viral Respiratory Diseases

11. Many human and animal infectious diseases are caused by airborne viruses. Notably, these include respiratory syncytial virus (RSV), influenza and coronaviruses. These viruses are highly contagious, mainly transmitted in aerosols received through the mouths and noses of victims. They produce very similar symptoms, which include runny nose, coughing, sneezing, wheezing, fever and decrease in appetite. The symptoms are largely consequences of the body's counter-reactions to a respiratory infection. These viruses infect hosts largely by inhalation of virus-laden

[4] HHS provides $590 million to accelerate pandemic influenza mRNA-based vaccine development, enhance platform capability for other emerging infectious disease. (January 17, 2025) https://www.hhs.gov/about/news/2025/01/17/hhs-provides-590-million-accelerate-pandemic-influenza-mrna-based-vaccine-development-enhance-platform-capability-other-emerging-infectious-disease.html

air. As such, their first opportunity to infect the body occurs in the larger passages of the upper respiratory tract—the nose, pharynx, larynx, trachea and bronchi.

12. Once these viruses invade cells of the upper airways, they hijack the body's intracellular machinery to replicate, and often cause cellular damage in the process by lysing the infected cells. If the body responds well, the immune system will prevent these viruses from spreading beyond the upper airways and will quickly terminate any illnesses induced by these viruses. If the immune response is insufficient, the infection might spread into the lower airways (alveoli) and develop into a much more serious systemic infection (including secondary infections such as bacterial pneumonia). The immune response to respiratory viruses in airway spaces is rather different when compared to an infection of the bloodstream from a skin wound or even an injection of a vaccine.

3.2. Influenza

13. Influenza has been recognized in humans as a seasonal illness for over a century with annual variations in prevalence and severity. Since wild birds can also migrate seasonally, the incidence of influenza is also seasonal in the wild. Adults can become infectious about a day before they manifest any symptoms, and they can remain infectious for five to seven days after the appearance of flu symptoms. These symptoms can include fever, cough, runny nose, body aches, nausea, vomiting, and diarrhea. The symptoms can be very mild to severe, with full recovery occurring in usually one to two weeks. After this time, recovered people and animals are rarely contagious. Adults tend to recover much faster than children.[5]

14. From the Orthomyxoviridae family, the influenza viruses occur in four types, A, B, C and D. The A and B types are mainly responsible for seasonal epidemics of the flu, whereas the C type produces mild illness, and the D type primarily infects cattle.[6] Their genomes consist of 8 segments of negative-sense stranded ribonucleic acid (RNA). Co-infection of the same cell with two different

[5] (2024) How flu spreads. Centers for Disease Control and Prevention. Retrieved from https://www.cdc.gov/flu/spread/index.html

[6] (2022) Types of influenza viruses. Centers for Disease Control and Prevention. Retrieved from https://www.cdc.gov/flu/about/viruses/types.htm

influenza viruses can allow the mixing of these segments to generate new variants, especially if one of the influenza strains is from another animal species.

15. The Influenza A viruses are divided into subtypes based on two proteins, *i.e.*, hemagglutinin (H) and neuraminidase (N), which are located on the surface of the virus. There are 18 different hemagglutinin subtypes (H1 though H18) and 11 different neuraminidase subtypes (N1 through N11). More than 130 influenza A subtype combinations have been identified in nature, mainly from wild birds, but there are likely additional influenza A subtype combinations given the propensity for virus "reassortment" of the eight RNA segments. The H1N1 and H3N2 subtypes have been responsible for the more recent influenza pandemics in humans. The H5N1 subtype in only rare occasions has caused serious illness in people, but it can efficiently infect and propagate in birds, and can infect other livestock such as cattle.

16. The most devastating human influenza pandemic on record is the 1918 "Spanish flu", which was caused by the H1N1 influenza virus A. It has been estimated to have produced disease in at least 500 million people, about a third of the world's population at the time, and resulted in up to 50 million deaths.[7] There were four waves of the Spanish flu, with the first occurring between February 15 and June 1, 1918, and the last wave persisting from December 1, 1919, to April 30, 1920.[8] Some 50,000 Canadians and 675,000 Americans appear to have succumbed to this H1N1 influenza A virus between 1919 and 1920. It had an estimated mortality rate of 2.5%, and primarily affected 25- to 40-year-olds. The deaths were primarily due to subsequent secondary bacterial pneumonia. The Spanish flu was probably one of the major factors that led to the end of World War I. The high lethality rate of the Spanish flu was likely a reflection in part of the high rates of war injuries, including damage to the airways and lungs by gas warfare, poor nutrition and inadequate sanitation, and high stress levels during the end and aftermath of World War I.

---

[7] Liang, S.T., Liang, L.T., Rosen, J.M. (2021) COVID-19: A comparison to the 1918 influenza and how we can defeat it. Postgrad Med J. 97(1147):273–274. doi:10.1136/postgradmedj-2020-139070

[8] Yang, W., Petkova, E., Shaman, J. (2014) The 1918 influenza pandemic in New York City: Age-specific timing, mortality, and transmission dynamics. Influenza Other Respir Viruses. 8(2):177–188. doi:10.1111/irv.12217

On the termination of the war, the spread of the flu was exacerbated by the return of soldiers to their war-torn, home countries.

17. H1N1 influenza subtypes were prevalent in the 1950s and then largely disappeared until 1977 when they reappeared causing a pandemic that originated in the former USSR.[9] The 1977 H1N1 subtype had a fatality rate of less than 0.005% and was fairly mild; it primarily affected people 26 years of age or younger. The gene sequence of the 1977 H1N1 was almost identical to the N1H1 subtype from 1950,[10] leading scientists to believe it was likely to have "escaped" from a lab that was developing a vaccine against influenza.[11] People older than 26 in 1977 probably already had lasting immunity against the H1N1 strain due to prior exposure. However, influenza A viruses tend to mutate faster than influenza B type viruses, and so evasion of pre-existing immunity is more likely with influenza A viruses. The H1N1 subtype that emerged during the 2009–2010 flu season (called "swine flu" in the media) was caused by a combination of influenza A viruses that infected pigs, birds, and humans.

18. Vaccines against influenza are usually developed for North America based on a mix of the subtypes that appear to be prevalent during the prior flu season in the Southern Hemisphere. Often, these predictions fail, and new influenza vaccines prove to be less effective than desired for the new flu season. For example, in a meta-analysis study of vaccine effectiveness from the 2009–2010 influenza pandemic, it was estimated that in the Northern Hemisphere it was only 22% effective.[12] But when most circulating flu viruses are well-matched to those used to make

---

[9] Kung, H.C., Jen, K.F., Yuan, W.C., Tien, S.F., Chu, C.M. (1978) Influenza in China in 1977: Recurrence of influenza virus A subtype H1N1. *Bull World Health Organ.* 56(6):913–918.

[10] Nakajima, K., Desselberger, U., Palese, P. (1978) Recent human influenza A (H1N1) viruses are closely related genetically to strains isolated in 1950. *Nature.* 274(5669):334–339. doi:10.1038/274334a0

[11] Rozo, M., Gronvall, G.K. (2015) The reemergent 1977 H1N1 strain and the gain-of-function debate. mBio. 6(4). doi:10.1128/mBio.01013-15

[12] Okoli, G.N., Racovitan, F., Abdulwahid, T., Righolt, C.H., Mahmud, S.M., *et al.* (2021) Variable seasonal influenza vaccine effectiveness across geographical regions, age groups and levels of vaccine antigenic similarity with circulating virus strains: A systematic review and meta-analysis of the evidence from test-negative design studies after the 2009/10 influenza pandemic. Vaccine. 39(8):1225–1240. doi:10.1016/j.vaccine.2021.01.032

flu vaccines, a reduction of flu illness between 40% to 60% can typically be observed.[13] It is clear that flu vaccines do not eliminate the potential threat of influenza infection in a population.

19. While the incidence of human influenza cases plummeted in 2020 and 2021 during the first two years of the COVID-19 pandemic, about 45% of the recorded influenza cases in Canada in the 2020–2021 season were in people who were recently vaccinated against the virus.[14] Since the influenza viruses in most vaccines tend to be attenuated, *i.e.,* weaker strains of influenza A viruses, there is a risk that some individuals who have weak immune systems that are unable to mount a sufficiently protective immune response, might contract the disease. Some inactive influenza vaccines use heat-killed virus, whereas others use only one of its proteins rather than the whole virus, but these tend to be less effective. With less efficacious vaccines, there remains a risk for a larger population of sick hosts and the increased opportunity for additional mutation of the virus to evade the weaker immune protection.

20. It should be appreciated that most people who die with influenza actually die from pneumonia. For that reason, Statistics Canada usually reports deaths from both influenza and pneumonia together. In the 2019–2020 flu season, there were 306 ICU admissions and 120 deaths with influenza in Canada, and over 70% were from influenza A. Over 90% of the human deaths were associated with at least one comorbidity, usually hypertension or another heart disorder. Typically, about 3,500 deaths with influenza occur annually in people in Canada.[15]

21. Even without prior immune protection from previous infection or vaccination, influenza can be successfully treated in most cases with antiviral drugs. Influenza A and influenza B viruses are sensitive to the recent antivirals oseltamivir (Tamiflu) from Roche and zanamivir (Relenza from GalaxoSmithKline). These are inhibitors of the neuraminidase enzyme on the surface of the

---

[13] Centers for Disease Control and Prevention, N. C. f. I. a. R. D. N. (2023) Vaccine effectiveness: How well do flu vaccines work? Retrieved from https://www.cdc.gov/flu/vaccines-work/vaccineeffect.htm

[14] Nwosu, A., Lee, L., Schmidt, K., Buckrell, S., Sevenhuysen, C., Bancej, C. (2021) National Influenza Annual Report, Canada, 2020–2021, in the global context. Can Commun Dis Rep. 47(10):405–413. doi:10.14745/ccdr.v47i10a02

[15] (2023) Seasonal influenza, avian influenza and pandemic influenza. Infection Prevention and Control Canada. Retrieved from https://ipac-canada.org/influenza-resources

influenza particles, which is needed to permit budding and release of the virus from infected host cells.

3.3. The Innate and Adaptive Immune Systems

22. The composition and functioning of the immune system is complex, and involves hundreds of diverse immune-response proteins that affect over 20 different types of immune cells. What follows is a very brief introduction to this amazing multi-pronged defense system against infectious pathogens and cancer.

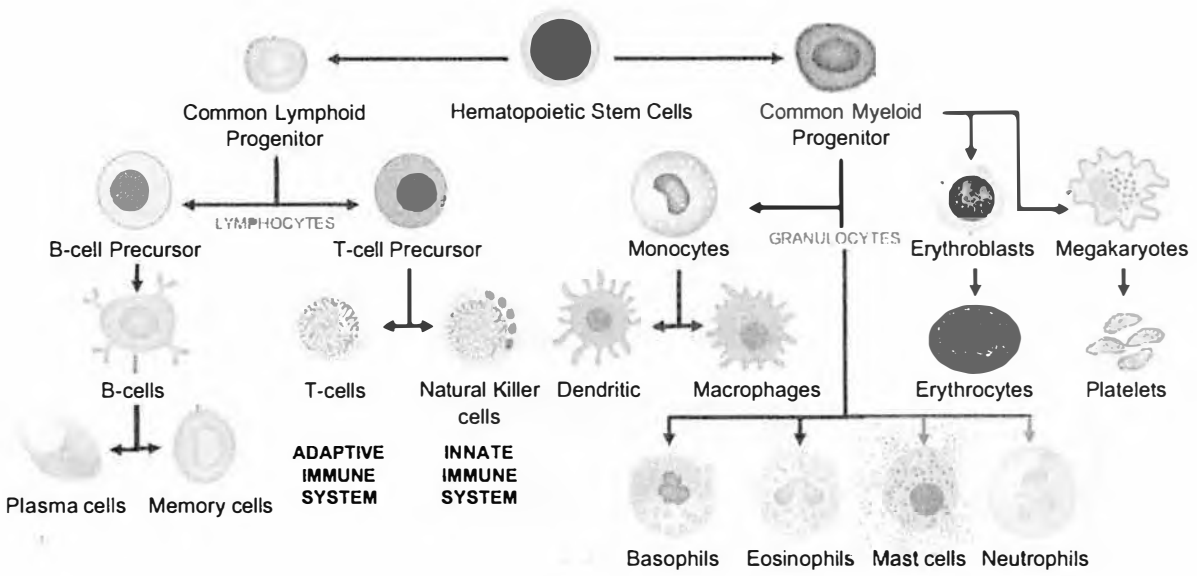
23. There are two main branches, known as the *innate* and the *adaptive* immune systems. The cells of the innate immune system are generally non-specific in their targeting, although they may be guided by antibodies that bind to pathogens. Immune cells develop very quickly, within minutes to days following exposure to a danger signal, and, therefore, are particularly useful for combating new pathogens. The innate immune system is especially strong in infants and children compared to adults. Over time, adaptive immune system cells called *lymphocytes* learn to recognize and remember foreign proteins and other structures called *antigens*. The specific portions that are targeted on an antigen are known as epitopes. The innate immune system, although still very active in adults, is less so due to the increased activity by the adaptive immune system to efficiently deal with an infection. Nonetheless, these two complementary systems work as a tightly coordinated defense force to protect the host against the diverse foreign agents that will be encountered over a lifetime.

24. Immune cells are collectively referred to as *white blood cells* or *leukocytes*. There is typically about one white blood cell for every *700 red bloods cells* or erythrocytes in the blood. There are many distinct leukocyte populations, particularly in the less specific innate immune system (Figure 1). For the purposes of this report, it is most useful to focus on the adaptive immune system. Precursor cells in the lymph nodes mature to form lymphocytes, of which *B-cells* (antibody-producing) and *T-cells* comprise the adaptive immune response. The B- and T-cells remaining after this careful selective process form a diverse pool of naïve lymphocytes that are sensitive to foreign pathogens. Selective stimulation of these naïve cells with antigens on

microbial pathogens triggers their activation and successive divisions and expansion into a clonal army of identical cells that have high specificity for an antigenic epitope (an epitope is the small part of target that is recognized by an antibody or T-cell antigen receptor). As the amount of foreign antigen in the environment declines, such as with the successful eradication of a pathogenic virus, the stimulated lymphocyte clones undergo programmed cell death or revert into an inactive resting state. During this process, memory lymphocytes also develop, which survive for various prolonged periods of times—in some cases even a lifetime—following exposure to a foreign entity. These memory cells can rapidly awaken from their slumber to engage with the pathogen once again when presented with the same or very similar antigens on the pathogen. This allows much faster and more effective immune responses than in their first encounter. This unique feature of long-term immunological memory is why recovery from a pathogenic infection often provides sustained protection against future encounters with that specific pathogen or a highly related pathogen. This is referred to as naturally acquired immunity. The durability of such natural immunity is exemplified with previous influenza infections. For example, plasma and memory B-cells in survivors of the 1918 influenza pandemic could endure for 85 years and could still produce antibodies upon reinfection with the same influenza pathogen.[16] When such immunity is established in a community, it is referred to as herd immunity. If the pathogen becomes endemic in the environment, then this becomes a source of antigen for natural boosting of the immune response as needed.

[16] Yu, X., Tsibane, T., McGraw, P., House, F.S., Keefer, C.J., *et al.* (2008) Neutralizing antibodies derived from the B-cells of 1918 influenza pandemic survivors. Nature. 455(7212):532–536. doi:10.1038/nature07231

Figure 1. Cells of the hematopoietic system.



3.4. Antibodies

25. The specific parts of the foreign antigens, such as tiny portions of viral proteins, that are recognized by B- and T-cells are called epitopes. As part of the *humoral* immune response, B-cells produce *immunoglobulin*s, which are relatively large proteins that bind to specific epitopes on antigens. These *antibodies* are among the most common classes of globulin proteins found in the plasma fraction of blood. Each B-cell initially produces a specific antibody that has affinity for a distinct epitope. Since the body has a broad repertoire of billions of different B-cells to recognize the various foreign antigens that it will encounter in a lifetime, at the start there can only be one of each unique antibody producing B-cell. However, in the process of clonal expansion, engagement of a B-cell with an antigen can induce its rapid proliferation into an army of identical B-cell clones that target exactly the same epitope on the antigen. Different B-cells may produce antibodies that bind to different epitopes on the same antigen; this is referred to as a *polyclonal antibody response*. In the long term, the body does not have the capacity to hold large numbers of each clone, so it expands and contracts the number of B-cell clones as required.

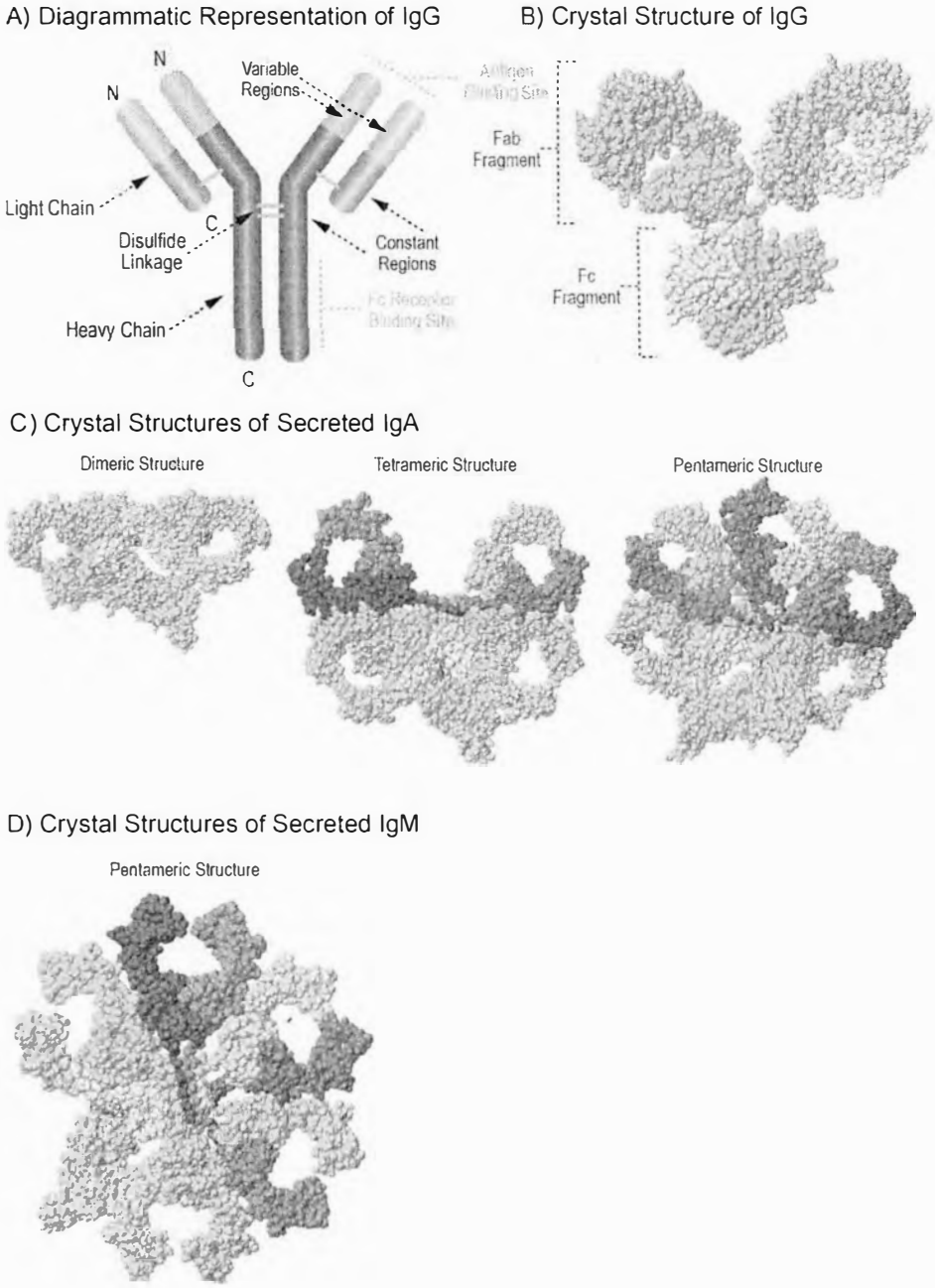
26. The pathogen itself might have many different proteins and other structures to which antibodies can bind. The binding of antibodies to a virus, bacteria or even the toxins produced by them, can block their functional interactions, such as attachment of the pathogen to host receptors to gain entry for replication. Bound antibodies also attract other immune mediators such as *complement proteins* to support the direct attack against antibody-coated infectious pathogens or cells infected with pathogens.

27. Antibodies are amazingly durable proteins. In humans, there are at least five different classes of antibodies that vary in their primary locations of action, ability to dock multiple antigens and stability (Figure 2). In the blood, IgG antibodies predominate, and these can survive for three weeks or more at 37°C, cruising at high speed through the 60,000 plus miles of the arteries, veins, and capillaries in the circulatory system as well as the lymphatic system. Stored at 4°C with antibiotics to prevent bacterial growth, these antibodies can retain their structure and binding properties for over a decade. In the nasopharynx, airway passages, lungs and lower digestive tract, secreted IgA and IgM antibodies can last for about five to six days. These latter antibodies are the most useful for fighting a respiratory virus infection. There are also IgD and IgE class antibodies that tend to exist primarily in the gut.

28. All human antibodies are composed of two identical large (heavy) chains and two identical small (light) chains linked together with disulfide atoms. These interwoven protein chains take on a "Y" shape where the branching portion (called the Fab portion) features two separate, identical binding regions at its tips for recognition of an epitope. This region is unique, with differences in amino acid sequences that define the specificity of an antibody. Due to the presence of two copies of epitope-binding domains in each antibody, antibodies are *bivalent* and can bridge two separate viruses simultaneously to cluster them into larger inactive complexes. The other end of the antibody, which is almost identical for antibodies of the same class, is known as the "Fc" portion and acts as a tail-piece. Many different cells of the innate immune system have specific Fc receptors, and so are directed to antibody-coated pathogens to facilitate their destruction. Antibodies of the IgD, IgE and IgG types are bivalent as they occur as only as monomers, or single units. However, IgA type antibodies can occur in units of two (dimers), four (tetramers), or five

(pentamers) as well, and IgM antibodies exist in complexes as pentamers or hexamers (6 copies) (Figure 2). This and other unique features of IgA and IgM class antibodies strengthen the mucosal antibody response to pathogenic microbes. These classes are better able than IgG class antibodies to sequester viruses and bacteria for destruction by roving macrophages. However, vaccines that are injected intramuscularly predominately generate IgG class antibodies.

Figure 2. Structures of Immunoglobulins. For visualization purposes, the light and heavy chains of the immunoglobulins are shown in different colors as space-filling representations of atoms on each of these macromolecules.



3.5. Detection of Viral Infections by PCR

29. Birds, amphibians and reptiles also produce a class of immunoglobulin known as IgY antibodies. These represent the major antibodies in these animals and are particularly concentrated in the yolks of bird eggs. The IgY structure is very similar to that of IgG antibodies with 2 light chains and 2 heavy chains, but they are less flexible than mammalian IgG.

30. The volume of an ostrich egg, about 1.3-1.4 liters, is typically about 25-time the volume of a chicken egg. Ostrich egg yolks contain about 4 grams of IgY, which is equivalent to the yield from the blood of about 8 rabbits.[17] Ostrich IgY are highly resistant to heat (up to 100°C) and pH changes (from 3.5 to 12).

31. There are two major types of testing used to determine whether a person or animal is actively infected with a pathogen like influenza. A nucleic acid test (NAT), most commonly the Reverse Transcription - Polymerase Chain Reaction (RT-PCR)-based test, has been used for detection of the RNA component of the virus. It relies on amplification of the viral nucleic acid material through repeated heating and cooling cycles of separation and annealing of the nucleic acid strands, with a doubling of the genetic material with each thermal cycle. The other type of test is the rapid antigen test (RAT), which typically detects the presence of a viral protein.

32. The main issue with the RT-PCR test is that it often employs a high number of thermal cycles (Ct), which can generate a large percentage of false-positive results. Individuals can still test positive with the RT-PCR test two weeks after they have fully recovered from COVID-19 and are non-contagious. It is not possible to amplify the viral protein material in a rapid antigen test, so it suffers from a lack of sensitivity and can often generate false-negatives. Depending on the specificity of the antibody detection reagent used, it may also cross-react with related proteins found in other influenza strains and produce false-positives for a target strain such as H5N1.

[17] https://ostritec.com/blog/ostrichs-strong-immune-system-leading-to-breakthrough-in-antibody-technology-research-/

33. While RT-PCR tests are based on a remarkable technology, they should not be used as a standalone "gold standard" test for defining cases of influenza or any other pathogen. It is wholly inappropriate to diagnose influenza, which is an illness with symptoms similar to those produced by infections with other respiratory viruses such as coronaviruses and RSV, based only on the presence of influenza RNA as detected by the PCR test. A positive result with a PCR test does not necessarily mean a person or animal has influenza and is able to transmit the disease. It is feasible that a person or animal may test positive for a virus from a swab from the mouth or nose simply by breathing in fragmented portions of the genome of the virus, which are replication incompetent. Cross-contamination of samples undergoing testing in a lab is also an issue with PCR-based testing.[18]

34. Firstly, every laboratory conducting RT-PCR tests for the detection of influenza should have determined an appropriate Ct cut-off through parallel testing of samples using the gold standard functional virology assay in which evidence of replication-competent, potentially infectious virus particles is obtained by looking for evidence of cytopathic effect (killing) in what are known as *permissive cells* (cells stripped of their antiviral properties so that viruses can readily infect them). For example, this was performed with the SARS-CoV-2 virus by Canada's National Microbiology Laboratory, with the Ct cut-off determined to be only 24, meaning that tests showing positive results at Ct values greater than 24 failed to demonstrate the presence of potentially infectious viral particles.

35. Ideally, following a positive-result with a PCR test, a collected sample from a swab should be tested for its ability to infect and kill permissive cells in culture. Alternatively, the sample can be

[18] Chandra, R. (2023) Preventing cross contamination in an infectious disease testing laboratory. Medical Laboratory Observer. https://www.mlo-online.com/management/lab-safety/article/53056019/preventing-cross-contamination-in-an-infectious-disease-testing-laboratory

injected into a fertilized, intact egg and tracked for the ability of the inoculate containing a pathogen to interfere with the development of the embryo in the egg.[19]

36. Secondly, the presence of replication-competent viral particles in a sample does not necessarily equate to a case of influenza, which is a disease with symptoms. The latter can only be diagnosed if an active infection is present in conjunction with signs and/or symptoms of illness, which would require assessment by a physician or veterinarian. However, it is typical for private and government laboratories to categorized swab samples with Ct cut-offs of up to 38 cycles and, in some cases, in the absence of clinical data, as representing positive cases of viral infection. However, this is associated with greater than 90% rate of false-positives with respect to replication-competent virus. Consequently, in the absence of data providing the Ct cut-off established using a functional virology assay, a PCR testing result alone is dubious.

37. Studies have shown that if more than 26 cycles of PCR amplification are required to detect the presence of SARS-CoV-2 RNA, the viral content is insufficient to propagate the virus in optimal cell culture conditions in a laboratory.[20] Unfortunately many results reported in the scientific literature are based on the use of 35 thermal cycles or greater. The extreme sensitivity of the PCR test to detect inactive virus is exemplified by its common use to detect the presence of the SARS-CoV-2 virus RNA (likely in a fragmented form) in waste water to monitor community levels of SARS-CoV-2 infection. The same issue would be true for influenza virus detection.

38. The Public Health Agency of Canada website "Avian influenza A(H5N1): For Health Professionals" states that:

> *"Influenza A and B RT-PCR with subtyping (H5) should be the primary method for detection of avian influenza A(H5N1). Any positive samples must be shared with the National Microbiology Laboratory (NML) for confirmatory testing and analysis to*

---

[19] Testing protocol. Detection of pathogens by the inoculation Test in embryonated chicken eggs. US Department of Agriculture Center for Veterinary Biologicals. https://www.aphis.usda.gov/sites/default/files/VIRPRO1017.pdf

[20] Bullard, J., Dust, K., Funk, D., Strong, J.E., Alexaner, D., *et al.*, (2020) Predicting infectious SARS-CoV-2 from diagnostic samples. Clin. Infect. Dis. Ciaa638. doi:10.1093/cid/ciaa638

fulfill NML's obligations as a National Influenza Centre and Canada's obligations under the International Health Regulations and other agreements."[21]

39. Whether there is such a requirement for the Canadian Food Inspection Agency to also verify positive-PCR test results for influenza with the National Microbiology Laboratory in Winnipeg is unclear to me.

3.6. Rapid Antigen Tests for SARS-CoV-2

40. Unlike PCR tests that monitor for the presence of viral mRNA or DNA, antigen tests detect the presence of target proteins encoded by the genome of the pathogen. This relies on the availability of pre-made antibodies that bind specifically to one or more of the virus's proteins. Such antibodies may be generated in animals inoculated with target viral proteins artificially manufactured in cells, described as *recombinant* versions of the proteins. These recombinant proteins are believed to be essentially identical to the original viral proteins, although they may be subjected to minor genetic modifications. A major difference between the antigen tests and the genetic tests is that the number of viral protein molecules in a sample cannot be amplified as it is using the PCR method.

41. During the COVID-19 pandemic, many Canadian provincial health authorities recommended widespread use of rapid antigen tests, especially for those who did not receive at least two injections of a COVID-19 vaccine. However, the inability of the Abbott rapid antigen test to detect SARS-CoV-2 in asymptomatic people was confirmed in a study conducted by the Canadian Public Health Laboratory. The test kit was unable to detect SARS-CoV-2 in samples that tested positive with RT-PCR cycle thresholds greater than 22 (*i.e.*, Ct amplifications greater than 22 are required for a positive-result). People testing positive at cycle thresholds of 22 or less are very likely to be sick (*i.e.*, symptomatic).[22]

---

[21] Avian influenza A(H5N1): For health professionals. Public Health Agency of Canada. (November 11, 2024) Retrieved from https://www.canada.ca/en/public-health/services/diseases/avian-influenza-h5n1/health-professionals.html

[22] (2021) Interim guidance for the detection of SARS-CoV-2 with the Abbott Panbio COVID-19 antigen rapid test. Public Health Agency of Canada. Retrieved from https://www.canada.ca/en/public-

42. Typically, swabs of mucus from inside the nose or back of the throat of a person or animal, the cloaca of birds, or a sample of blood are used in rapid antigen tests. There are several commercial rapid antigen test kits for detection of the H5N1 strain influenza viral proteins, including the CTK Biotech OnSite® Influenza A/B Ag Rapid Test,[23] the Ringbio Avian Influenza Antigen Test Kit, AIV Ag Test,[24] and GlobalDx Herdscreen® GDX84-2 AIV H5 Ag Test.[25]

3.7. Serological Tests for Antibodies Against Viruses

43. Once a virus is cleared by the immune system of recovered survivors of an infection, evidence of a previous infection and immunity is best established by the presence of antibodies in their blood and other body fluids such as saliva, or less commonly, by the presence of specific T lymphocytes in their blood.

44. Blood tests for antibody detection have the advantage that they are highly sensitive and can provide a measure of the immunity present in a previously infected individual, even years after the initial exposure to the virus. However, it is also possible to pick up cross-immunoreactivities with antibodies produced against related viral proteins found in other related viruses.

45. Serological antibody tests work by immobilizing a purified protein from a pathogen on a surface such a cellulose membrane, or glass or plastic slide. If an antibody present in a blood or saliva sample recognizes the protein or peptide as an antigen, then it may tightly bind to it. The binding of that antibody is then detected with a secondary antibody that recognizes the Fc portion of the primary antibody being tracked. For example, this could be an anti-human IgG antibody made in rabbits, sheep or even ostriches. The secondary antibody is tagged with a dye, or an enzyme that generates a dye, which will be visible on the surface of the antigen-coated membrane or slide.

---

health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2021-47/issue-1-january-2021/interim-guidance-detection-sars-cov-2-abbott-panbio-antigen-rapid-test.html

[23] https://ctkbiotech.com/onsite-influenza-a-b-ag-rapid-test/

[24] https://www.ringbio.com/solutions/poultry/avian-influenza-antigen-test-kit

[25] https://globaldx.com/avian-flu/

For high throughput testing of many specimens at the same time, enzyme-linked immunosorbent assay (ELISA) plates are also commonly used.

46. According to the US CDC website on H5N1 serology testing, "*there are no commercially available H5N1 serological test since such testing does not currently have a clinical role in patient care.*"[26] Part of the challenge for development of a specific serological test for H5N1 proteins is the high degree of amino acid sequence identity between both the hemagglutinin (H) and neuraminidase (H) proteins of the different influenza strains. Figures 3 and 4 shows the amino acid identities and similarities between the N and H proteins of the most common influenza strains that target chickens. Inspection of these alignments of the amino acid sequences of the 5 most common H proteins and 7 most common N proteins in strains of influenza that account for most infections of chickens reveals a high degree of what is referred to as homology within the two groups of H and N proteins. This means that antibodies against one strain of the influenza virus are likely to give a positive-test result against several other strains of the virus if recombinant full length versions of these viral proteins are used as the antigens for detection of anti-H or anti-N antibodies present in serological samples. Furthermore, it is also likely that a previous exposure to one or more of these other influenza virus strains will confer some degree of protection and immunity against the H5N1 strain.

Figure 3. CLUSTAL O(1.2.4) multiple sequence alignments of 5 chicken influenza virus hemagglutinin (H) proteins using amino acid sequences from the Uniprot (www.uniprot.org) database. Each of the 20 possible amino acid types is represented with a single letter in the sequences of five representative H types. Amino acid identity (100% match) is represented with asterisks and amino acid similarity is represented by colons (highly similar) and periods (moderately similar). This alignment comparison was generated by Dr. Pelech using the automated software available at the Uniprot website.

```
tr|Q4ZJF4|Q4ZJF4_9INFA   H9  MEAVSLITILL----VVTVSNADKICIGYQSTNSTETVDTLTENNVPVTHAKELLHTEHN        56
sp|P09345|HEMA_I59A0     H5  ME--RIVLLLA----IVSLVKSDQICIGYHANKSTKQVDTIMEKNVTVTHAQDILERTHN        54
sp|P19695|HEMA_I75A4     H4  MLSITILFLLIAEGSSQNYTGNPVICLGHHAVSNGTMVKTLTDDQVEVVTAQELVESQHL        60
sp|P12581|HEMA_I49A0     H10 MYKVVVIIALL-----GAVRGLDKICLGHHAVANGTIVKTLTNVQEEVTNATETVESTSL        55
sp|P09343|HEMA_I85A3     H7  MNTQILILTLV----AAIHTNADKICLGHHAVSNGTKVNTLTERGVEVVNATETVERRTI        56
                             *    ::  *            **:*:::  .   *.*: :    *. * : :.
```

[26] CDC report on Missouri H5N1 serology testing. U.S. Centers for Disease Control and Prevention. (October 24, 2024) Retrieve from https://www.cdc.gov/bird-flu/spotlights/missouri-h5n1-serology-testing.html

```
tr|Q4ZJF4|Q4ZJF4_9INFA  H9  GMLCATNLGHPLILDTCTIEGLIYGNPSCNLLLGGREWSYIVERPSAVNGLCYPGNVENL  116
sp|P09345|HEMA_I59A0    H5  GKLCSLNGVKPLILRDCSVAGWLLGNPMCDEFLNVPEWSYIVEKDNPINSLCYPGDFNDY  114
sp|P19695|HEMA_I75A4    H4  PELCPS-PLRLVDGQTCDIVNGALGSPGCNHLNG-AEWDVFIERPTAV-DTCYPFDVPDY  117
sp|P12581|HEMA_I49A0    H10 NRLCMK-GRSYKDLGNCHPIGMLIGTPACDLHLT-GTWDTLIERKNAI-AYCYPGTTINE  112
sp|P09343|HEMA_I85A3    H7  PRICTK-GKKAIDLGQCGLLGIITGPPQCDQFLE-FTADLIIERREGN-DVCYPGKFVNE  113
                                :*           *   .   * * *:       . ::*:       ***    :

tr|Q4ZJF4|Q4ZJF4_9INFA  H9  EELRSLFSSASSYQSIQIFPDTIWNVSY--SGTSKAC----SDSFYGSMRWLAQK--NNA  168
sp|P09345|HEMA_I59A0    H5  EELKHLLSSTNHFEKIQIIPRSSWSNHDASSGVSSACPYIGRSSFFRNVVWLIKK--DNA  172
sp|P19695|HEMA_I75A4    H4  QSLRSILANNGKFEFI--VEKFQWNT-VKQNGKSGACKRANENDFFTNLNWLTKS-DGNA  173
sp|P12581|HEMA_I49A0    H10 GALRQKIMESGGISKT--STGFAYGSSINSAGTTKACMRNGGDSFYAEVKWLVSKDKGQN  170
sp|P09343|HEMA_I85A3    H7  EALRQILRESGGINKE--TTGFTYSG-IRTNGVTSACRR-LGSSFYAEMKWLLSNTDNAA  169
                              *:  : . .  .         :.      * : **     ..*: .: ** ..  .

tr|Q4ZJF4|Q4ZJF4_9INFA  H9  YPIQDAQYTNNRGKNIPFMWGINHPPTDTVQTNLYTRTDTTTSVATEDINRTFKPLIGPR  228
sp|P09345|HEMA_I59A0    H5  YPTIKRSYNNTNQEDLLILWGIHHPNDAAEQTKLYQNPTTYVSVGTSTLNQRSIPEIATR  232
sp|P19695|HEMA_I75A4    H4  YPLQNLTKVNNGDYARLYIWGVHHPSTDTEQTNLYENNPGRVTVSTKTSQTSVVPNIGSR  233
sp|P12581|HEMA_I49A0    H10 FPQTTNTYRNTDTAEHLIIWGIHHPSSTQEKNDLYGTQSLSISVGSSTYQNNFVPVVRAR  230
sp|P09343|HEMA_I85A3    H7  FPQMTKSYKNTRNEPALIVWGIHHSGSATEQTKLYGSGNKLITVGSSNYQQSFVPSPGAR  229
                            :*       *.       :**::*      :..**       :*.:.  :    *    *

tr|Q4ZJF4|Q4ZJF4_9INFA  H9  PLVNGQQGRIDYYWSVLKPGQTLRVRSNGNLTAPWYGHILSGESHGRILKTDLNSGNCVV  288
sp|P09345|HEMA_I59A0    H5  PKVNGQSGRMEFFWTILKPNDAINFESNGNFIAPEYAYKIVKKGDSAIMKSGLAYGNCDT  292
sp|P19695|HEMA_I75A4    H4  PWVRGQSGRISFYWTIVEPGDIIVFNTIGNLIAPRGHYKLNSQKKSTILNTAVPIGSCVS  293
sp|P12581|HEMA_I49A0    H10 PQVNGQSGRIDFHWTLVQPGDNITFSHNGGRIAPSRVSKLVGRGL-GIQSEASIDNGCES  289
sp|P09343|HEMA_I85A3    H7  PQVNGQSGRIDFHWLILNPNDTVTFSFNGAFVAPDRVSFFKGKSM-GIQSEVPVDTNCEG  288
                            * *.**.**:.:.* :::*.: : .   *   **     :  .    * .      .*

tr|Q4ZJF4|Q4ZJF4_9INFA  H9  QCQTERGGLNTTLPFHNVSKYAFGNCPKYVGVKSLKLAVGLRNVPAR----SSRGLFGAI  344
sp|P09345|HEMA_I59A0    H5  KCQTPVGAINSSMPFHNIHPHTIGECPKYVKSDRLVLATGLRNVPQR----KKRGLFGAI  348
sp|P19695|HEMA_I75A4    H4  KCHTDRGSITTTKPFQNISRISIGDCPKYVKQGSLKLATGMRNIPEK----ATRGLFGAI  349
sp|P12581|HEMA_I49A0    H10 KCFWRGGSINTKLPFQNLSPRTVGQCPKYVNKKSLMLATGMRNVPEIM---QGRGLFGAI  346
sp|P09343|HEMA_I85A3    H7  ECYHNGGTITSNLPFQNVNSRAVGKCPRYVKQKSLLLATGMKNVPEIPKKREKRGLFGAI  348
                            :*    * :.:. **:*:   :.*.**:**    * **.*::*:*        *******

tr|Q4ZJF4|Q4ZJF4_9INFA  H9  AGFIEGGWSGLVAGWYGFQHSNDQGVGMAADRDSTQKAIDKITSKVNNIVDKMNKQYEII  404
sp|P09345|HEMA_I59A0    H5  AGFIEGGWQGMVDGWYGYHHSNEQGSGYAADKESTQKAIDGITNKVNSIIDKMNTQFKAV  408
sp|P19695|HEMA_I75A4    H4  AGFIENGWQGLIDGWYGFRHQNAEGTGTAADLKSTQAAIDQINGKLNRLIEKTNEKYHQI  409
sp|P12581|HEMA_I49A0    H10 AGFIENGWEGMVDGWYGFRHQNAQGTGQAADYKSTQAAIDQITGKLNRLIEKTNTEFESI  406
sp|P09343|HEMA_I85A3    H7  AGFIENGWEGLVDGWYGFRHQNAQGEGTAADYKSTQSAIDQITGKLNRLIEKTNQQFELI  408
                            *****.**.*:: ****::*.* :* * *** .*** *** *..*:* :::* * ::. :

tr|Q4ZJF4|Q4ZJF4_9INFA  H9  DHEFSEVETRLNMINDKIDDQIQDIWAYNAELLVLLENQKPLDEHDANVNNLYNKVKRTL  464
sp|P09345|HEMA_I59A0    H5  GKEFNNLERRVENLNKKMEDGFLDVWTYNVELLVLMENERTLDFHDSNVKNLYDKVRLQL  468
sp|P19695|HEMA_I75A4    H4  EKEFEQVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDVTDSEMDKLFERVRRQL  469
sp|P12581|HEMA_I49A0    H10 ESEFSEIEHQIGNVINWTKDSITDIWTYQAELLVAMENQHTIDMADSEMLNLYERVRKQL  466
sp|P09343|HEMA_I85A3    H7  DNEFTEVEKQIGNVINWTRDSITEVWSYNADLLVAMENQHTIDLADSEMNKLYERVRRQL  468
                              ** ::* ::  : .   *   ::*:*:.:*** :**:: :*  *::: :*:::*:  *

tr|Q4ZJF4|Q4ZJF4_9INFA  H9  GSNAVEDGKGCFELYHKCDDQCMETIRNGTYNRRKYKEESRLERQKIEGVKLESEGTYKI  524
sp|P09345|HEMA_I59A0    H5  KDNARELGNGCFEFYHKCDNECMESVRNGTYDYPQYSEEARLNREEISGVKLESMGVYQI  528
sp|P19695|HEMA_I75A4    H4  RENAEDKGNGCFEIFHQCDNNCIESIRNGTYDHDIYRDEAINNRFQIQGVKLTQ-GYKDI  528
sp|P12581|HEMA_I49A0    H10 RQNAEEDGKGCFEIYHTCDDSCMESIRNNTYDHSQYREEALLNRLNINSVKLSS-GYKDI  525
sp|P09343|HEMA_I85A3    H7  RENAEEDCTGCFEIFHKCDDDCMASIRNNTYDHSTYREEAMQNRVKIDPVKLSS-GYKDV  527
                              .** :  .****::* **:.*: ::**.**:   * :*:  :* :*. *** . *  .:

tr|Q4ZJF4|Q4ZJF4_9INFA  H9  LTIYSTVASSLVIAMGFAAFLFWAMSNGSCRCNICI   560
sp|P09345|HEMA_I59A0    H5  LSIYSTVASSLALAIMIAGLSFWMCSNGSLQCRICI  564
sp|P19695|HEMA_I75A4    H4  ILWISFSISCFLLVALLLAFILWACQNGNIRCQICI  564
sp|P12581|HEMA_I49A0    H10 ILWFSFGASCFVLLAAVMGLVFFCLKNGNMQCTICI  561
sp|P09343|HEMA_I85A3    H7  ILWFSLGASCFLLLAIAMGLVFMCVKNGNMRCTICI  563
                            :   *   *.: :     .: :   .**. :* ***
```

Figure 4. CLUSTAL O(1.2.4) multiple sequence alignments of 7 chicken influenza virus neuramidase (N) proteins using amino acid sequences from the Uniprot (www.uniprot.org) database. Each of the 20 possible amino acid types is represented with a single letter in the sequences of five representative H types. Amino acid identity (100% match) is represented with asterisks and amino acid similarity is represented by colons (highly similar) and periods (moderately similar). This alignment comparison was generated by Dr. Pelech using the automated software available at the Uniprot website.

```
tr|D1LM97|D1LM97_9INFA          N8  MNPNLKIITIGSVSLGLVVLNILLHIVSIT---ITVLVLPGD-GNN---------GSCNE 47
sp|Q809V2|NRAM_I01A2            N1  MNPNQKIITIGSICMVIGIVSLMLQIGNIISIWVSHSIQTGNQHQA---------EPCNQ 51
sp|P18881|NRAM_I000F            N7  MNPNQKLFALSGVAIALSVLNLLIGISNVGLNVSLHLKGEGVKQENNLTCTTITQ--NNT 58
tr|A0A0C4K198|A0A0C4K198_9INFA  N9  MNPNQKILCTSATAIIIGAIAVLIGIANLGLNIGLHLKPGCNCSHSQPET---TN--TSQ 55
tr|A0A0K0YAR4|A0A0K0YAR4_9INFA  N6  MNPNQKITCISATGMTLSVVSLLIGIANLGLNIGLHYKVSDSTTINIPNM---NE--T-- 53
tr|A6M7W4|A6M7W4_9INFA          N3  MNPNQKIITLGVVNTTLSTIALIIGVGNLIFNTVIHEKIGDHQTVVYPTVTPPGTPNCSD 60
sp|P09573|NRAM_I83A6            N2  MNPNQKIITIGSVSLTIATVCFLMQIAILATNVTLHFRQNERSIPAYNQTTP-----CKP 55
                                    **** *:   .     :  : .:: :  :

tr|D1LM97|D1LM97_9INFA          N8  TVIREYNETVRIEKITQWHNTNIIE-YIEKPESDLFMNNTEPLCDAKGFAPFSKDNGIRI 106
sp|Q809V2|NRAM_I01A2            N1  SIITYENNTWVNQTYVNISNTNL---LTEKAVASVTLAGNSSLCPISGWAVYSKDNGIRI 108
sp|P18881|NRAM_I000F            N7  TVVENTY----------VNNTTIINKG-TNLKAPNYLLLNKSLCSVEGWVVIAKDNAIRF 107
tr|A0A0C4K198|A0A0C4K198_9INFA  N9  TII-NNY----------YNETNITNIQMEERTSRNFNNLTKGLCTINSWHIYGKDNAVRI 104
tr|A0A0K0YAR4|A0A0K0YAR4_9INFA  N6  ------N----------PTTTNITNIIVNKNEERTFLNLTKPLCEVNSWHILSKDNAIRI 97
tr|A6M7W4|A6M7W4_9INFA          N3  TIITYNN----------TVVNNITTTII--AEAEKHFKPSLPLCPFRGFFPFHKDNAIRL 108
sp|P09573|NRAM_I83A6            N2  I------------------------II--ERNIKYRNWSKPQCQITGFAPFSKDNSIRL 88
                                                                .  *   .:    ***.:*:

tr|D1LM97|D1LM97_9INFA          N8  GSRGHVFVIREPFVSCSPTECRTFFLTQGSLLNDKHSNGTVKDRSPYRTLMSVGIGQSPN 166
sp|Q809V2|NRAM_I01A2            N1  GSKGDVFVIREPFISCSHLECRTFFLTQGALLNDKHSNGTVKDRSPYRTLMSCPVGEAPS 168
sp|P18881|NRAM_I000F            N7  GESEQIIVTREPYVSCDPSGCKMYALHQGTTIRNKHSNGTIHDRTTFRGLISTPLGTPPT 167
tr|A0A0C4K198|A0A0C4K198_9INFA  N9  GESSDVLVTREPYVSCDPDECRFYALSQGTTIRGKHSNGTIHDRSQYRALISWPLSSPPT 164
tr|A0A0K0YAR4|A0A0K0YAR4_9INFA  N6  GEDAHILVTREPYLSCDPQGCRMFALSQGTTLRGRHANGTIHDRSPFRALISWEMGQAPS 157
tr|A6M7W4|A6M7W4_9INFA          N3  GENKDVIVTREPYVSCDNDGCWSFALAQGALLGTKHSNGTIKDRTPYRSLIRFPIGTAPV 168
sp|P09573|NRAM_I83A6            N2  SAGGGIWVTREPYVSCDPSKCYQFALGQGTTLDNNHSNGTIHDRTPHRTLLMNELGVPFH 148
                                    .   : * ***::**.   *  : * **: :  .*:***::**: .* *:   :.

tr|D1LM97|D1LM97_9INFA          N8  VYQARFEAVAWSATACHDGKKWMTIGVTGPDAKAVAVVHYGGIPTDVINSWAGDILRTQE 226
sp|Q809V2|NRAM_I01A2            N1  PYNSRFESVAWSASACHDGTSWLTIGISGPDNGAVAVLKYNGIITDTIKSWRNNILRTQE 228
sp|P18881|NRAM_I000F            N7  VSNSDFICVGWSSTSCHDGVGRMTICIQGNNDNATATVYYNRRLTTTIKTWAKNILRTQE 227
tr|A0A0C4K198|A0A0C4K198_9INFA  N9  VYNSRVECIGWSSTSCHDGKSRMSICISGPNNNASAVVWYNRRPVAEINTWAQNILRTQE 224
tr|A0A0K0YAR4|A0A0K0YAR4_9INFA  N6  PYNTRVECIGWSSTSCHDGISRMSICISGPNNNASAVVWYRGRPVTEIPSWVGNILRTQE 217
tr|A6M7W4|A6M7W4_9INFA          N3  LGNYKEICVAWSSSSCFDGKEWMHVCMTGNDNDASAQIIYAGKMTDSIKSWRRDILRTQE 228
sp|P09573|NRAM_I83A6            N2  LG-TRQVCIAWSSSSCHDGKAWLHVCVTGDDRNATASFIYNGMLVDSIGSWSQNILRTQE 207
                                          .:.**:::*.**   : : : * :  * * . *    .  * :*  :******

tr|D1LM97|D1LM97_9INFA          N8  SSCTCIQGECYWVMTDGPANRQAQYRAFKAKQGKIIGQTEIS-FNGGHIEECSCYPNEGK 285
sp|Q809V2|NRAM_I01A2            N1  SECACVNGSCFTVMTDGPSNGQASYKIFKIEKGKVVKSVELN-APNYHYEECSCYPDAGE 287
sp|P18881|NRAM_I000F            N7  SECVCYNGTCAVVMTDGPASSQAYTKIMYFHKGLIIKEEPLR-GSARHIEECSCYGHDQK 286
tr|A0A0C4K198|A0A0C4K198_9INFA  N9  SECVCHNGVCPVVFTDGSATGPADTRIYYFKEGKILKWESLT-GTAKHIEECSCYGERTG 283
tr|A0A0K0YAR4|A0A0K0YAR4_9INFA  N6  SECVCHKGICPVVMTDGPANNKAATKIIYFKEGKIQKIEELQ-GNAQHIEECSCYGAAGM 276
tr|A6M7W4|A6M7W4_9INFA          N3  SECQCIDGTCVVAVTDGPAANSADHRVYWIREGRVIKYENVPKTKIQHLEECSCYVDI-D 287
sp|P09573|NRAM_I83A6            N2  SECVCINGTCTVVMTDGSASGKADIRILFIREGKIVHISPLS-GSAQHIEECSCYPRYPN 266
                                    *.* * .* *  ..*** :   *  :    .:* :     :      * ******

tr|D1LM97|D1LM97_9INFA          N8  VECVCRDNWTGTNRPVLVISSD-LSYRVGYLCAGLPSDTPRGEDNQFTGSCTSPMGN--Q 342
sp|Q809V2|NRAM_I01A2            N1  ITCVCRDNWHGSNRPWVSFNQN-LEYQIGYICSGVFGDNPRPNDG--TGSCGPVSPN--G 342
sp|P18881|NRAM_I000F            N7  VSCVCRDNWQGANRPIIEIDMSTLEHTSRCVCTGVLTDTSRPGDKP-NGDCSNPITGSPG 345
tr|A0A0C4K198|A0A0C4K198_9INFA  N9  ITCTCRDNWQGSNRPVIQIDPVAMTHTSQYICSPVLTDNPRPNDPN-IGKCNDPYPGN-N 341
tr|A0A0K0YAR4|A0A0K0YAR4_9INFA  N6  IKCVCRDNWKGANRPIITIDPEMMTHTSKYLCSKILTDTSRPNDPT-NGNCDAPITGGSP 335
tr|A6M7W4|A6M7W4_9INFA          N3  VYCVCRDNWKGSNRPWMRINNE-TILETGYVCSKFHSDTPRPADPS-TVSCDSPSNVN-G 344
sp|P09573|NRAM_I83A6            N2  VRCVCRDNWKGSNRPVIDINMADYSIDSSYVCSGLVGDTPRNDDSSSSSNCRDPNNER-G 325
                                    : *.***** *:*** : :.          :*: .  *. *  *     .*
```

```
tr|D1LM97|D1LM97_9INFA          N8  GYGVKGFGFRQGNDVWMGRTISRTSRSGFEILRVRDGWIQ-NSKEQIKRQVVVDNLNWSG 401
sp|Q809V2|NRAM_I01A2            N1  AYGIKGFSFKYGNGVWIGRTKSTNSRSGFEMIWDPNGWTG-TDSNFSVKQDIVAITDWSG 401
sp|P18881|NRAM_I000F            N7  APGVKGFGFLNGDNTWLGRTISPRSRSGFEMLKIPNAETD-PNSRIIERQEIVDNSNWSG 404
tr|A0A0C4K198|A0A0C4K198_9INFA  N9  NNGVKGFSYLDGANTWLGRTISTASRSGYEMLKVPNALTD-DRSKPIQGQTIVLNADWSG 400
tr|A0A0K0YAR4|A0A0K0YAR4_9INFA  N6  DPGVKGFAFLDGENSWLGRTISKDSRSGYEMLKVPNAETD-TQSGPTSYQLIVNNQNWSG 394
tr|A6M7W4|A6M7W4_9INFA          N3  GPGVKGFGFKTGDDVWLGRTVSISGRSGFEIIRVAEGWINSPNHAKSVTQTLVSNNDWSG 404
sp|P09573|NRAM_I83A6                NPGVKGWAFDIGDDVWMGRTISKDSRSGYETFRVIGGWATANSKSQTNRQVIVDNNNWSG 385
                                      *:**:.:  * . *:*** *  .***:* :    .           * :*   :***

tr|D1LM97|D1LM97_9INFA          N8  YSGSFTLPVELTRRNCLVPCFWVEMIRGKPEEK--TMWTSSSSIVMCGVDHEIADWSWHD 459
sp|Q809V2|NRAM_I01A2            N1  YSGSFVQHPELTGVDCIRPCFWVELIRGRPKES--TIWTSGSSISFCGVNSDTVGWSWPD 459
sp|P18881|NRAM_I000F            N7  YSGSFIDCWD-EANECYNPCFYVELIRGRPEEAKYVWWTSNSLIALCGSPVSVGSGSFPD 463
tr|A0A0C4K198|A0A0C4K198_9INFA  N9  YSGSFMDYWA-E-GDCYRACFYVELIRGRPKEDK-VWWTSNSIVSMCSSTEFLGQWNWPD 457
tr|A0A0K0YAR4|A0A0K0YAR4_9INFA  N6  YSGAFIDYWA-N-KECFNPCFYVELIRGRPKEID-VLWASNSMVALCGSRERLGSWSWHD 451
tr|A6M7W4|A6M7W4_9INFA          N3  YSGSFIV----ENNGCFQPCFYVELIRGRPNKNDDVSWTSNSIVTFCGLDNEPGSGNWPD 460
sp|P09573|NRAM_I83A6            N2  YSGIFSV----ESKSCINRCFYVELIRGRPQE-TRVWWTSNSIVVFCGTSGTYGTGSWPD 440
                                    *** *          *   **:**:***:*::   . *:*.* : :*.       .: *

tr|D1LM97|D1LM97_9INFA          N8  GAILPFDIDKM  470
sp|Q809V2|NRAM_I01A2            N1  GAELPFTIDK-  469
sp|P18881|NRAM_I000F            N7  GAQIQYFS---  471
tr|A0A0C4K198|A0A0C4K198_9INFA  N9  GAKIEYFL---  465
tr|A0A0K0YAR4|A0A0K0YAR4_9INFA  N6  GAEIIYFK---  459
tr|A6M7W4|A6M7W4_9INFA          N3  GSNIGFMPK--  469
sp|P09573|NRAM_I83A6            N2  GANINFMPL--  449
                                    *: : :
```

47. A microneutralization assay is another test for the presence of antibodies in a specimen sample that is capable of blocking the ability of the avian influenza H5N1 virus to bind to host cells and cause their death. However, this is a more cumbersome and expensive test that takes longer and requires the use of cells in culture, and focuses only on a subset of antibodies in a sample that can confer immune protection.[27]

48. While commercial serological tests for anti-H5 or anti-N1-specific antibodies do not apparently exist, it is very feasible to quickly develop such tests. There are several regions in the amino acid sequences of the hemagglutinin and neuraminidase proteins that are highly unique and distinguishable from the other influenza strains as can be seen in Figures 3 and 4. Short peptides based upon these amino acid sequences can easily be produced commercially and tested for their immunogenicity to antibodies recovered in blood samples from humans or egg yolk samples from birds. This kind of testing for antibodies in human blood samples against the SARS-CoV-2 proteins

[27] Protocol for enhanced human surveillance of avian influenza A(H5N1) on farms in Canada. Public Health Agency of Canada. (November 20, 2024) Retrieved from https://www.canada.ca/en/public-health/services/diseases/avian-influenza-h5n1/health-professionals/protocol-enhanced-human-surveillance-avian-influenza-farms-canada.html

that was previously undertaken in my own laboratory.[28] This involved the use of peptide SPOT arrays in which all of the 28 predicted proteins encoded by the SARS-CoV-2 genome were synthesized directly on cellulose membranes in short peptides of 14 amino acid length. This allowed the testing of over 6,000 peptides as potential markers of a SARS-CoV-2 immune response.

49. These COVID-19-related studies in my lab demonstrated that certain regions of the SARS-CoV-2 protein elicited particularly robust antibody responses in people that recovered from COVID-19. Approximately 4,500 participants were tested for SARS-CoV-2 antibodies in their serum in this clinical study that I led at Kinexus Bioinformatics. Interestingly, many people, who never developed symptoms of COVID-19, were found to have strongly immunoreactive antibodies, which probably accounted for why they did not show any symptoms of infection during the multiple waves of COVID-19 cases during the pandemic. These studies also revealed that different people had very distinctive patterns of antibody reactivity against the various SARS-CoV-2 epitopes, and these patterns were very stable for more than a year for the same person. This may reflect, in part, genetic differences between the clinical study participants. It is also likely that the antibodies that immunoreacted against the SARS-CoV-2 peptides were generated in asymptomatic individuals from exposure to other coronaviruses previously in their history, and this conferred a degree of immunity from getting sick when exposed to SARS-CoV-2.

50. As someone who recognizes the importance of development of sensitive and specific tests to evaluate immunity against H5N1 influenza, whether by natural infection or by immunization with vaccines, it seems to me that the herd of ostriches at Universal Ostrich Farms site represent a very unique opportunity to develop such antibody tests. SPOT arrays with a set of optimal H5N1 peptides would be useful not only for evaluation of the potential immunity of wild and domesticated birds to H5N1 infection, but also easily adapted for testing humans and other livestock such as minks, pigs and cows.

---

[28] Majdoubi, A., Michalski, C., O'Connell, S.E., Dada, S., Narpala, S. *et al.* (2021) A majority of uninfected adults show pre-existing antibody reactivity against SARS-CoV-2. *JCI Insight* 6(8): e14631. https://doi.org/10.1172/jci.insight.146316

PART 4 – THE RISKS OF INFLUENZA TRANSMISSION FROM THE UOF HERD AND THEIR VALUE

51. In this section of my expert report, I will comment on the specific questions that I was asked to address by Cleveland Doan LLP.

52. **What is the likelihood that the Herd presently is transmissible for H5N1 to each other and wild migratory birds such as ducks?**

53. At this time, it is highly unlikely that H5N1 is being actively transmitted within the Herd or that it would be transmissible to humans, wild birds or other animals. It would appear that the Herd has achieved a high degree of natural immunity. My conclusions are based on the following observations that are described as facts in paragraph 4, and additional information that I have learned from listening to the owners of the UOF ostriches.

54. The Herd underwent a period of illness around February 2020, which resulted in the deaths of 10 of the approximately 250 ostriches that were on-site. While this was diagnosed as a possible bacterial pseudomonas or *E. coli* infection at the time, the symptoms associated with the illness were also consistent with influenza. The first report of a pathogenic H5N1 virus in Canada was in December 2021 in Newfoundland and Labrador.[29] However, this particular virulent strain of H5N1 was already detected in wild birds in Europe in 2020, and the first H5N1 strain was first detected in geese in China in 1996.[30] Therefore, it is feasible that the ostrich herd could have been infected with H5N1 or a highly related influenza strain in 2020. In addition, secondary bacterial infections following initial influenza infection often are accompanied by a pseudomonas infection.[31]

---

[29] Distribution of highly pathogenic avian influenza in North America, 2021/2022. National Wildlife Health Center. (November 27, 2022) Retrieved from https://www.usgs.gov/centers/nwhc/science/distribution-highly-pathogenic-avian-influenza-north-america-20212022

[30] Katella, K. (2024) H5N1 Bird Flu: What you need to know. Yale Medicine. Retrieved from https://www.yalemedicine.org/news/h5n1-bird-flu-what-to-know

[31] Morris, D.E., Cleary, D.W., Clarke, S.C. (2017) Secondary bacterial infections associated with influenza pandemics. Front Microbiol. 8:1041. doi: 10.3389/fmicb.2017.01041.

55. It is significant that with the recent outbreak of what appears to be H5N1 in the UOF Herd, all of the deaths were in younger ostriches that were not on the farm prior to 2021. None of the older ostriches that survived the 2020 outbreak died or were seriously ill. This is extremely strong evidence that these older birds already had natural immunity to H5N1, most likely from a previous exposure. That 69 of some 200 younger birds succumbed to the recent infection indicates that this was a particularly virulent strain, and yet it had minimal effect on the older ostriches.

56. It is somewhat problematic that only a PCR-test for H5N1 was performed on two of the ostriches that died in January of this year. As pointed out in the previous section, performed at a high thermal cycle (Ct) number, this test has a high rate of false-positives. It is unclear at what Ct number the test was performed by the CFIA. For positive-test results with human cases of H5N1, this is normally rechecked by the National Microbiology Laboratory in Winnipeg. It is not known to the owners of UOF whether this was done or even if the PCR test was repeated.

57. It is also unclear whether the presence of viable H5N1 was in the mouth and rectal samples from the two dead birds retrieved by the CFIA inspectors. Normally, the samples would be checked for their ability to infect and kill cells in culture or injected into fertilized eggs and cause developmental defects or loss of viability of the embryo. However, on the basis of probabilities, it seems likely that these birds did die with an influenza H5N1 infection.

58. The main issue is whether the remaining ostriches represent a health hazard to each other, the staff and visitors to the UOF, and wild birds and animals that come to the farm. In view of the information that there was been no deaths from infectious disease on the farm for over two weeks, and all of the ostriches appear to be healthy, it is highly likely that herd immunity has been achieved in the flock. It is extremely unlikely that they would be shedding virus to each other, their caretakers, and to other birds and animals. The longer that these birds remain healthy, the lower the risk of potential transmission of the virus.

59. To confirm that these ostriches have natural immunity, I recommend that the antibody levels against the H5 and N1 proteins be tested in a subset of the younger ostriches as well as some of

the older birds, which are likely to serve as positive controls. The owners and staff that attend these birds should also be tested to determine if they also have natural immunity.

60. It is likely that the ostriches at the UOF were originally infected by sick ducks that visited the farm during their migration and intermingled with ostriches as they attempted to eat their feed. It is likely that these flocks of wild birds have been developing their own natural immunity to the H5N1 virus. If the UOF ostriches have achieved natural immunity to H5N1, then this flock may actually offer some protection to wild birds from future infection with the virus. Wild birds that come to the UOF would be less likely to visit other neighbouring sites and infect birds and other animals at those locations, which would be naïve to the virus and more vulnerable to getting sick and further propagating the spread of the virus.

61. By breeding ostriches that are able to easily recover from a viral infection like H5N1, it is also feasible to produce offspring that are even more resistant to future viral epidemics. However, if a herd is completely destroyed after the first signs of H5N1 infection, it would likely be replaced by young birds that have had no previous exposure to the virus and not necessarily to right genetics to limit future infections and prevent sickness and death.

62. **If the Herd has achieved herd immunity, is there anything rare and valuable about the Herd that would promote the advancement of biomedical research?**

63. As pointed out in paragraph 30, the ostrich is an amazing model system for the production of antibodies for research and even therapeutic purposes. The IgY antibodies that are enriched in the yolk of the largest eggs that are produced by birds. These antibodies are also the most heat and pH resistant antibodies known,[17] which makes these immunoglobulins extremely attractive for industrial applications. One example of this is the use of the anti-SARS-CoV-2 antibodies to coat masks to offer increased protection from infection and reduced transmission of this virus

during a COVID-19 outbreak, which is an application developed by Dr. Yasuhiro Tsukamoto at Kyoto University in Japan.[32] Dr. Tsukamoto is an active collaborator with the UOF.

64. The high yield of IgY antibody in the yolk of ostrich eggs is extremely convenient for large scale antibody production, as it is unnecessary to have to subject the animals to any stress. In my own lab, we have been producing antibodies that target proteins that are important disease research for over 36 years, using rabbits. For the production of rabbit antibodies, we have to obtain the blood from the animal, which involves bleeding from its ear or termination of the animal and exsanguination. From one rabbit, the median yield of an affinity-purified antibody is in own hands is about 1.5 mg. In the biomedical research reagent market, this amount of antibody against an interesting target protein is worth about $6,000 if it is all sold. For comparison, from one ostrich egg, around 12 mg or more of affinity-purified antibody can be obtained, which would be worth about $48,000. if it was all sold. Literally, ostrich hens can lay golden eggs if the right proteins are targeted for development of highly desirable antibodies. Moreover, due to their long reproductive life spans, ostriches can keep producing more eggs over a period of decades.

65. Another advantage of using ostriches as opposed to using mammals like rabbits, goats, sheep, horses and mice for antibody production is that there is greater success in being able to produce a desired antibody, since the physiology of birds is more distinct and it is less likely that the antigen may resemble a naturally occurring human protein. Due to phenomena of tolerance, B-cells that recognize proteins in the body are often killed off early in development of the immune system to avoid the development of auto-immune disease.

66. In addition to antibody development, ostrich eggs are rich in oils, fats and other enzymes, including proteases and carbohydrolases such as lysozyme, which also have industrial applications.

[32] Finney, A. (2022) Kyoto University creates mask from ostrich cells that glows when coronavirus is detected. Dezeen. Retrieved from https://www.dezeen.com/2022/01/11/ostrich-coronavirus-detection-mask-glow-kyoto-university-yasuhiro-tsukamoto/

67. Due to the continued use of the UOF ostriches in biomedical research, their genetic profiling, their history of H5N1 infection, their long lifespan, and the banking of their eggs, they represent an important potential research model. For example, they can be used to evaluate how long and effective herd immunity to H5N1 can last.

68. **Is there any risk of transmitting the H5N1 virus from the yolk of the ostrich eggs if they were used for testing and research purposes?**

69. Intact ostrich eggs are normally sterile due to their thick shell wall. If an egg somehow became infected with a bacteria or virus during its development, it would not fully form and this would be plainly evident. The oviduct of the bird where the eggs develop is located very far from the organs and tissues where a respiratory virus would initially take hold. The yolk of the egg is highly enriched with IgY antibodies, which are usually present to protect the developing embryo from infection from a pathogen that may be in the environment of the egg-laying hen. While eggs can be used to propagate attenuated forms of viruses for vaccine development, they have to be injected with the virus through the egg shell. Therefore, the risk of transmission of the H5N1 virus in the yolk of ostrich eggs is extremely remote for testing purposes. Moreover, the yolk could be pasteurized by heat treatment to kill bacteria and viruses, since the IgY antibodies are very resistant to high temperatures.

70. **Would the testing for antibodies against the H5N1 virus from the egg yolks be a good measure of natural or vaccine-induced immunity?**

71. Testing egg yolks from an ostrich hen for the presence of antibodies against a virus like H5N1 would be an ideal method to evaluate natural immunity from a previous infection or immunity that may be produced using a vaccine. This method yield a large amount of antibody with no invasive treatment of the bird to obtain sufficient specimens for testing purposes.

72. **Is there any evidence that vaccine-induced immunity for influenza is superior to natural immunity following recovery from an influenza infection?**

73. Attenuated strains of influenza virus have often been used to elicit immunity in humans and animals. However, the efficacy is usually below 50%. Other methods using RNA-based genetic vaccines for influenza are being developed, but if these work in a manner similar to the COVID-19 mRNA vaccines, then their efficacy and safety are questionable. This is in part due to the fact that usually a single protein of the surface of the virus is usually targeted. With natural immunity, an immune response is generated against potentially all of the proteins of the virus. Moreover, the response is less likely to induce autoimmunity.

PART 5: QUALIFCATIONS AND ACKNOWLEGEMENTS AS AN EXPERT ON IMMUNOLOGY

74. I am a full Professor in the Department of Medicine and Division of Neurology at the University of British Columbia (UBC), where I have been on faculty since 1988. I was one of the founding senior scientists of The Biomedical Research Centre at UBC starting in 1987. I hold B.Sc. Honours (1979) and Ph.D. (1982) degrees in Biochemistry from UBC. My post-doctoral training was at the University of Dundee with Sir Philip Cohen, and at the University of Washington in Seattle with Nobel laureate Dr. Edwin Krebs.

75. I have previously completed several courses in microbiology, immunology and virology during my B.Sc. undergraduate training, and I was a founding and senior scientist for six years at The Biomedical Research Centre, which was an immunology focused institute located at UBC, where I have remained on faculty as a professor in the Department of Medicine for over 36 years. Over a dozen of my scientific research articles have appeared in specialty immunology journals, including the *Journal of Immunology, Blood, Molecular Immunology, Immunology, Infectious Immunology, Cancer Immunology and Immunotherapy*, *International Journal of Vaccine Theory, Practice and Research* and *Vaccines*. These studies document some of my work to understand the molecular mechanisms by which different immune cells, including macrophages, T and B cells become activated.

76. My lectures in formal graduate level courses include teaching in immunology and virology at UBC. I have presented my research at over 100 national and international scientific conferences. As a

faculty member at UBC, I regularly attend grand-rounds and other seminar by speakers on biomedical research on a weekly basis as part of my continuing education as a professor.

77. My UBC lab and spin-out companies have been engaged in the production and testing of over 1,600 antibodies for our internal research programs and for commercial sale for over 28 years. My research has routinely involved for over 36 years, the use of standard and novel immunological techniques developed in my lab, such as Western blotting, dot blotting, antibody microarrays, reverse lysate microarrays and epitope mapping for determination of where antibodies specifically bind their targets.

78. I have authored over 280 scientific publications in peer-reviewed journals and book chapters about cell communication systems important for cell survival and function and implicated in the pathology of cancer, diabetes, neurological and immunology-related diseases. My accolades include the 1993 Martin F. Hoffman Award for Research at UBC, and the 1993 Merck Frosst Canada Prize from the Canadian Society of Biochemistry and Molecular Biology. I was the 2001 Distinguished Lecturer for the Faculty of Medicine at UBC for the Basic Sciences. I have served on grant review panels for the US National Institutes of Health, the Canadian Institutes for Health Research, the National Research Council of Canada, the Michael Smith Health Research Foundation, Genome Alberta, Genome Prairie, the Canadian National Cancer Institute, the Canadian Heart and Stroke Foundation and the American Heart Association, and I have acted as an external reviewer for 22 other agencies including the U.S. National Science Foundation and the Israel Science Foundation. I have also been an external reviewer for over 30 different scientific journals, including those that are focused on immunology and vaccines.

79. I was the founder and president of Kinetek Pharmaceuticals Inc. from 1992 to 1998, and the founder, president and chief scientific officer of Kinexus Bioinformatics Corporation from 1999 to the present. Kinetek was engaged in the development of drugs that inhibit protein kinases, primarily for oncology application and diabetes. Kinexus has produced over 1,600 antibody products against cell regulatory proteins, and employs these antibodies in novel, immunology-based, high throughput methods such as antibody microarrays to monitor cell communication systems in biological specimens from over 2000 academic and industrial clients in over 35

countries over the last 25 years. These antibody products include those that specifically recognize proteins in the SARS-CoV-2 virus as well as host proteins that interact with viral proteins.

80. My expertise has been sought specifically with respect to understanding the immunological mechanisms by which a natural immune response is elicited by SARS-CoV-2, the causative agent of COVID-19, and the immunity afforded by the lipid nanoparticle spike RNA- and adenovirus spike DNA-based COVID-19 vaccines. This has been informed, in part, by clinical studies undertaken in the last 5 years at my company Kinexus in which we have investigated the nature and production of antibodies against the 28 different proteins that are encoded by the SARS-CoV-2 viral genome, by examination of blood samples from over 4,500 participants from across Canada. In this independent ethics review board approved clinical study, I was the lead investigator, and I have been in direct communication with all of the participants. Some of our preliminary findings have already been published in *JCI Insights*, which is the flagship journal of the American Society for Clinical Investigation in 2021.[28] Additional manuscripts that document our SARS-CoV-2 antibody testing study are currently in preparation, and we are now engaged in a second antibody testing study to determine the extent of immunity against the Omicron variants and the duration effectiveness of the COVID-19 vaccines.

81. I have also investigated the use of drugs to inhibit the replication of the SARS-CoV-2 virus in infected host cells. My expertise on enzymes known as protein kinases has permitted me to predict and then verify that compounds that inhibit a protein kinase known as GSK3-beta can block the production of the spike of the virus, and assembly of SARS-CoV-2 virus particles. A provisional patent based on this work has already been filed with the University of British Columbia (UBC) and a manuscript that describes this work has been accepted for publication.[33] I have also spearheaded the development commercial antibodies against many of the SARS-CoV-2 proteins and verified their utility in another published scientific article in the peer-reviewed

[33] Shapira, T., Rens, C., Pichler, V., Rees, W., Steiner, T., Jean, F., Winkler, D.F.H., Sarai, I., Pelech, S., Av-Gay, Y. (2022) Inhibition of glycogen synthase kinase-3-beta (GSK3β) blocks nucleocapsid phosphorylation and SARS-CoV-2 replication. *Molecular Biomedicine.* 3, 43. Retrieved from https://doi.org/10.1186/s43556-022-00111-1

journal Microbial Factories.[34] I am presently working on inhibitory therapeutic peptides that target the NSP15 protein of the SARS-CoV-2 virus.

82. In addition to the direct study of the SARS-CoV-2 and immune responses to this virus in people, I am also a co-founder and vice president of the Canadian Citizens Care Alliance (CCCA) (formerly the Canadian Covid Care Alliance) and very active within this organization. The CCCA's membership include over 600 biomedical scientists, medical doctors and other health practitioners, and the CCCA examines the scientific literature and data from public health authorities to ascertain the threat of COVID-19 and the various strategies available to mitigate its effects. In my capacity as the co-chair of the Scientific and Medical Advisory Committee (SMAC) of the CCCA, I oversee the activities of a panel of 35 scientists and medical doctors that seeks to provide a scientific evidence-based and balanced, independent, but critical assessment of health care policies related to COVID-19. This Committee has met weekly or biweekly over the last three years by Zoom, but typically has daily correspondences by e-mails. The fruits of our efforts are published on the CCCA website (www.canadiancovidcarealliance.org) and in peer-reviewed scientific journals. In particular, I was a coauthor on a CCCA report that critiqued the original 6-months clinical study performed by Pfizer/BioNTech on their BNT162b2 RNA vaccine,[35] a published review about COVID-19 vaccines and pregnancy in the peer-reviewed *Journal of Vaccine Theory, Practice and Research*.[36] In addition, I am a coauthor on several other publications that have been posted on the CCCA website that relate to the manufacturing and

---

[34] McGuire, B.E., Mela, J.E., Thompson, V.C., Cucksey, L.R., Stevens, C.E., McWhinnie, R.L., Winkler, D.F.H., Pelech, S., Nano, F.E. (2022) *Escherichia coli* recombinant expression of SARS-CoV-2 protein fragments. *Microbial Cell Factories*. 21:21. https//doi.org/10.1186/s12934-022-01753-0. *bioRxiv* pre-print. Retrieved from https://doi.org/10.1101/2021.06.22.449540)

[35] Bridle, B.W., Martins, I., Mallard, B.A., Karrow, N.A., Speicher, D.J., Chaufan, C., Northey, J.G.B., Pelech, S., Shaw, C.A., Halgas, O. (2021) Concerns regarding the efficacy and safety for BNT162b2 mRNA coronavirus disease (COVID-19) vaccine through six months. www.CanadianCovidCareAlliance.org (January 10, 2022) 1-10 Retrieved from https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/01/Final-CCCA-Critique-Thomas-COVID-19-Vaccines-6-months-NEJM-Jan-10-22.pdf

[36] McLeod, D., Martins, I., Pelech, S., Beck, C., Shaw. C.A. (2022) Dispelling the myth of a pandemic of the unvaccinated. *Int. J. Vaccine Theory Practice Res.* 2(1):267-286.

quality issues associated with the BNT162b2 mRNA COVID-19 vaccine,[37] the efficacy and safety of the BNT162b2 mRNA COVID-19 vaccine based on phase III trial results,[38] and the vaccination of children with COVID-19 vaccines.[39]

83. Recently, I was the leading editor and an author of several chapters in two multi-authors book on COVID-19 that have just been published.[40,41] My *curriculum vitae* is attached as **Exhibit C**, and provides a more detailed account of my professional activities.

84. I believe that my formal training, experience and published research, demonstrates my expertise in immunology, and my recent activities specifically related to SARS-CoV-2 over the last three years, places me in an excellent situation to comment upon related matters such as immunity to the influenza virus. I have been sought as an Expert Witness for several court cases with respect to natural and vaccine-induced immunity with respect to COVID-19.

85. A listing of some court cases related to COVID-19 matters that I have been asked to furnish sworn affidavits or file expert reports includes, but is not limited to:

---

[37] Gutchi, M., Speicher, D. J., Natsheh, S., Oldfield, P., Britz-McKibbon, P., Palmer, M., Karrow, N., Massie, B., Mallard, B., Chan, G. Pelech, S. (2022) An independent analysis of the manufacturing and quality control issues of the BNT162b BioNTech/Pfizer vaccine identified by the European Medicine Agency. www.Canadian Covid Care Alliance.org (October 29, 2022) 1-5 https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/11/22OC29_EMA-Analysis-of-BNT162b-Manufacture.pdf

[38] Bridle, B.W., Martins, I., Mallard, B.A., Karrow, N.A., Speicher, D.J., Chaufan, C., Northey, J.G.B., Pelech, S., Shaw, C.A., Halgas, O. (2021) Concerns regarding the efficacy and safety for BNT162b2 mRNA coronavirus disease (COVID-19) vaccine through six months. www.CanadianCovidCareAlliance.org (January 10, 2022) 1-10 https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/01/Final-CCCA-Critique-Thomas-COVID-19-Vaccines-6-months-NEJM-Jan-10-22.pdf

[39] Payne, E., Rennebohm,R., Bridle, B., Mallard, B., Karrow, N., Massie, B., Northey, K., Shoemaker, C., Pelech, S., Chaufan C., McLeod, D., Hardie, J., Pinto, C., Britz-McKibbin, P., Shaw, C. (2022) Request to halt vaccinations of children. www.CanadianCovidCareAlliance.org (July 14, 2022) 1-28 https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/07/CCCA-Halt-vaccination-of-children-Officials-Letter-Jul-14-22.pdf

[40] (2024) Down the COVID-19 rabbit hole: Independent scientists unmask the pandemic. (ed. S. Pelech & C. Shaw) Skyhorse Publishing, Inc., New York, USA.

[41] (2025) COVID-19 Pandemonium: A pandemic of ignorance, fear and greed. The capture of our institutions. Ekstasis Press, Victoria, B.C., Canada

a.	COURT FILE NUMBER	210600780
	COURT	COURT OF QUEEN'S BENCH OF ALBERTA
	JUDICIAL CENTRE	LETHBRIDGE
	APPLICANT	HAYLEY NASSICHUK-DEAN
	RESPONDENT	UNIVERSITY OF LETHBRIDGE
		Cross-examination Feb. 16, 2022
b.	COURT FILE NUMBER	T-1694-21
	COURT	FEDERAL COURT OF CANADA (Trial Division)
	APPLICANT	DAVID LAVERGNE-POITRAS
	RESPONDENTS	ATTORNEY GENERAL OF CANADA (Minister of Public Services and Procurement) – and – PMG TECHNOLOGIES INC.
		Cross-examination September 8, 2022
c.	COURT FILE NUMBER	T-168-22-ID-1
	COURT	FEDERAL COURT OF CANADA
	APPLICANTS	THE HONOURABLE A. BRIAN PECKFORD, LEESHA NIKKANEN, KEN BAIGENT, DREW BELOBABA, NATALIE GRCIC, AND AEDAN MACDONALD
	RESPONDENTS	THE MINISTER OF TRANSPORT and THE ATTORNEY GENERAL OF CANADA
		Cross-examination May 13 and 16, 2022
d.	COURT FILE NUMBER	2101-13202
	COURT	COURT OF QUEEN'S BENCH OF ALBERTA
	JUDICIAL CENTRE	CALGARY
	APPLICANTS	DR. ERIC T. PAYNE, DR. JOANNE J. MOSER, DR. DAVID W. L. LOEWEN and DR. GREGORY CHAN
	RESPONDENTS	ALBERTA HEALTH SERVICES, DR. VERNA YIU IN HER CAPACITY AS CHIEF EXECUTIVE OFFICER OF ALBERTA HEALTH SERVICES, DR. JOHN T. CHMELICEK IN HIS CAPACITY AS POST GRADUATE PROGRAM DIRECTOR, DEPARTMENT OF FAMILY MEDICINE, UNIVERSITY OF ALBERTA -and- THE UNIVERSITY OF ALBERTA
e.	COURT FILE NUMBER	CV-21-00670360-0000
	COURT	SUPERIOR COURT OF JUSTICE ONTARIO
	APPLICANTS	SARAH HARJEE, EVAN KRAAYENBRINK, HIBAH AOUN, SARAH LAMB, SAM SABOURIN, JACKIE RAMNAUTH, MARK MCDONOUGH -and- LINDA MCDONOUGH
	RESPONDENT	HER MAJESTY THE QUEEN IN RIGHT

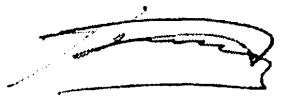
OF THE PROVINCE OF ONTARIO
Cross-examination April 28 & May 5, 2022

f.	COURT FILE NUMBER	FDF-443-19
	COURT	COURT OF QUEEN'S BENCH OF NEW BRUNSWICK
	JUDICIAL CENTRE	FAMILY DIVISION JUDICIAL DISTRICT OF FREDERICTON
	APPLICANT	VICTORIA LYNN MITHAM
	RESPONDENT	BRADLEY SCOTT FOLLETT
g.	COURT FILE NUMBER	72/2022
	COURT	HIGH COURT OF SOUTH AFRICA
	JUDICIAL CENTRE	FREE STATE DIVISION, HELD AT BLOEMFONTEIN
	APPLICANTS	SOLIDARITY obo MEMBERS, SOLIDARITY YOUTH Obo MEMBERS, JOANNA STANDER, SHANIQUE PIENAAR, ALICE FLORENCE MARINA STANDER - and - ANNELI BOTHA
	RESPONDENTS	CHAIRMAN OF THE COUNCIL OF THE UNIVERSITY OF THE FREE STATE– and – THE UNIVERSITY OF THE FREE STATE
		h.
h.	COURT FILE NUMBERS	C.A.C.V.3903of202 C.A.C.V.3904of2021 C.A.C.V.3908of2021
	COURT	COURT OF APPEAL FOR SASKATCHEWAN ON APPEAL FROM THE QUEEN'S BENCH (FAMILY LAW DIVISION)
	JUDICIAL CENTRE	JUDICIAL CENTRE OF SASKATOON DIV. No. 625 of 2012
	APPLICANT	OLENA MYKOLAYIVNA SCHEMENAUER
	RESPONDENT	EVAN JOSEPH SCHEMENAUER
i.	COURT FILE NUMBER	FD 19-01-22922
	COURT	COURT OF QUEEN'S BENCH (FAMILY DIVISION)
	JUDICIAL CENTRE	WINNIPEG CENTRE
	APPLICANT	JORDAN SARAH CURÉ
	RESPONDENT	KENNETH PETER TYSON CURÉ
j.	COURT FILE NUMBER	E59176
	COURT	SUPREME COURT OF BRITISH COLUMBIA
	JUDICIAL CENTRE	NEW WESTMINISTER
	APPLICANTS	VICTORIA LARA DRAPER AKA VICTORIA LARA DRAPER SMITH

	RESPONDENT	MATTHEW LAWRENCE NEALE SMITH
k.	COURT FILE NUMBER	E17315
	COURT	SUPREME COURT OF BRITISH COLUMBIA
	JUDICIAL CENTRE	CHILLIWACK REGISTRY
	APPLICANT	DALE JAMES HOOGENDOORN
	RESPONDENT	KATIE NADINE HOOGENDOORN
		Testimony Feb. 17, 2022.
l.	COURT FILE NUMBER	FC-13-917-02
	COURT	SUPERIOR COURT OF JUSTICE FAMILY COURT BRANCH
	JUDICIAL CENTRE	OSHAWA REGISTRY
	APPLICANT	KAREN DIAZ (BOL)
	RESPONDENT	BRENT BOL
m.	COURT FILE NUMBER	2022/1456 P
	COURT	HIGH COURT OF IRELAND
	APPLICANTS	DAVID EGAN AND SHARON BROWNE AND EMMANUEL LAVERY
	RESPONDENTS	MINISTER FOR HEALTH, AN TAOISEACH, AND HSE
n.	ARBITRATION	
	EMPLOYER	HUMBER RIVER HOSPITAL
	UNION	NATIONAL ORGANIZED WORKERS UNION
		Grievances: NOWU Policy Service #170,2021 (All Bargaining Units) Covid Directive 6, NOWU Policy Service #01,2022 (All Bargaining Units) Covid Policy, 2022-NOWU-Clerical-55-HRH; Grievance of Gail Ackie Cross-examination Feb. 20, 22 & 29, 2023
o.	COURT FILE NUMBER	No. S2110229
	COURT	SUPREME COURT OF BRITISH COLUMBIA
	JUDICIAL CENTRE	NEW WESTMINISTER
	APPLICANTS	CANADIAN SOCIETY FOR THE ADVANCEMENT OF SCIENCE IN PUBLIC POLICY and KIPLING WARNER
	RESPONDENT	DR. BONNIE HENRY IN HER CAPACITY AS PROVINCIAL HEALTH OFFICER FOR THE PROVINCE OF BRITISH COLUMBIA
p.	COURT	ONTARIO
	APPLICANT	VALERIE ALAGNA
	RESPONDENT	HAMILTON HEALTH SCIENCES CORPORATION

q.	DISCIPLINARY HEARING	
	CASE	2021-AF-01136
	COLLEGE	COLLEGE OF NURSES OF ONTARIO
	DEFENDENT	SARAH A. CHOUJOUNIAN-ABULU
		Cross-examination April 13 & 14, May 19, June 9 & 30, July 8, 2023
r.	DISCIPLINARY HEARING	
	COLLEGE	BC COLLEGE OF NURSES AND MIDWIVES
	DEFENDENT	SEAN TAYLOR
		Cross-examination July 19 & 20, 2023
s.	DISCIPLINARY HEARING	
	CASE	CPSID 17223; IC2021-0481; IC2021-0535
	COLLEGE	COLLEGE OF PHYSICIANS AND SURGEONS OF BC
	DEFENDENT	DR. CHARLES HOFFE
t.	COURT FILE NUMBER	CV-22-0069-1880-0000
	COURT	ONTARIO SUPERIOR COURT OF JUSTICE
	APPLICANT	DR. BYRAM BRIDLE
	RESPONDENTS	UNIVERSITY OF GUELPH, JEFFREY WICHTEL, LAURIE ARNOTT, CHARLOTTE YATES, SCOTT WEESE, GLEN PYLE, ANDREW PEREGRINE, DOROTHEE BIENZLE, AMY GREER, DAVID FISMAN, NICK DULEY, JANE OR JOHN DOE JUNIOR SCIENTIST
u.	COURT	COURT OF KING'S BENCH ALBERTA
	JUDICIAL CENTRE	GRANDE PRAIRIE
	APPLICANT	ANNETTE LEWIS
	RESPONDENTS	ALBERTA HEALTH SERVICES AND REDACTED PARTIES
v.	COURT FILE NUMBER	SCBC Action E222370
	COURT	SUPREME COURT OF BRITISH COLUMBIA
	JUDICIAL CENTRE	VANCOUVER REGISTRY
	APPLICANT	TRICIA MARIE BARR ALLARD
	RESPONDENT	PATRICK JAMES ALLARD
w.	DISCIPLINARY INVESTIGATION	
	CASE	IC 2022
	COLLEGE	COLLEGE OF PHYSICIANS AND SURGEONS OF BC
	DEFENDANT	DR. SOFIA T. BAYFIELD

Respectfully submitted by,



Steven Pelech, Ph.D.

Professor,
Department of Medicine,
University of British Columbia

President and Chief Scientific Officer,
Kinexus Bioinformatics Corporation

Vice-President, and Co-Chair,
Scientific and Medical Advisory Committee,
Canadian Citizens Care Alliance

Exhibit A

CLEVELAND DOAN
Barristers & Solicitors

Michael D. Carter*
*Practicing through a law corporation
Email michael@clevelanddoan.com
Phone 604 536 5002
File No. 26408

January 27, 2025

VIA EMAIL

Dr. Steven Pelech
University of British Columbia
Department of Medicine, Division of Neurology
2775 Laurel Street
Vancouver, BC V5Z 1M9

Dear Dr. Pelech

Re: Medical Opinion regarding Universal Ostrich Farms Ltd.

We are the lawyers for Universal Ostrich Farms Ltd. We are writing to request that you provide us with an opinion on a number of matters relating to a potential culling of ostriches.

When preparing your opinion please base it on the facts set out in the "Facts" section of this letter. If you rely on additional facts please describe those facts in your opinion.

Facts

1. Universal Ostrich Farms Ltd. ("UOF") is located at 301 Langille Road, Edgewood, British Columbia (the "Property").

2. The Property is approximately 10 kilometres northwest of Edgewood, British Columbia.

3. According to Statistics Canada, the 2021 Census Profile of Edgewood lists a total population of 235 people.

4. The nearest population centres are Vernon, at over 90 kilometres by air, and Castlegar, at over 70 kilometres by air.

5. UOF raises ostriches at the Property.

6. As of February 2020 UOF was raising about 250 ostriches on the Property.

7. At that time some ostriches in the herd became sick. Tissue samples were taken from a deceased ostrich and were sent for analysis. A report from the BC Animal Health Centre returned positive results for "Proteus sp., Pseudomonas aeruginosa and E. coli (non-haemolytic)".

8. Ten ostriches died around February 2020.

9. In the following year UOF began increasing the size of the herd, including by purchasing some ostriches from other producers.

10. As of December 1, 2024 there were approximately 450 ostriches being raised at the Property (the "Herd").

11. On about December 10, 2024 representatives from UOF began noticing some ostriches in the Herd were showing signs of illness.

12. In the coming week ostriches began to die from apparent illness.

13. On December 30, 2024 representatives from the Canadian Food Inspection Agency ("CFIA") attended at the Property and took swab samples from two of the dead ostriches.

14. CFIA tested using the Avian Influenza matrix and H5H7 PCR test, and the test result was positive for the H5N1 type of Avian Influenza.

15. On December 31, 2024 CFIA issued a written Requirement to Quarantine, which was amended on January 2, 2025, January 12, 2025 and January 24, 2025.

16. UOF has been complying with the requirements of the quarantine.

17. Between about December 12, 2024 and January 15, 2025 69 ostriches died of the H5N1 type symptoms.

18. No ostriches have died of H5N1 symptoms since January 15, 2025.

19. The only ostriches of the Herd that died of H5N1 type symptoms belonged to the group of ostriches that did not experience the pseudomonas infection in 2020.

20. Four ostriches have died of non-H5N1 type symptoms in January 2025. Three of these ostriches slipped on the ice and injured themselves, and one ostrich was caught in a fence.

Requested Opinion

Please provide your opinion on the following questions:

1. What is the likelihood that the Herd presently is transmissible for H5N1 to each other and wild migratory birds such as ducks?

2. If the Herd has achieved herd immunity, is there anything rare and valuable about the Herd that would promote the advancement of biomedical research?

3. Is there any risk of transmitting the H5N1 virus from the yolk of the ostrich eggs if they were used for testing and research purposes?

4. Would the testing for antibodies against the H5N1 virus from the egg yolks be a good measure of natural or vaccine-induced immunity?

5. Is there any evidence that vaccine-induced immunity for influenza is superior to natural immunity following recovery from an influenza infection?

Yours truly,

CLEVELAND DOAN LLP
Per:
MICHAEL D. CARTER

Exhibit B

Court File No._____

FEDERAL COURT

BETWEEN:

UNIVERSAL OSTRICH FARMS LTD.
APPLICANT

- and-

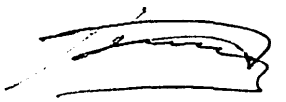
CANADIAN FOOD INSPECTION AGENCY
RESPONDENT

APPLICATION UNDER THE *FEDERAL COURTS ACT,*
R.S.C. 1985, c. F-7, s. 18.1

CERTIFICATE CONCERNING CODE OF CONDUCT FOR EXPERT WITNESSES

I, Dr. Steven Pelech, having been named as an expert witness by the applicant, Universal Ostrich Farms Ltd., certify that I have read the Code of Conduct for Expert Witnesses set out in the schedule to the *Federal Courts Rules* (and attached hereto) and agree to be bound by it.

Date: January 29, 2025



Dr. Steven Pelech
5640 Musgrave Crescent
Richmond, B.C.
V7C 5N3

Code of Conduct for Expert Witnesses

General Duty to the Court

1 An expert witness named to provide a report for use as evidence, or to testify in a proceeding, has an overriding duty to assist the Court impartially on matters relevant to his or her area of expertise.

2 This duty overrides any duty to a party to the proceeding, including the person retaining the expert witness. An expert is to be independent and objective. An expert is not an advocate for a party.

Experts' Reports

3 An expert's report submitted as an affidavit or statement referred to in rule 52.2 of the *Federal Courts Rules* shall include

(a) a statement of the issues addressed in the report;

(b) a description of the qualifications of the expert on the issues addressed in the report;

(c) the expert's current *curriculum vitae* attached to the report as a schedule;

(d) the facts and assumptions on which the opinions in the report are based; in that regard, a letter of instructions, if any, may be attached to the report as a schedule;

(e) a summary of the opinions expressed;

(f) in the case of a report that is provided in response to another expert's report, an indication of the points of agreement and of disagreement with the other expert's opinions;

(g) the reasons for each opinion expressed;

(h) any literature or other materials specifically relied on in support of the opinions;

(i) a summary of the methodology used, including any examinations, tests or other investigations on which the expert has relied, including details of the qualifications of the person who carried them out, and whether a representative of any other party was present;

(j) any caveats or qualifications necessary to render the report complete and accurate, including those relating to any insufficiency of data or research and an indication of any matters that fall outside the expert's field of expertise; and

(k) particulars of any aspect of the expert's relationship with a party to the proceeding or the subject matter of his or her proposed evidence that might affect his or her duty to the Court.

4 An expert witness must report without delay to persons in receipt of the report any material changes affecting the expert's qualifications or the opinions expressed or the data contained in the report.

Expert Conferences

5 An expert witness who is ordered by the Court to confer with another expert witness

(a) must exercise independent, impartial and objective judgment on the issues addressed; and

(b) must endeavour to clarify with the other expert witness the points on which they agree and the points on which their views differ.

Exhibit C

University of British Columbia

Curriculum Vitae for Faculty Members

Date: January 25, 2025

Initial: —S—

1. **SURNAME:** Pelech **FIRST NAME:** Steven **MIDDLE NAME(S):**
2. **DEPARTMENT/SCHOOL:** Medicine, Div. Neurology
3. **FACULTY:** Medicine
   JOINT APPOINTMENTS:
4. **PRESENT RANK:** Professor **SINCE:** July 1, 1998

5. POST-SECONDARY EDUCATION

(a)

University or Institution	Degree	Subject Area	Dates
University of British Columbia	B.Sc.	Biochemistry	1975-1979
University of British Columbia	Ph.D.	Biochemistry	1979-1982

(b) Title of Dissertation and Name of Supervisor

Regulation of Phosphatidylcholine Biosynthesis - with Dr. Dennis E. Vance

(c) Continuing Education or Training

(d) Continuing Medical Education

(e) Professional Qualifications

1 Biomedical Research Scientist

6. EMPLOYMENT RECORD

Prior

University, Company or Organization	Rank or title	Dates
University of British Columbia	Assistant Professor	July 1, 1988 - June 30, 1993
University of British Columbia	Associate Professor	July 1, 1993 - June 30, 1997
University of British Columbia	Postdoctoral Fellow (with Dr. Dennis Vance)	1983-1983
University of Dundee, Scotland	Postdoctoral Fellow (with Dr. Philip Cohen, knighted as Sir Philip Cohen)	1983-1984
University of Washington, Seattle	Postdoctoral Fellow (with Dr. Edwin Krebs, Nobel Prize recipient)	1984-1987
Biomedical Research Centre, Vancouver (Immunology Institute)	Senior Scientist	1987-1998
Kinetek Pharmaceuticals, Inc.	Founder, President & Chief Executive Officer	1992-1997

Present

University, Company or Organization	Rank or title	Dates
University of British Columbia	Professor	July 1, 1997 - present
Kinexus Bioinformatics Corporation	Founder, President & Chief Scientific Officer, Director	1999-present

c) Date of granting tenure at UBC:
July 1, 1993

7. LEAVES OF ABSENCE

University, Company Or Organization at which Leave was taken	Type of Leave	Dates

None taken since starting as a UBC faculty member. However, from November 3, 2004 through to April 15, 2005, I was summoned for 24 full days to appear in a B.C. Human Rights Hearing Case. I also had to appear in the BC Supreme Court for a judicial review of this case over a week's period in April 2009.

8. TEACHING

(a) Areas of special interest and accomplishments

1 Percentage of Overall Time Devoted to:

Non-clinical instruction:	20%
Clinical instruction:	0%
Research/publication:	55% (includes R&D at private biotechnology company)
Administration (UBC):	20%
Administration (Kinexus):	5%
Clinical practice:	0%

---

2 For over 32 years, I was very active in the establishment of the Experimental Medicine Graduate Program and worked closely with its six directors (i.e. Drs. Rabkin, Quamme, Wong, Duronio, Sly and Tang). My goal was to develop courses that would provide practical, useful skills to graduate students. In particular, the students should acquire a solid knowledge base, be able to read the scientific literature and on-line websites critically, adapt to new lab environments and assimilate new techniques, deliver clear oral presentations, and write competitive grants for funding. I left this committee in the Spring of 2023.

3 To improve the knowledge-base of Experimental Medicine students, I became the course coordinator for MEDI 501, a lecture course that is required of all students in the program and focuses on the molecular basis of disease. I originally presented the opening four lectures for this course, which is taught by several faculty members. I am convinced that future improvements in the treatment of diseases will depend upon a firm understanding of the molecular mechanisms underlying the diseases. Imparting this knowledge to graduate students will better prepare them for disease-related research. In 2024, I taught one 90-minute lecture in the Fall term. I also provide an examination question for the mid-term exam and graded 35 answers.

4 To improve the laboratory skills of Experimental Medicine students, I became the course coordinator for MEDI 502, which is the second course that is required of all students in the program. Previously, the students went on mass together to a different lab each week to see a technique taught by a faculty member. I altered the course so that each student could select two host labs out of two dozen possible labs in which they would spend half a day per week for two months in each lab learning about the research area and various techniques in use in that lab. This improved research interactions among various members of the Department of Medicine. Half way through this course, the student has to give to the other students in the course a 20-minute

oral presentation that outines the nature of the research in the first host lab and a technique that is being used to approach a biological problem in that lab. At the conclusion of the rotation in the second host lab, the student has to write an MRC grant application that combines aspects of his experience in the host laboratories. The oral presentation and the grant application account for the majority of the final grade for this course. This is the only course of this kind that is offered through the U.B.C. Currently, I have one students per term in my laboratory for this course in 2025.

5 I have also provided the opportunity for many undergraduate students to obtain research experience in my laboratory through the BIOL 448A, E2P PharmD & BPSc and MEDI 548 Directed Studies courses and the cooperative education programs at the Department of Microbiology and Immunology at U.B.C. and the Simon Fraser University Science Coop. From these coop programs, over 200 undergraduate students have work full-time in my laboratory under my supervision for 4 to 12 month terms.

6 My area of research expertise is signal transduction, and defective cell signalling is at the root of cancer, Alzheimer's, diabetes, immune dysfunction and many other chronic diseases of aging. As there was no advanced, graduate level course in signal transduction that was offered each year at U.B.C., I took the initiative to create one. The majority of my teaching is in the MEDI 590 Cell Regulation course, which I coordinate and provide all of the lectures. The course is very advanced and covers a lot of ground, but most students perform very well. The final mark for MEDI 590 course is largely dependent upon an exercise to gather detailed information about various members of a family of cell signalling proteins. This exercise forces the students to read the scientific literature and collect data from relevant websites, and present their results organized in Excel tables. The collected information is made available to the scientific community after it is integrated into a database. In 2024, there were 15 registered graduate students that completed the course. All of the 52 hours of PowerPoint lectures and supporting materials are provided to all the students in pdf format in advance of each class. I devoted over 25 hours additional outside of the classroom in 2024 in MEDI 590 course preparation, including the development of new original content and marking midterms and final assignments. The results of the 2024 MEDI-590 final assignment, which was a project selected by the students to examine the expressions and interactions of extracellular mediators and their receptors, is presently being used to expand the open-access, on-line knowledgebase www.kinector.ca with the help of a team of 5 computer science BCIT students. I have made much of these educational materials available to wider audiences on the Kinexus Bioinformatics website at www.kinexus.ca. My long-term objective is to produce 10-minute teaching videos of portions of the lectures for the MEDI590 course that will be posted on-line with open-access.

7 Another course that I originally coordinated for five years is MEDI 535, which I designed to be a journal club in which the participants critically analyze recent scientific papers based on signal transduction research. In this course, the students received a scientific paper a week before the next class that they are expected to read and critically review. The following week, the student that originally selected the paper provided a brief synopsis of the paper and then led the round table discussion among myself and the other students of the paper's strengths and deficiencies. I have not tutored in this course in recent years.

8 I have also provided 2 hours of lecture per year in the Neuroscience 500 course (1999-2001), I participated as a medical student PBL tutor in the Endocrinology Block for Second Year (1999, 2000) and Hyperplasia Block for First Year), gave a 1 hour lecture to First Year Medical Students (2002) and 2 hours of lecture per year in Pathology 500 (2001, 2002) and 2 hours of lecture to Pharmaceutical Sciences graduate students in PHAR 545 (2003).

(b) Recent Courses Taught at UBC:

Year	Session	Course Number	Scheduled Hours	Class Size	Hours Taught			
					Lecture	Tutorials	Labs	Other
2019 + 2020	Fall 2019 + Winter	BIOL 448 – Directed Studies	60	1 – Kevin Wong	0	5	>250 h	1
2019 + 2020	Fall 2019 + Winter	ISCI 448 – Directed Studies	60	1 – Abiel Kwok	0	5	>250 h	1
2020	Winter 2020	MEDI 502 - Molecular and Cellular Biology	30	1 – Jackie Ho	0	4	10	1
2020	Fall 2020	MEDI 590 - Molecular Regulation of Cell Growth	>100	9	56	0	0	>100 h (see Note 1)
2020	Fall 2020	MEDI 501 - Molecular and Cellular Biology	7	19	1.5	0	0	+5.5 h (see Note 2)
2021	Fall 2021	MEDI 590 - Molecular Regulation of Cell Growth	>100	4	52	0	0	>50 h (see Note 1)
2021	Fall 2021	MEDI 501 - Molecular and Cellular Biology	10	30	1.5	0	0	+5.5 h (see Note 2)
2022	Fall 2022	MEDI 590 - Molecular Regulation of Cell Growth	>100	6-12	52	0	0	>50 h (see Note 1)
2022	Fall 2022	MEDI 501 - Molecular and Cellular Biology	10	24	1.5	0	0	+5.5 h (see Note 2)
2023	Fall 2023	MEDI 590 - Molecular Regulation of Cell Growth	>100	7	52	0	0	>50 h (see Note 1)
2023	Fall 2023	MEDI 501 - Molecular and Cellular Biology	10	28	1.5	0	0	+8.5 h (see Note 2)

2024	Fall 2024	MEDI 590 - Molecular Regulation of Cell Growth	>100	15	52	0	0	>50 h (see Note 1)
2024	Fall 2024	MEDI 501 - Molecular and Cellular Biology	10	35	1.5	0	0	+8.5 h (see Note 2)

Note 1 - +50-150 h course preparation; +2 h for midterm; +2 h midterm marking; + >50 h final assignment marking

Note 2 - +4.5-10 h lecture preparation and mid-term or final exam marking

(c) Graduate Students directly supervised at UBC:

Student Name	Program Type	Year		Principal Supervisor	Co-Supervisors
		Start	Finish		
Palaty, Chrystal	Exp. Med. Ph.D.	1990	1995	Pelech	
Samiei, Mitra	Exp. Med. Ph.D.	1990	1994	Pelech	Devine
Mordred, Guy	Biochemistry Ph.D.	1991	1993	Paucellier	Pelech
Charest, David	Exp. Med. Ph.D.	1991	1998	Pelech	
Charlton, Lorin	Exp. Med. Ph.D.	1991	1998	Pelech	
Morrison, Donna	Exp. Med. Ph.D.	1992	1998	Pelech	
Kim, Sung	Pharm. Sci. Ph.D.	1992	1998	Katz	Pelech
Tudan, Christopher	Exp. Med. Ph.D.	1993	1999	Pelech	
Tao, Jingsong	Microbiol. Ph.D.	1995	1998	Levy	Pelech
Marotta, Anthony	Exp. Med. Ph.D.	1996	1999	Sahl	Pelech
Wagey, Ravenska	Exp. Med. Ph.D.	1996	2000	Krieger	Pelech
Sayed, Mohamed	Exp. Med. Ph.D.	1998	2002	Pelech	Sahl
Vilimek, Dino	Exp. Med. M.Sc.	1999	1999	Duronio	Pelech
Je-Hong Hu	Simon Fraser [illegible]	2000	2004	Krieger	Pelech
Gobind Sun	Exp. Med. Ph.D.	2006	2008	Pelech	
Amy Lai	Exp. Med. Ph.D.	2007	2008	Pelech	
Shenshen Lai	Exp. Med. Ph.D.	2009	2015	Pelech	

Javad Safaei	Math. & Comp. Sci. Ph.D	2009	2015	Gupta	Pelech
Dominik Sommerfeld	Exp. Med. Ph.D.	2010	2012	Pelech	
S.M. Shabab Hossain	Comp. Sci. M.Sc.	2011	2011	Gupta	Pelech
Lambert Yue	Exp. Med. Ph.D.	2016	2020	Pelech	
Hamidreza Galavi	Exp. Med. Ph.D.	2020	2023	Pelech	
Andréa Bleret	M.Sc. Université catholique de Louvain	2022 Feb.	2022 May	Bernard Hallet	Pelech
Ghada Maged Ali	M.Sc.(Neuro-science) Alexandria Univ., Egypt	2022 Feb.	present	Ahmad Raafat Bassiouny	Pelech

(d) MEDI 502 Graduate Student Rotation Supervision

1	Julian Vasilescu	UBC , MEDI 502	January 27-31, 2003
2	Lisa Bradley	UBC , MEDI 502	January 13-17, 2003
3	Loutfig Demirjian	UBC , MEDI 502	March 23 – April 23, 2004
4	Edgar Lam	UBC , MEDI 502	February 28 – March 4, 2005
5	Philip Ly	UBC , MEDI 502	January 10, 2006 – February 28, 2006
6	Michael Butt	UBC , MEDI 502	April 12, 2007 – April 30, 2007
7	Alastair Davies	UBC , MEDI 502	January 15 – February 15, 2008
8	Chengcheng Zhang	UBC , MEDI 502	February 15, 2009 – March 15, 2009
9	Anthony Tam	UBC , MEDI 502	January 15 – February 15, 2010
10	Helen Chen	UBC , MEDI 502	February 15 – February 28, 2011
11	Jack Lui	UBC , MEDI 502	March 1 – March 16, 2011
12	Saeideh Davoodi	UBC , MEDI 502	January 10 – January 30, 2012
13	Soojin Kim	UBC , MEDI 502	January 11 – February 1, 2013
14	Sehyun Cho	UBC , MEDI 502	February 1 – February 28, 2013
15	Paul Toren	UBC , MEDI 502	January 11 – February 1, 2014
16	Franco Cavaleri	UBC , MEDI 502	February 1 – February 28, 2015
17	Ryan Yue	UBC, MEDI 502	January 14 – February 28, 2016
18	Alexandre Kadhim	UBC, MEDI 502	January 14 – February 28, 2016
19	Jian Gao	UBC, MEDI 502	January 14 – February 28, 2017

20	Muyan Cao	UBC, MEDI 502	January 29 – February 28, 2018
21	Jackie Ho	UBC, MEDI 502	January 29 – February 28, 2020
22	Dr. Haifa Al Sudairy	UBC, MEDI 502	January 22 – February 28, 2025

In 2012, I also marked mock grant reviews prepared by Mary Rose Pambid and Saeideh Davoodi as part of the MEDI-502 course.

(e) MBA Student Supervision (at my industrial lab at Kinexus)

1	Deborah Bender	SFU, MBA Student	May 1 - July 31, 2001
2	Darius Panaligan	SFU, MBA Student	June 5 - August 31, 2001

(f) Undergraduate Coop Student Research Supervision (at my industrial lab at Kinexus)

I have taken on over 175 undergraduate students from the Simon Fraser University, University of Victoria and University of B.C. Coop programs through my companies Kinetek Pharmaceuticals Inc. (1992-1998) and Kinexus Bioinformatics Corp. (1999-present). Most of these students worked on average for 8 months full work-terms. I have only listed my trainees at Kinexus below.

No.	Name of Student	Months	Start Date	End Date
1	Korine Ung	4	1-Sep-1999	30-Dec-1999
2	David Brewster	4	1-Jan-2000	30-Apr-2000
3	Michael Hsing	8	1-Jan-2000	31-Aug-2000
4	Pinky Chua	4	1-May-2000	31-Aug-2000
5	Bonnie Jones	8	1-May-2000	31-Dec-2000
6	Claire Hou	4	1-Sep-2000	31-Dec-2000
7	Tiffany Chen	8	2-Jan-2001	31-Aug-2001
8	Christopher Huang	8	2-Jan-2001	31-Aug-2001
9	Kevin Ma	8	1-May-2001	31-Dec-2001
10	Jason Sterne	8	7-May-2001	31-Dec-2001
11	Kristy Lynn Williams	8	27-Aug-2001	31-Dec-2001
12	Jeff Druce	8	27-Aug-2001	31-Dec-2001
13	Mark White	4	27-Aug-2001	31-Dec-2001
14	Jack Min	4	4-Sep-2001	31-Dec-2001
15	Jill Youds	8	1-Jan-2002	31-Aug-2002
16	Jackie To	8	1-Jan-2002	31-Aug-2002
17	Marina Kanjer	4	1-Jan-2002	30-Apr-2002
18	Andrea Ramalho	8	1-Jan-2002	30-Aug-2002
19	Leon Poznanski	8	1-May-2002	31-Dec-2002
20	Devon Yeoman	8	1-May-2002	31-Dec-2002
21	Kyla Hingwing	8	1-Sep-2002	30-Apr-2003
22	Gavin Lee	4	10-Sep-2002	31-Dec-2002

23	Richard Li	8	1-Jan-2003	30-Aug-2003
24	Anna Moorhouse	8	1-Jan-2003	30-Aug-2003
25	Beth Clendening	8	22-Apr-2003	31-Dec-2003
26	Shauna Murray	12	25-Aug-2003	31-Aug-2004
27	Heidi Cheung	8	1-Sep-2003	30-Apr-2004
28	Sharan Swarup	16	1-Sep-2004	31-Dec-2004
29	Nadia Brinkman	8	1-Jan-2004	31-Aug-2004
30	Elbert Chang	4	1-Jan-2004	30-Apr-2004
31	Wilson Luk	8	3-May-2004	31-Dec-2004
32	Tina Chen	8	26-Aug-2004	30-Apr-2005
33	Anar Dhallar	8	26-Aug-2004	30-Apr-2005
34	Sylive Bryant	8	4-Jan-2005	31-Aug-2005
35	Melissa Hogg	4	4-Jan-2005	30-Apr-2005
36	Benjamin Jong	8	4-Jan-2005	31-Aug-2005
37	Amanda Heiler	8	2-May-2005	31-Dec-2005
38	Poonam Jassi	8	2-May-2005	31-Dec-2005
39	Theresa Connor	8	1-Sep-2005	30-Apr-2006
40	Gavin Ha	8	1-Jan-2006	31-Aug-2006
41	Megan Kofoed	16	1-Jan-2006	30-Apr-2007
42	Iris Juan	8	1-May-2006	31-Dec-2006
43	Andrew Park	5	1-May-2006	1-Oct-2006
44	Ryan Whitehead	4	1-May-2006	25-Aug-2006
45	Bryanna Grace	4	1-Sep-2006	31-Dec-2006
46	Michael Peabody	8	1-Sep-2006	30-Apr-2007
47	Joanna Kam	8	19-Dec-2006	31-Aug-2007
48	Nova Do	8	1-Jan-2007	31-Aug-2007
49	Jason Wong	8	1-Jan-2007	31-Aug-2007
50	Charrise Pagarigan	4	1-Jan-2007	30-Apr-2007
51	Sabrina Rayworth	8	1-May-2007	31-Dec-2007
52	Fredrick Bantandos (SFU)	8	1-Sep-2007	30-Apr-2008
53	Pringle Comia (SFU)	8	1-Sep-2007	30-Apr-2008
54	Raymond Leung (SFU)	8	1-Sep-2007	30-Apr-2008
55	Adam Leigh (UBC)	8	1-Jan-2008	31-Aug-2008
56	Ellen Sung (UBC)	4	1-Jan-2008	30-Apr-2008
57	Angie Chu (UBC)	4	1-May-2008	31-Aug-2008
58	Stephanie Lam (SFU)	8	1-May-2008	31-Dec-2008
59	Amy Tam (UBC)	8	1-May-2008	31-Dec-2008
60	Ken Ng (SFU)	8	1-May-2008	31-Dec-2008
61	Ryan Saranchuk (UBC)	4	1-Sep-2008	31-Dec-2008
62	Sarah Zaidi (SFU)	3.5	1-Sep-2008	15-Dec-2008
63	Anna Chau (UBC)	8	1-Jan-2009	31-Aug-2009
64	Kerrie Law (UBC)	8	1-Jan-2009	31-Aug-2009
65	Jose Canas (SFU)	8	1-Jan-2009	31-Aug-2009
66	Steven Pham (UBC)	8	1-Jan-2009	31-Aug-2009

67	Connie Drewbrook (SFU)	4	1-May-2009	31-Aug-2009
68	Justin Yu (UBC)	4	1-May-2009	31-Aug-2009
69	Ryan Foyle (UBC)	8	1-May-2009	31-Dec-2009
70	Tak Poon (UBC)	8	1-May-2009	31-Dec-2009
71	Tammy Wang (UBC)	4	1-Sept-2009	31-Dec-2009
72	Yan Zhou (SFU)	4	1-Sept-2009	31-Dec-2009
73	Tommy Lee (UBC)	4	1-Sept-2009	31-Dec-2009
74	Kerrie Tian (SFU)	8	1-Sept-2009	30-Apr-2010
75	Christine Yu (UBC)	4	1-Jan-2010	30-Apr-2010
76	Vivienne Chan (UBC)	8	1-Jan-2010	31-Aug-2010
77	Katelyn Fines (UBC)	4	1-Jan-2010	30-Apr-2010
78	Katelyn Janzen (UBC)	8	1-Jan-2010	31-Aug-2010
79	Mandy Hu (UBC)	8	1-Jan-2010	31-Aug-2010
80	Mandy Chung (SFU)	4	1-May-2010	31-Aug-2010
81	Abby Yang (UBC)	8	1-May-2010	31-Dec-2010
82	Christopher Bond (SFU)	8	1-Sep-2010	31-Dec-2010
83	Jarrod Mackay (SFU)	4	1-Sep-2010	31-Dec-2010
84	Karyll Magtibay (UBC)	8	1-Sep-2010	30-Apr-2011
85	Kathryn Marshall (SFU)	4	1-Sep-2010	30-Apr-2011
86	Christopher Meschino (SFU)	4	1-Sep-2010	30-Apr-2011
87	Bonnie Cheung (UBC)	8	1-Jan-2011	31-Aug-2011
88	Lisa Luo (UBC)	8	1-Jan-2011	31-Aug-2011
89	Abhinav Sharma (UBC)	8	1-Jan-2011	31-Aug-2011
90	Cherie Tan (UBC)	8	1-Jan-2011	31-Aug-2011
91	Puneet Litt (SFU)	4	1-May-2011	31-Aug-2011
92	Kingsley Shih (UBC)	8	1-May-2011	31-Dec-2011
93	Sophie Tsai (SFU)	8	1-May-2011	31-Dec-2011
94	Sze Wing Wong (UBC)	4	1-May-2011	31-Aug-2011
95	J.C. Cheng (UBC)	4	1-Sep-2011	31-Dec-2011
96	Dennis Chau (SFU)	4	1-Sep-2011	31-Dec-2011
97	Jarrod Mackay (SFU)	8	1-Sep-2011	30-Apr-2012
98	Lisa Ying (UBC)	8	1-Jan-2012	31-Aug-2012
99	Krista Wong (UBC)	8	1-Jan-2012	31-Aug-2012
100	Gurjot Dhaliwal (UBC)	8	1-Jan-2012	31-Aug-2012
101	Michael Ni (UBC)	4	1-May-2012	31-Aug-2012
102	Chelsea Lee (Emily Carr)	3	20-May-2012	31-Aug-2012
103	Inderpal Gill (UBC)	4	1-Sep-2012	31-Dec-2012
104	Ryan Lee (SFU)	4	1-Sep-2012	31-Dec-2012
105	Ashley Steuck (UBC)	4	1-Sep-2012	31-Dec-2012
106	Kaitlin Hong Tai (SFU)	12	1-Sep-2012	31-August-2013
107	Roanette Postma (SFU)	8	1-Jan-2013	31-Aug-2013
108	Christine Chan (UBC)	8	1-Jan-2013	31-Aug-2013
109	James Hopkins (SFU)	8	1-Jan-2013	31-Aug-2013
110	Sally Maguet (SFU)	4	1-Sep-2013	31-Dec-2013

111	Martin Radvenis (UBC)	4	1-Sep-2013	31-Dec-2013
112	Katy Tan (UBC)	4	1-Sep-2013	31-Dec-2013
113	Alisa Too (UBC)	8	1-Jan-2014	31-Aug-2014
114	Lambert Yue (UBC)	8	1-Jan-2014	31-Aug-2014
115	Enoli de Silva (UBC)	8	1-Jan-2014	31-Aug-2014
116	Sonia Hessels (SFU)	8	1-Jan-2014	31-Aug-2014
117	Jeremy Nan (UBC)	8	1-Jan-2014	31-Aug-2014
118	Alexander Mann (UBC)	8	1-May-2014	31-Dec-2014
119	Alexa Creenan (UBC)	4	1-Sep-2014	31-Dec-2014
120	Maggie Fu (UBC)	4	1-Sep-2014	31-Dec-2014
121	Lisa Lee (UBC)	4	1-Sep-2014	31-Dec-2014
122	Colm Quirke (UBC)	8	1-Sep-2014	30-April-2015
123	Kristy Dever (UBC)	8	1-Sep-2014	30-April-2015
124	Jordan Chiu (UBC)	8	1-Jan-2015	31-August-2015
125	Tam Dang (UBC)	8	1-Jan-2015	31-August-2015
126	Minnie Huang (UBC)	8	1-Jan-2015	31-August-2015
127	Marti Hua (UBC)	8	1-Jan-2015	31-August-2015
128	Nimisha Arora (India)	6	1-Jan-2015	30-June-2015
129	Jeffrey White (UBC)	8	1- May-2015	31-December-2015
130	Alex Sweeten (SFU)	4	1- May-2015	30-August-2015
131	Lambert Yue (UBC)	8	1- May-2015	31-December-2015
	Lambert Yue (UBC)	8	1-May-2016	31-December-2016
132	Ryan Hounjet (UBC)	4	1-Sept-2015	31-December-2015
133	Andy Lam (UBC)	4	1-Sept-2015	31-December-2015
134	Tianna Sun (UBC)	4	1-Sept-2015	31-December-2015
135	Johnathan Wong (SFU)	4	1-Jan-2016	30-April-2016
136	Paula Tao (UBC)	8	1-Jan-2016	31-August-2016
137	Tony Han (UBC)	8	1-Jan-2016	31-August-2016
138	Desiree Pagulayan (UBC)	4	1-Jan-2016	30-April-2016
139	Jason Liu (UBC)	8	1-Jan-2016	31-August-2016
140	Jenny Chan (UBC)	8	1-Jan-2016	31-August-2016
141	Claire Doyon (UBC)	12	1-May-2016	30-April-2017
142	Christine Sam (UBC)	4	1-Sept-2016	31-December-2016
143	Yezen Dean (SFU)	8	1-Sept-2016	30-April-2017
144	Kevin Gonzalez (UBC)	12	1-Sept-2016	31-August-2017
145	Karin Parkeh (UBC)	4	1-Sept-2016	31-December-2016
146	Ayasha Brown (UBC)	8	1-Jan-2017	31-August-2017
147	Sarina Chen (UBC)	4	1-May-2017	31-August-2017
148	Jenna Grose (SFU)	8	1-May-2017	31-December-2017
149	Dhiraj Mannar (UBC)	8	1-May-2017	31-December-2017
150	Aster Fan (SFU)	8	1-Sept-2017	30-April-2018
151	Leo Escano (SFU)	4	1-Sept-2017	31-December-2017
152	Ashley Perron (UBC)	8	1-Jan-2018	31-August-2018
153	Eva Momchilova (SFU)	8	1-Jan-2018	31-August-2018

154	Iqbal Sarai (SFU)	8	1-May-2018	31-December-2018
156	Angela Wu (UBC)	8	1-May-2018	31-December-2018
157	Joanne Chan (UBC)	4	1-Sept-2018	31-December-2018
158	Abiel Kwok (UBC)	12	1-Sept-2018	31-August-2019
159	Jazica Chan (SFU)	12	1-Sept-2018	31-August-2019
160	Zhong Yuan Zhang (UBC)	4	1-Jan-2019	30-April-2019
161	Guravneet Gill (UBC)	4	1-May-2019	31-August-2019
162	Naiomi Khan (UBC)	4	1-May-2019	31-August-2019
163	Mona Golmohammadzadeh (UBC)	8	1-Sept-2019	30-April-2020
164	Avery Mak (SFU)	8	1-Sept-2019	30-April-2020
165	Mataya Lukas (SFU)	8	1-Jan-2020	31-August-2020
166	Sarah Agnew (UBC/BCIT)	8	1-May-2020	31-December-2020
167	Gage Fairlie (UBC)	8	1-May-2020	31-December-2020
168	Akshra Atrey (UBC)	12	1-Sept-2020	15-August-2021
169	Hallie Emory (UBC)	8	1-Sept-2020	30-April-2021
170	Tammy Yu (SFU)	8	1-Jan-2021	31-August-2021
171	Britney Yuen (UBC)	8	1-May-2021	31-December-2021
172	Jason Zhao (UBC)	10	1 July-2021	30-April-2022
172	Melody Lam (UBC)	8	1-Sept-2021	30-April-2022
173	Ekaterina Galysheva (UBC)	8	1-Jan-2022	31-August-2022
174	Trang Ngyen (UBC)	4	1-May-2022	31-August-2022
175	Trinity Truong (UBC)	8	1-May-2022	31-December-2022
176	Sierra Neff (UBC)	3.5	1-May-2022	15-August-2022
177	Samuel Bakteria (UBC)	12	1-May-2023	30-April-2024

(g) Undergraduate BC Institute of Technology Student Supervision (at my industrial lab at Kinexus)

I directly worked with each of these students in the development of the open-access, on-line databases and knowledgebases hosted Kinexus Bioinformatics Corporation. These usually involved bi-weekly interactions for 1 to 2 hours over a 5 to 6 week period.

1	Anchal Jain	BCIT Computer Sci. Prgm.	21-June-2005 to 10 –Sep-2005
2	Eric Chua	BCIT Computer Sci. Prgm.	21-June-2005 to 10 –Sep-2005
3	Ho Sand (Alex) Lee	BCIT Computer Sci. Prgm.	21-June-2005 to 10 –Sep-2005
4	Jimmy Chan	BCIT Computer Sci. Prgm.	12-Oct-2005 to 25 –Nov-2005
5	Kevin Rabang	BCIT Computer Sci. Prgm.	12-Oct-2005 to 25 –Nov-2005
6	Kannon Woo	BCIT Computer Sci. Prgm.	12-Oct-2005 to 25 –Nov-2005
7	Norma Wong	BCIT Computer Sci. Prgm.	12-Oct-2005 to 25 –Nov-2005
8	Kevin Odger	BCIT Computer Sci. Prgm.	1-Nov-2006 to 30-Jan-2007
9	Travis Nicholson	BCIT Computer Sci. Prgm.	21-Apr-2008 to 21-May-2008
10	Jonathan Jose	BCIT Computer Sci. Prgm.	21-Apr-2008 to 21-May-2008
11	Ryan Pattinson	BCIT Computer Sci. Prgm.	21-Apr-2008 to 21-May-2008
12	Hannah Rosellon	BCIT Computer Sci. Prgm.	21-Apr-2008 to 21-May-2008
13	John Liau	BCIT Computer Sci. Prgm.	1-Oct-2008 to 28-Feb-2009

14	Joe Hu	BCIT Computer Sci. Prgm.	15-Apr-2010 to 21-May-2010
15	Ysabel Lago	BCIT Computer Sci. Prgm.	15-Apr-2010 to 21-May-2010
16	David Liau	BCIT Computer Sci. Prgm.	15-Apr-2010 to 21-May-2010
17	Christine Livingstone	BCIT Computer Sci. Prgm.	15-Apr-2010 to 21-May-2010
18	Melissa Manalac	BCIT Computer Sci. Prgm.	15-Apr-2010 to 21-May-2010
19	Nevin Petersen	BCIT Computer Sci. Prgm.	15-Apr-2010 to 21-May-2010
20	Janice Sargent	BCIT Computer Sci. Prgm.	15-Apr-2010 to 21-May-2010
21	Brandon Wang	BCIT Computer Sci. Prgm.	15-Apr-2010 to 21-May-2010
22	Alvin Yip	BCIT Computer Sci. Prgm.	15-Apr-2010 to 21-May-2010
23	Nicholas Tagle	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
24	Igor Kozlov	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
25	Fausto Faioli	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
26	Justin Ma	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
27	Simon Ho	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
28	Isan Chen	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
29	Keegan Kelly	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
30	Aly Jamani	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
31	Colin Nguyen	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
32	David Gannon	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
33	Lili Hao	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
34	Mila Khadarina	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
35	Andrii Skrynnyk	BCIT Computer Sci. Prgm.	26-Apr-2011 to 27-May-2011
36	Kyle Li	BCIT Computer Sci. Prgm.	21-Apr-2013 to 24-May-2013
37	Theo Mutia	BCIT Computer Sci. Prgm.	21-Apr-2013 to 24-May-2013
38	Travis Ryder	BCIT Computer Sci. Prgm.	21-Apr-2013 to 24-May-2013
39	Clarence Sng	BCIT Computer Sci. Prgm.	21-Apr-2013 to 24-May-2013
40	James Chen	BCIT Computer Sci. Prgm.	21-Apr-2013 to 24-May-2013
41	Andy Chow	BCIT Computer Sci. Prgm.	21-Apr-2013 to 24-May-2013
42	Sunju Christine Jeong	BCIT Computer Sci. Prgm.	21-Apr-2013 to 24-May-2013
43	Dan Stephenson	BCIT Computer Sci. Prgm.	21-Apr-2013 to 24-May-2013
44	Nadezhda Dobrianskaia	BCIT Computer Sci. Prgm.	20-Apr-2015 to 18-May-2015
45	Guanyi Fang	BCIT Computer Sci. Prgm.	20-Apr-2015 to 18-May-2015
46	Calvin Truong	BCIT Computer Sci. Prgm.	20-Apr-2015 to 18-May-2015
47	Kevin Thet	BCIT Computer Sci. Prgm.	20-Apr-2015 to 18-May-2015
48	Haruna Kakinoki	BCIT Computer Sci. Prgm.	20-Apr-2018 to 18-May-2018
49	Matthew Lau	BCIT Computer Sci. Prgm.	20-Apr-2018 to 18-May-2018
50	Noah McMurchy	BCIT Computer Sci. Prgm.	20-Apr-2018 to 18-May-2018
51	Roberg Koeing	BCIT Computer Sci. Prgm.	20-Apr-2018 to 18-May-2018
52	Ryan Liang	BCIT Computer Sci. Prgm.	10-Sept-2018 to 30-Nov-2018
53	Garth Nelson	BCIT Computer Sci. Prgm.	10-Sept-2019 to 30-Nov-2018
54	Andy Tang	BCIT Computer Sci. Prgm.	10-Sept-2018 to 30-Nov-2018
55	Thomas Bui	BCIT Computer Sci. Prgm.	10-Sept-2019 to 25-May-2020
56	Saeed Naguib	BCIT Computer Sci. Prgm.	10-Sept-2019 to 25-May-2020
57	Daria Dimchuk	BCIT Computer Sci. Prgm.	10-Sept-2019 to 25-May-2020

58	Dawson Verboven	BCIT Computer Sci. Prgm.	10-Sept-2019 to 25-May-2020
59	Kyle Eeles	BCIT Computer Sci. Prgm.	1-Jan-2025 to 7-April-2025
60	Christine Trites	BCIT Computer Sci. Prgm.	1-Jan-2025 to 7-April-2025
61	Byron Dray	BCIT Computer Sci. Prgm.	1-Jan-2025 to 7-April-2025
62	Max Li	BCIT Computer Sci. Prgm.	1-Jan-2025 to 7-April-2025
63	Ademi Ordobaeva	BCIT Computer Sci. Prgm.	1-Jan-2025 to 7-April-2025

I have also provided co-supervision for UBC Computer Science Ph.D. candidate Mr. Alireza Davoodi with Dr. Jan Manuch in a MITAC Project from April 1, 2013 for the KinATLAS website.

(h) Continuing Education Activities

1 February 9, 2005 – UBC TAG Workshop – Preparation of Teaching Dossier for Promotion and Tenure

2 November 9, 2005 – UBC TAG Workshop – Preparation of Teaching Dossier for Promotion and Tenure

3 November 30, 2005 – UBC TAG Workshop – Preparation of Teaching Dossier for Promotion and Tenure

4 February 15, 2006 – UBC TAG Workshop – Preparation of Teaching Dossier for Promotion and Tenure

5 March 15, 2006 – UBC TAG Workshop – Preparation of Teaching Dossier for Promotion and Tenure

6 November 8, 2006 – UBC TAG Workshop – Preparation of Teaching Dossier for Promotion and Tenure

7 April 11, 2007 – UBC TAG Workshop – Preparation of Teaching Dossier for Promotion and Tenure

8 November 14, 2007 – UBC TAG Workshop – Preparation of Teaching Dossier for Promotion and Tenure

9 November 21, 2007 - UBC TAG Workshop for Dept. of Urology – Preparation of Teaching Dossier for Promotion and Tenure

10 March 5, 2008 - UBC TAG Workshop – Preparation of Teaching Dossier for Promotion and Tenure

11 January 26, 2022 - UBC Ethics in the Arts Workshop

12 July 20, August 31, October 26, 2022 - UBC Racism Workshop - Decolonial and Anti-Racist Approaches to Wellbeing with Future Ancestors' Larissa Crawford

13 As part of my continuing education activities, I regularly attend the Neurosciences Grand Rounds on Wednesday mornings at 8:00 am, the Department of Medicine Grand Rounds on Thursdays at 12:00 noon and the DMCBH Lectures on Fridays at 11:00 am each week.

(i) Visiting Lecturer (indicate university/organization and dates)

This is included with my invited presentation list in Section 9(d).

(j) Mentor for Sabbatical

1	Dr. Byung Soon Moon – Professor and Head of Surgery, WONKWANG University Iksan Oriental Medical Center, Korea, February 1, 2007 - January 31, 2008

(k) Other

1 MRC Representative for Scholarships Day at U.B.C. - October 25, 1991; Sept. 24, 1992
2 Volunteer for Careers Presentation - Science World, Vancouver - March 9, 1993
3 Scientists & Innovators in the Schools, Kitsilano Secondary School, Vancouver -Feb. 14, 1993
4 Volunteer for Careers Presentation - Science World, Vancouver - March 1, 1996
5 Scientists & Innovators in the Schools, Gladstone Secondary School, Vancouver -January 24, 1997
6 Volunteer for B.C. Regional Science Fair, University of B.C. - April 5, 2001

High School Student Mentorship (1 day to 2 weeks) at my industrial lab at Kinexus

1 Davita Fuchs - Windermere Secondary School, Vancouver, 24-29-Jul-2001
2 Ariella Zbar – Eric Hamber High School, Vancouver, 26-30-Aug-2002
3 Tom Chan - Windermere Secondary School, Vancouver, 27-31-Jan-2003
4 Nga Wailau - Windermere Secondary School, Vancouver, 23-27-Jun-2003
5 Maggie Lau - Windermere Secondary School, Vancouver, 21-25-Jul-2003
6 Winnie Chen – Prince of Wales Secondary School, Vancouver, 18-22-Aug-2003
7 Peter Quon - Windermere Secondary School, Vancouver, 26-30-Jan-2004
8 Reginald Naidu - Windermere Secondary School, Vancouver, 17-30-Jun-2004
9 Anthony Leung - Windermere Secondary School, Vancouver, 24-28-Jan-2005
10 Ricky Quan - Windermere Secondary School, Vancouver, 20-25-Jun-2005
11 Dorothy Yeung - Windermere Secondary School, Vancouver, 23-27-Jan-2006
12 Sophia Guerrero - Windermere Secondary School, Vancouver, 19 – 30-Jun-2006
13 Alex Sutter- McMath Secondary School, Richmond, 26-30-Jun-2006
14 Yin Woo - Windermere Secondary School, Vancouver, 14-31-Dec-2007
15 Gail Ng - Windermere Secondary School, Vancouver, 26-30-Jan-2009
16 Fiona Leung - Windermere Secondary School, Vancouver, 25-29-Jan-2010
17 Leanne Huang - Windermere Secondary School, Vancouver, 21-Jun - 2-Jul-2010
18 Wilkin Chou - Windermere Secondary School, Vancouver, 21-Jun - 2-Jul-2010
19 Rebecca Hu – Templeton Secondary School, Vancouver, 24-25-Jun-2010
20 Angela Pinto – Windermere Secondary School, Vancouver, 22-Jun - 30-Jun-2011
21 Katie Piper – Windermere Secondary School, Vancouver, 22-Jun - 30-Jun-2011
22 Hailey Xi - Secondary School, Vancouver, 16-Dec-2022; July 16-31-2023; August 16-31-2024.

(l) Post-doctoral Fellows

1 Dr. Hong Zhang – 2000-2002
2 Dr. Y. J. Xu – 1998-1999
3 Dr. D. F. Liao – 1998 (3 months)
4 Dr. Ian Melhado – 1998 (6 months)
5 Dr. Sanjay Bhanot – 1995-1997
6 Dr. Baljinder Sahl – 1994-1998
7 Dr. Diana Lefebvre – 1994-1996
8 Dr. Brook Koide – 1993-1995
9 Dr. Yaw Loon Siow – 1992-1997
10 Dr. Jasbinder Sanghera – 1989-1995
11 Dr. Maleki Daya-Makin – 1989-1991

9. SCHOLARLY AND PROFESSIONAL ACTIVITIES

(a) Areas of special interest and accomplishments

Role of protein phosphorylation in cellular signal transduction.

1 My research has broadly focused on the characterization of protein kinases involved in mitogen- and stress-signalling and cell cycle control. Protein kinases are major intracellular transducers of information from extracellular stimuli. Their defective signalling, as a consequence of mutations in the genes that encode these enzymes, underlies many degenerative diseases of aging such as cancer, diabetes, immune cell dysfunction, heart disease and neurological disorders.

2 The main model systems that are under investigation in my laboratory are oocytes from sea stars and frogs, human solid tumours and diverse cancer cell lines, insulin-target tissues such as skeletal muscle and heart from normal and diabetic rats, and human brain and spinal cord tissues from patients with neurological disorders. Many of the same protein kinases that are abnormally activated in cancer cells are stimulated in a controlled fashion during the meiotic maturation of oocytes or during activation of terminally differentiated immune cells of the blood, heart and brain.

3 As a postdoctoral fellow in the laboratory of Dr. Edwin Krebs, I was one of the co-discoverers of MAP kinase. Over the last 37 years, as a principal investigator, my research team and I have shown that MAP kinases such as ERK1 and ERK2 operate in the following mitogen-activated protein kinase cascade: Raf1-Mek-Erk1/2-Rsk1/2. My laboratory examined the role of this protein kinase cascade in platelets, T cells, B cells, macrophages, neutrophils, keratinocytes, cardiomyocytes, oligodendrocytes and neurons. These studies have been expanded for analysis of the related MAP kinase-dependent pathways that involve JNK and p38 MAP kinases.

4 Other protein kinases under scrutiny in my lab include cyclin-dependent kinases, p70 S6 kinase, protein kinase C, oncogene-encoded kinases (e.g., Pim1, Cot and PKB), and casein kinase 2 (CK2a), and glycogen synthase kinase 3 (GSK3). Some of these kinases are activated by second messengers such as calcium, whereas others are regulated by small GTP-binding proteins such as Ras and Rac or via direct phosphorylation by upstream kinases. Anti-peptide antibodies developed in my laboratory have been produced for the specific detection of all of these kinases. Recombinant forms of mammalian versions of kinases are expressed in *E. coli*, COS cells and baculovirus-infected Sf9 cells. Site-directed mutagenesis is used to identify important regulatory phosphorylation sites in Erk1, Mek1, Mekk and Pim1. Synthetic peptide substrates are used to identify the critical amino acid residues that are required for kinase recognition. Specific roles for these kinases are being defined by identification of their target substrates and by establishing how the kinases are integrated into signaling networks.

5 Other technologies that are applied in my research program include antibody microarrays, multi-immunoblotting, protein sequencing, cDNA cloning, sequencing and site-directed mutagenesis, cell culture and microinjection, and immunocytochemical localization. We can now track over 700 protein kinases, phosphatases, stress, cell cycle and apoptosis proteins in addition to over 1100 phosphorylation sites in many of these phosphoproteins. This kind of technology has led to the spin-out of Kinexus Bioinformatics Corporation from my UBC lab. Kinexus produces the highest density commercial antibody microarrays in the world, which feature 2026 different antibodies printed in quadruplicate per slide.

6 Over the last 25 years, in collaboration with my company Kinexus, I have built a strong bioinformatics program to create databases and knowledgebases that are available online with free access for the scientific community. KiNET (http://www.kinet.ca) has the results from the analysis of over 10,000 multi-immunoblots performed in-house at Kinexus using the Kinetworks methodology that was development in my UBC lab. It is the largest repository of quantitative proteomics data on cell signalling proteins available. In 2010, we launched the PhosphoNET knowledgebase (www.phosphoNET.ca). It presently has detailed information on over 180,000 experimentally confirmed and 780,000 predicted human phosphorylation sites. PhosphoNET also provides evolutionary analysis and kinase prediction for all 967,000 phosphosites. In 2011, we launched the TranscriptoNET knowledgebase (www.transcriptonet.ca) with detailed mRNA expression data information on 21,000 genes in over 600 different human tissues, tumour types and cancer cell lines. We also released the KiNET-AM database (www.kinet-am.ca) which contains antibody microarray data on 650-800 proteins and phosphosites levels tracked in over 2000 cell and tissues lysates from diverse experimental model systems. In 2013, we launched the DrugKiNET knowledgebase (www.drugkinet.ca) with information on the sensitivities of over 400 protein kinases to more than 850 drugs and other kinase inhibitory compounds. In 2015, we produced beta-versions of the OncoNET knowledgebase (www.onconet.ca) with detailed information on over 3000 proteins related to cancer, and the KinaseNET knowledgebase (www.kinasenet.ca) with detailed information on 536 human protein kinases. Most of these knowledgebases were further updated in 2017 and 2018. In 2018, we also developed a website for drug-protein interactions with identification of the most critical amino acid residues in proteins for the binding of over 2000 approved and experimental drugs (www.drugpronet.ca). I am also working on online knowledgebases for extra-cellula mediators and their receptors. My ultimate goal is to create an atlas of cell signalling maps and the ability to track key proteins and phosphosites within these networks with protein microarrays. Towards this end, I have also been working on producing signalling maps online with Kinections Maps that detail experimentally verified interactions with protein kinases and KinATLAS (www.kinatlas.ca), which features customizable maps of kinase-drug, protein-protein interactions, and kinase-substrate interactions and extracellular mediator-receptor interactions with KiNector (www.kinector.ca).

7 Ultimately, the research undertaken in my laboratory should help identify rational targets for the development of pharmacological agents for the treatment of cancer, neurological diseases, diabetes, autoimmune diseases, and other disorders that involve protein kinases. In addition, it is helping to identify biomarkers that may be useful for diagnosing diseases and defining the most appropriate therapeutic strategies to treat these diseases.

8 Since February of 2020, my lab has been extensively involved in the analysis of natural and COVID-19 vaccine induced immunity to the SARS-CoV-2 virus. This included leading a 4,500-person clinical study to evaluate antibody levels against 10 of the SARS-CoV-2 proteins in blood, serum and saliva samples. This involved an extensive examination of hundreds of epitopes in SARS-CoV-2 proteins. My research also involved the development of rabbit polyclonal antibodies against at least 8 of the SARS-CoV-2 proteins, including several against the Spike protein. We also examined the role of the kinase GSK3-beta in the replication of the SARS-CoV-2 virus, and identified inhibitors of this kinase that blocked the reproduction of the virus in cultured cells. In 2024, we have been optimizing a pentapeptide that binds to the SARS-CoV-2 NSP15 protein, which also has the potential to block the replication of the SARS-CoV-2 virus. Presently, we are also working on a serological test for antibodies against the H5N1 influenza strain.

(b)+(c) Research or equivalent grants/contracts (indicate under COMP whether grants were obtained competitively (C) or non-competitively (NC))

Grants

Granting Agency	Subject	COMP	$ Per Year	Year	Principal Investigator	Co-Investigator(s)
Med. Res. Council of Canada	Role of Protein phosphorylation in viral action	C	54,000 -2 yr	1987-1989	Pelech	
B.C. Health Care Res. Foundation	Phosphatidylcholine turnover and protein phosphorylation in lymphokine action	C	12,000 -2 yr	1988-1990	Pelech	
B.C. Health Care Res. Foundation	TL-100 ultracentrifuge - Role of protein phosphorylation in cell cycle progression	C	17,000	1989	Pelech	
Med. Res. Council of Canada	Purification and characterization of cell cycle-regulated protein kinases	C	57,640 -2 yr	1989-1991	Pelech	
B.C. Health Care Res. Foundation	Role of protein phosphorylation in signal transduction by platelet agonists	C	22,000 -1 yr	1990		
B.C. Health Care Res. Foundation	Oocyte microinjection system & microscope	C	19,600	1990	Pelech	
B.C. Health Care Res. Foundation	Role of protein kinase C in signal transduction by platelet agonists	C	23,320 -1 yr	1991	Pelech	
Medical Research Council of Canada	Sorvall RC28S supraspeed centrifuge & F28/36 rotor	C	32,736	1991	Pelech	
B.C. Heart & Stroke Foundation	Protein kinase cascades in signal transduction by platelet agonists	C	60,000 -2 yr	1991-1993	Pelech	
Nat'l Cancer Inst. of Canada	Tyrosine-phosphorylated MBP/MAP-2 kinases in haemopoietic signal transduction	C	59,438 -3 yr	1991-1994	Pelech	
Nat'l Cancer Inst. of Canada	Characterization of oncogene-encoded protein-serine kinases	C	64,050 -3 yr	1991-1994	Pelech	

Med. Res. Council of Canada	Protein kinase cascades in cell cycle control	C	81,488 -3 yr	1991-1994	Pelech	
B.C. Health Care Res. Foundation	Elutriator Centrifuge	C	48,000	1992	Pelech	Berger, Weeks, Sadowski, Astell
B.C. Health Care Res. Foundation	HPLC system	C	29,000	1993	Pelech	
National Cancer Institute of Canada	HPLC system	C	29,000 (declined)	1993	Pelech	
B.C. Heart & Stroke Foundation	Role of protein kinase cascades in platelets	C	84,500 -2 yr	1993-1995	Pelech	
NRC of Canada IRAP	Protein kinase assay kit development	C	50,000	1994-1995	Pelech(Kinetek)	
Med. Res. Council of Canada	Protein kinase cascades in cell cycle control	C	84,748 -3 yr	1994-1997	Pelech	
Nat'l Cancer Inst. of Canada	MAP kinase pathways in haemopoietic signal transduction	C	77,825 -4 yr	1994-1998	Pelech	
Nat'l Cancer Inst. of Canada	Characterization of oncogene-encoded protein-serine kinases	C	99,063 -4 yr	1994-1998	Pelech	
B.C. Heart & Stroke Foundation	Role of protein kinase cascades in platelets	C	10,000 -1 yr	1995-1996	Pelech	
B.C. Science Council	Assay for activated Ras-related G proteins	C	50,000	1995-1996	Pelech (Kinetek)	Kalmar (Simon Fraser Univ.)
B.C. Heart & Stroke Foundation	Activation of protein kinases in heart	C	82,000 -3 yr	1996-1999	Katz	Pelech
Kinetek Pharmaceuticals, Inc.	Histidine kinase and tumour-activated protein kinases	NC	65,000 - 3 yr	1996 - 1999	Pelech	

Med. Res. Council of Canada	Characterization of insulin-inhibited serine kinases	C	82,000 -1 yr	1997-1998	Pelech	McNeill
Nat'l Cancer Inst. of Canada	MAP kinase pathways in seastar oocyte cell cycle control	C	10,000	1998-1999	Pelech	
Nat'l Cancer Inst. of Canada	Structure-function analysis of protein-serine kinase complexes	C	37,500	1998-1999	Pelech	
BC Heart & Stroke Foundation	Regulation of cardiomyocyte differentiation by protein kinases	C	58,450 - 2 yr	1999 - 2001	Pelech	
JDF/MRC NCE	Cell signalling in NOD mice	C	5,000 - 3 yr	1999 - 2001	Delovich Ochi et al.	Pelech
Nat'l Cancer Inst. of Canada	Identification of putative breast cancer-linked protein kinases	C	49,000 - 1 yr	1999 - 2001	Pelech	
BC Heart & Stroke Foundation	MAP kinase pathways in normal and disease heart	C	92,970 - 3 yr	1999 - 2002	Pelech	Katz
Can. Inst. Health Res.	MAP kinase pathways in seastar oocycte cell cycle control	C	82,000 - 3 year	2000-2003	Pelech	
National Research Council of Canada IRAP	Development of Relational Functional Proteomics Databases	C	48,000 - 9 months	2004-2005	Pelech	Kinexus Bioinformatics Corporation
National Research Council of Canada IRAP	Development of Protein Kinase-Based Arrays for Diagnostics and Drug Discovery	C	80,000 - 2 year	2004-2006	Pelech	Kinexus Bioinformatics Corporation
Can. Inst. Health Res.	Protein kinase pathways in seastar oocyte cell cycle control	C	107,000 - 5 year	2005-2007	Pelech	
Can. Foundation for Innovation	Brain Research Centre: A Platform for Basic and Translational Neuroscience.	C	$6.8 million	2007	Cynader	Pelech + 10 other co-investigators. I wrote approximately 30% of this successful

National Research Council of Canada IRAP	Building the On-line SigNET KnowledgeBank	C	50,000 – 1 year	2009-2010	Pelech	Kinexus Bioinformatics Corporation
Nati. Sci. & Eng. Res. Council of Canada	Mapping the human kineome and phosphoproteome	C	80,000 – 2 years	2009-2011	Stacho + Pelech	Simon Fraser Univ. + Kinexus Bioinformatics Corporation. I wrote 95% of this successful grant
National Research Council of Canada IRAP	Production of Epitope-mapped Phosphosite Antibodies	C	38,000 – 1 year	2011-2011	Pelech	Kinexus Bioinformatics Corporation
National Research Council of Canada IRAP	Development of Protein Kinase/Phosphatase Substrate Microarrays	C	178,000 – 2 years	2012-2014	Pelech	Kinexus Bioinformatics Corporation
National Research Council of Canada IRAP	Development of Protein Kinase/Phosphatase Assays (Salary support for Iqbal Sarai)	C	20,000 – 9 months	2020	Pelech	Kinexus Bioinformatics Corporation
Neurodegenerative Disease Research (NDR), Inc.	Development of Phosphosite Antibodies for ALS Target Proteins	C	US$140,000	2021	Pelech	Kinexus Bioinformatics Corporation
COVID-19 Immunity Task Force	Immmunogenicity of current SARS-CoV-2 vaccine schedules in BC and Ontario	C	$729,149	2021	Pascal Lavoie	Pelech
Neurodegenerative Disease Research (NDR), Inc.	Development of Phosphosite Antibodies for ALS Target Proteins (Salary support for Ghada Maged)	C	US$15,000	2022	Pelech	Kinexus Bioinformatics Corporation

(d) Invited Presentations

103 Local in B.C.; 37 in Canada outside B.C.; 66 in U.S.A.; 32 Internationally, outside of Canada and USA

1. July 1987 - Biochemistry Department, Univ. of B.C.
2. December 1988 - Biochemistry & Molecular Biology, Univ. of Manitoba, Winnipeg, Manitoba.
3. 14 December 1989 - Dept. of Obstetrics & Gynaecology, Univ. of B.C., Grace Hospital Site. Regulation of meiotic maturation and egg mitosis by protein phosphorylation.
4. 6 February 1989 - Vancouver Council of Woman, Unitarian Church, Vancouver. Present and future of human embryo and fetal research.
5. 12 March 1990 - Dept. of Paediatrics, Univ. of B.C., Shaughnessy Hospital Site.
   Protein phosphorylation in cell cycle control.
6. 21 March 1990 - Pharmacology Department, Univ. of B.C. Cell cycle-regulated protein kinase cascades.
7. July 1990 - Ludwig Cancer Institute, London, U.K.
8. July 1990 - Imperial Cancer Research Fund, London, U.K. Regulation of protein kinase C in haemopoietic cells.
9. July 1990 - Wellcome Biotech., Beckenham, U.K.
10. February 1991 - Biotechnology Building, Cornell University, Itheca, NY, USA. p44mpk - a paradigm for a family of mitogen-regulated, tyrosine-phosphorylated protein-serine kinases implicated in cell cycle control.
11. 4 October 1991 - Inst. Molecular Biol. & Biochem., Simon Fraser Univ., Burnaby. MAP kinases, a family of tyrosyl-phosphorylated and activated protein-seryl kinases.
12. 8 October 1991 - Dept. of Ophthalmology, Univ. of B.C., Eye Care Centre, V.G.H. MAP kinases, a family of tyrosine-phosphorylated & activated protein-serine kinases.
13. 7 November 1991 - Manitoba Inst. of Cell Biology, Univ. of Manitoba, Winnipeg, Manitoba.
14. 6 December 1991 - Dept. of Biochemistry, Queens University, Kingston, Ontario. MAP kinases, a family of tyrosyl-phosphorylated and activated protein-seryl kinases.
15. 15 January 1992 - Department of Physiology, Univ. of B.C. MAP kinases, God's gift to the Pelech lab.
16. 28 February 1992 - Dept. of Microbiology, University of Virginia, Charlottesville, VA, USA. Charting regulatory pathways with MAP kinase.
17. 11 March 1992 - Department of Microbiology, Univ. of B.C.
18. 9 April 1992 - Department of Anatomy & Cell Biology, University of Kansas, Kansas, USA.
19. 8 May 1992 - Department of Biochemistry, University of Calgary, Calgary, AB. Charting regulatory pathways with MAP kinase.
20. 17 September 1992 - Div. Endocrinology, Dept. Medicine, Univ. of B.C. Charting regulatory pathways with MAP kinase.
21. 11 July 1992 - D. Vance Honourary Symposium, Univ. of B.C.
22. 25 October 1992 – Keystone A.S.B.M.B. Symposium, Keystone, CO, USA Chairperson
23. 14 November 1992 - Frontiers in Science, Shrum Science Centre, Simon Fraser Univ., Burnaby. The power and promise of biomedical research.

24. 3 March 1993 - Dept. of Biochemistry, University of Alberta, Edmonton, AB
25. 26 October 1993 - Department of Medicine, Univ. of B.C. Abnormal insulin regulation of protein kinases during diabetes.
26. 28 October 1993 - Pharmaceutical Sciences, Univ. of B.C. Insulin-activated protein kinase cascades - A paradigm for mitogenic signalling.
27. 4 November 1993 - Department of Obstetrics & Gynaecology, Univ. of B.C. Networking with MAP kinases.
28. 8 December 1993 - Department of Biochemistry, McGill Univ., Montreal, QC. Charting regulatory pathways with MAP kinases.
29. 18 June 1993 - C.F.B.S. Meeting, Windsor, ON. Merck Frosst Canada Prize Award Lecture for C.S.B.M.B.
30. 21 June 1993 - Hotel Dieu Hospital, Montreal, QC. Regulation of insulin-activated protein kinases in diabetic rats.
31. 22 June 1993 - N.R.C. Biotechnology Research Institute, Montreal, QC. Networking with protein kinases.
32. 22 September 1993 - European Cell Cycle Conference, La Rochelle, France.
33. 1 October 1993 - Biological Regulatory Mechanisms, Rossiter Conference, Barrie, ON. Cell cycle-regulation of serine/threonine kinases
34. 18 April 1994 - Dept. Anatomy & Cell Biology, University of Toronto, Toronto, ON. At the cross-roads of diverse signal transduction pathways.
35. April 1994 - Department of Biochemistry, University of Minnosota, St. Paul, MN, USA. Networking with protein kinases.
36. November 1994 - N.R.C. Workshop-Biotechnology Research Institute, Montreal, QC. Signal transduction: Advances and applications.
37. 21 May 1994 - Schmitt Symposium: The Cytoskeleton in Alzheimer's Disease, Univ. of Rochester, Rochester, NY. Phosphorylation cascades.
38. 14 June 1994 - Dupont Symposium on Biological Signals, C.F.B.S. Meeting, Montreal, QC. Mitogen-activated protein kinases: at the cross-roads of diverse signal transduction pathways.
39. 21 June 1994 - XIIth Annual Workshop on Membrane Transport, University of Montreal, Montreal, QC. Protein kinase and phosphatase networks in cell signaling.
40. 21 July 1994 - XVI Annual Meeting Internatl. Society Heart Research Symposium, London, ON. Regulation of protein kinase circuitry by growth factors.
41. November 1994 - Onyx Pharmaceuticals, Richmond, CA. U.S.A. MEK'ing connections in MAP kinase-dependent signalling pathways.
42. 28 March 1995 - Dept. of Pathology, Univ. of B.C., St. Paul's Hospital. MAP kinase networks in cell proliferation and stress.
43. 16 May 1995 - Dept. of Pharmacology, Vanderbilt University, Nashville, TN, USA. Mitogenic and stress-activated protein kinase modules in cellular signalling.
44. 29 June 1995 - Internatl. Soc. Neurochemistry Workshop, Nagoya Japan.
45. 18 July 1995 - Cornell University, Ithaca, NY, USA.
46. 28 August 1995 - Virological and Immunological Mechanisms, Functional Outcomes and Possibilities for Therapy in Enteroviral Heart Disease: An International Workshop, St. Paul's

Hospital, Vancouver, Moderator, Ventricular function, myocyte biology, therapeutics.

47. 26 January 1995 - Pacific NorthWest Biotechnology Exposition, Westin Hotel, Vancouver.
48. 27 January 1995 - Aquatech'95 Conference, Westin Hotel, Vancouver.
49. 9 May 1995- John P. Robarts Research Institute, London, ON. MAP kinase pathways in hemopoietic cell activation.
50. 15 February 1995 - Merck Frosst - Growth Factor Meeting, Hyatt Regency, Vancouver.
51. 11 May 1995 - Weis Centre for Research, Geisinger Clinic, Dansville, PE, USA. Regulation of mitogenic and stress-activated protein kinases.
52. 19 May 1995 - ICOS Inc., Bothell, WA, USA.
53. 20 July 1995 - W. Alton Jones Science Centre, Lake Placid, NY, USA. Protein kinase circuitry in mitogenic and stress signalling.
54. 6 December 1995 - Upstate Biotechnology Inc., Lake Placid, NY, USA.
55. 3 May 1996 - Dept. of Surgery, Univ. of B.C., Jack Bell Research Centre. Malfunctions in cell signaling systems - the molecular basis of chronic diseases.
56. 9 May 1996 - Dept. of Pathology, Univ. of B.C., Eye Care Centre. Protein kinases and disease.
57. 22 January 1996 - Pierce Chemicals, Rockford, IL, USA.
58. 21 February 1996 - Hospital for Sick Children, Toronto, ON.
59. 4 March 1996 - Biochemistry, Pharmacology & Physiol. Club of Univ. of B.C.- Keynote Speaker. Your future in the basic medical sciences-bridging academia, government & industry.
60. 23 March 1996 - Fisher Winternational Conference, Banff, AB.
61. 26 March 1996 - Vancouver Enterprise Forum, Science World, Vancouver. Coaching the captain: the mentoring process.
62. October 1996 - Signal Transduction Conference, Lake Tahoe, Nevada, USA. Insulin signaling through protein kinase cascades.
63. October 1996 - Insulin Signaling & Diabetes, Washington, D.C. , USA Vanadium compounds for treatment of diabetes in rats.
64. November 1996 - Biochem. Pharma, Laval, QC. Insulin signal transduction through protein kinases.
65. November 1996 - Life Sciences Venture Forum, Toronto, ON. Kinetek Pharmaceuticals Inc.
66. 20 December 1996 - Biochemistry, Pharmacology & Physiol. Club of U.B.C.- Vancouver Keynote Speaker - Careers in Biotechnology.
67. 7 November 1997 - Dept. of Medicine, Univ. of B.C., St. Paul's Diabetes Centre. Insulin signalling and organovanandium compounds.
68. 23 July 1997 -1997 International Society for Heart Research International Conference, Vancouver. Protein kinase workshop.
69. 22 September 1997 - IBC Signal Transduction Therapy, San Diego, CA, USA. Insulin signalling and vanadium compounds for treatment of diabetes in rats.
70. 23 June 1997 - University of Calgary, Dept. of Pharmacology, Calgary, AB. Insulin signalling through kinase cascades.
71. 18 December 1997 - Dept. of Medicine, University of B.C., St. Paul's Diabetes Centre. Insulin signalling and organovandandium compounds.

72. 29 November 1997 - Brain and Spinal Cord Research Centre Symposium. UBC, Vancouver. Signal transduction research.
73. 6 June 1998 - Bridging the Straight of Georgia Cancer Conference, Cowichan Bay, BC. Protein kinases for cancer diagnosis and therapeutic targets for chemotherapy.
74. 11 June 1998 - Dept. of Pharmacology, University of Virginia, Charlottesville, Virginia, USA. MAP kinases in sea star oocyte cell cycle control.
75. 5 March 1998 - Biochemistry, Pharmacology & Physiol. Club of University of BC, Vancouver. Keynote speaker - Career opportunities in the biotechnology industry.
76. 7 May 1998 - Association of University Anaethesists Annual General Meeting, San Francisco, CA, USA. Pursuit of scientific excellence in industry.
77. 11 March 1999 - Dept. of Physiology, Univ. of B.C. Introduction to protein kinases.
78. 8 April 1999 - Dept. of Pharmacology, Univ. of B.C. Introduction to protein kinases.
79. 25 June 1999 - American Society for Microbiology Conference, Vancouver. Analysis of protein kinase networks.
80. 24 August 1999 - Pacific Institute for the Mathematical Sciences Symposium, Univ. of B.C. Mathematical analysis of protein kinase networks.
81. 14 October 1999 - Simon Fraser University - Harbour Centre, Vancouver. Canadian Brain drain to United States.
82. 3 February 2000 - Dept. of Pharmacology, University of South Alabama, Mobile, Alabama, USA. MAP kinases in cardiovascular disease.
83. 21 February 2000 - UBC Signal Transduction Network, Univ. of B.C. Mapping kineomes - protein kinase network analysis.
84. 28 April 2000 - Dept. of Biochemistry, University of Alberta, Edmonton, AB. p38 MAP kinase pathways.
85. 6 October 2000 - Montreal Heart Institute, Montreal, QC. Analysis of protein kinase networks in muscle models.
86. 14 March 2000 - BC Biotechnology Alliance, Hyatt Regency, Vancouver. Genomics, proteomics and bioinformatics.
87. 8 June 2000 - Canadian Society Pharmaceutical Sciences, Crowne Plaza Hotel, Vancouver. Spinning out companies from university research.
88. 21 August 2000 - Univ. of B.C. Dept. of Medicine Jubilee CME, Galaxy Cruise, Alaska. What you need to know about molecular biology.
89. 30 September 2000 - Foresight Capital Corporation, Delta Resort, Whistler, BC. Human genome project benefits for disease diagnosis and treatment.
90. 13 November 2000 - Pacific Rim biotechnology Conference, Hotel Vancouver, Vancouver. The Midas Touch.
91. 30 November 2000 - Eldercollege/Capilano College, North Vancouver. How to invest in biotechnology with dollars and sense.
92. 30 November 2000 - Biofuture Fund conference, Vancouver. Human genome and personalized medicine.
93. 25 January 2001 - PENCE Group, University of Toronto, Toronto, ON. Proteomic analysis of signal transduction pathways.

94. 24 April 2001 - Vancouver Enterprise Forum - Proteomics, bioinformatics and personalized medicine.
95. 26 April 2001 - Aventis Biotechnology Fair - BCIT, Burnaby - Genomics, proteomics and bioinformatics.
96. 27 April 2001 - UBC Department of Pharmacology and Therapeutics - Proteomics analyses of protein kinase networks.
97. 28 May 2001 - UBC Department of Biochemistry and Molecular Biology. MAP kinase networks in cell signaling.
98. 11 June 2001 - University of Calgary, Calgary, AB. Kinetworks mapping of cell signaling pathways.
99. 28 June 2001 - BC Canacer Agency - Advanced Therapeutics Group. Analysis of protein kinase networks.
100. 4 October 2001 - UBC Faulty of Medicine Distinguished Lecture. MAP kinase signalling pathways in human cancer.
101. 3 July 2001 Institute of Molecular and Cell Biology, National University of Singapore - Proteomic analyses of cell signalling networks: Mapping protein kinase networks.
102. 27 February 2002 - Children's Hospital Eastern Ontario, Univ. of Ottawa, Ottawa, ON. Kinetworks proteomics analyses: Mapping protein kinase networks in neural disorders.
103. 5 March 2002 - Scripps Institute, San Diego, CA, USA. Kineome analysis: Mapping cell signalling networks.
104. 6 March 2002 - International Business Communications - Protein Kinase Drug Discovery Conference, San Diego, CA, USA. Kineome analysis: Mapping protein kinase networks.
105. 21 March 2002 - Cambridge Health Institute- Protein to Profits Conference, Munich, Germany. Kinetworks analysis: Mapping cell signalling networks.
106. 4 April 2002 - First Forward Network/BC Biotech, Vancouver Terminal City Club. Bioinformatics for Biotech Executives - Keynote talk - A history of Bioinformatics: The past and beyond.
107. 12 April 2002 - The Prostate Centre at Vancouver General Hospital Seminar. Mapping cell signalling systems by Kinetworks analysis.
108. 26 April 2002 -BC Institute of Technology, Aventis Student Biotech Challenge Talk. Biotechnology in your future.
109. 3 June 2002 - 85th Meeting of the Canadian Chemical Society, Vancouver. Drug profiling by Kinetworks analysis.
110. 9 September 2002 - IBC 2nd Annual Protein Kinase Conference, Boston, MA, USA Mapping protein kinase pathways by Kinetworks.
111. 19 September 2002 - The First Pacific North-West Cell Signalling Conference, Vancouver. Charting protein kinase pathways involved in mitotic checkpoint control.
112. 20 September 2002 - The 4th Annual Pacific Northwest Venture Forum- Monte Jade, Vancouver. Kinexus Bioinformatics.
113. 9 October 2002 - Laval University, Quebec City, QC. Mapping protein kinase networks.
114. 21 November 2002 - BioFuture 2002 Conference and Exhibition, Vancouver. Stress Molecules - Listening to cells to silence disease.
115. 29 November 2002 - University of Calgary, Calgary, AB. Promise of proteomics in the post-genomic era.

116. 29 November 2002 - University of Calgary, Calgary, AB. Challenge to the entrepreneur scientist in the pursuit of academic excellence and success in the biotechnology industry.
117. 3 March 2003 - Strategic Health Institute's Protein Kinase Meeting, San Diego, CA, USA. Kinetworks analysis: Elucidating the cell specific architecture of protein kinase networks.
118. 6 March 2003 - Bioinformatics Training Initiative - BC Institute of Technology. Drug discovery in the post-genomics era: The Bioinformatics challenge and opportunity.
119. 10 March 2003 - Invest NorthWest Conference, Seattle, WA, USA. Drug target discovery by Kinetworks analysis.
120. 19 March 2003 - Cambridge Health Institutes, Molecular Market Place Meeting, Santa Clara, CA, USA. Tracking protein kinase pathways for identification and validation of drug targets.
121. 21 March 2003 - Cambridge Health Institute's TriGenome Conference - Santa Clara, CA, USA. Kinetworks analysis: Elucidating the cell-specific architecture of protein kinase networks.
122. 29 March 2003 - BC Pharmacy Assoc. Continuing Education Association - Richmond, BC. The promise of proteomics in the post-genomics era of personalized medicine.
123. 4 April 2003 - Eric Hamber Secondary School, Vancouver, BC. Careers in biotechnology.
124. 25 April 2003 - British Columbia Institute of Technology - Burnaby, BC. Genomics and proteomics and the future of medicine.
125. 29 April 2003 - Pt. Grey Secondary School, Vancouver BC. Careers in biotechnology.
126. 29 May 2003 - International Council of Electrophoresis Society on Proteomics: Present perspectives and future challenges. Glasgow, Scotland. Mapping protein kinase pathways in mitotic checkpoint control by Kinetworks.
127. 16 June 2003 - University of California San Francisco Cancer Centre, San Francisco, CA, USA. Proteomics analysis of cancer.
128. 15 September 2003 - Parkinson's Disease Conference. Painter's Lodge, BC. Proteomics analysis of neurodegenerstive diseases.
129. 8 October 2003 - Human Proteome Organization Meeting. Montreal, QC. Tracking protein kinase signalling on macroarrays with antibodies and peptide antibody mimetics (PAM's).
130. 20 October 2003 - Strategic Health Institute - Protein Kinase Meeting – Philadelphia, PA, USA. Mapping protein kinase signalling oathways by Kinetworks analysis.
131. 23 October 2003 - IIR Life Science Conference - 2nd Annual Protein Kinase Meeting - Amsterdam, Holland. Monitoring protein kinase networks with arrays of antibodies and peptide antibody mimetics (PAM's).
132. 10-17 Jan 2004 - Cambridge Health Institute - PEPTalk Meeting, San Diego, CA, USA. Tracking protein kinases and protein phosphorylation on macroarrays with antibodies and paptide antibody mimetics (PAM's).
133. 2+3 March 2004 - GenomeCanada presentation in Toronto, ON.
134. 8 March 2004 - Univ. of British Columbia, Robson Square, Public Address for Research Awareness Week. Dr. Professor/Mr. President - The curse of the entrepreneur scientist.
135. 9 June 2004 - Cambridge Health Institute - Protein Kinase targets - Strategies for Drug Development. Boston, MA, USA. Tracking the kinome by multiblotting with antibodies and peptide antibody mimetics (PAM's).
136. 19-23 September 2004 - International Business Communications - CHIPS to Hits, Boston MA,

USA. Kineome analysis: Mapping protein kinase networks.

137. 22-23 Jan. 2005 - Ramandhai Foundation 2nd International Symposium "Current Trends in Pharmaceutical Sciences: Role of Genomics and Proteomics. Ahmedabad, India. (Had to cancel 2 days before departure due to illness)

138. 28 Feb. 2005 - Strategic Research Institute – 3rd Annual Protein Phosphorylation Drug Discovery World Summit, San Diego, CA, USA. Tracking the kineome and phosphoproteome in arrays with antibodies and peptide antibody mimetics (PAM's).

139. 14 May 2005 - B.C. Pharmacy Association Annual Meeting, Vancouver. The promise of pharmacoproteomics for disease diagnosis and drug discovery.

140. 20 March 2005 - World Congress on Microarray Technology, Vancouver. Tracking the kineome and phosphoproteome in arrays with antibodies and peptide antibody mimetics (PAM's).

141. 13 September 2005 - International Consortium on Anti-Virals Symposium and Workshop, Trent University, Peterborough, ON. Mapping cell signaling pathways.

142. 28 September 2005 - National Research Council of Canada Genomics and Health Initiative Annual General Meeting. Ottawa, ON. Commercialization of technology.

143. 9 January 2006 - Cambridge Healthtech Institute PepTalk Conference. Coronado, CA. Mapping the phosphoproteome by Kinex™ antibody arrays.

144. 24 March 2006 - World Congress on Microarray Technology, Vancouver. Tracking cell signalling protein expression and phosphorylation by antibody microarrays.

145. 8 May 2006 - GTCbio Protein Kinases in Drug Discovery Conference. Boston, MA, USA. Tracking the regulation of protein kinases and phosphorylation by quantitative antibody microarrays and multi-immunoblotting.

146. 3 July 2006 - IIR's 5th Annual Protein Kinases Congress. Zurich, Switzerland. Kinase pathway analysis for target identification. Chair.

147. 26 September 2006 - NRC-Biotechnology Research Institute, Montreal, QC. Meta-analyses of the human kineome and phosphoproteome.

148. 2 December 2006 - GTCBio Drug Discovery Meeting. Philadelphia, PA. Antibody multi-immunoblotting and microarray analysis for CNS biomarker discovery in Alzheimer, Parkinson and ALS disease.

149. 22 February 2007 - UBC Department of Medicine, Division of Neurology Grand Rounds. Vancouver. Phosphoproteomics and neurodegenerative diseases of the CNS.

150. 8 March 2007 - SSP,.PSC.CSCO.WPS Joint meeting. Banff, AB. Mapping cell signalling networks with multi-immunoblotting and antibody microarrays.

151. 22+24 May 2007 - Workshop Course - Informa 6th Annual Protein Kinases Congress – Biomarker profiling for kinase target evaluation– Principal Instructor and Coordinator. Lisbon, Portugal

152. 18 June 2007 – Frontiers in Bioinformatics Workshop – University of British Columbia, Vancouver. Mapping the human phosphoproteome.

153. 30 June 2007 - Workshop Course - World Congress on Microarray Technology, Vancouver. Tracking cell signalling protein expression and phosphorylation by antibody microarrays.

154. 29 August 2007 – Seminar Presentation - University of Bath, Bath, UK. Tracking the human phosphoproteome.

155. 30 August 2007 – Seminar Presentation - University of Liverpoole, Liverpoole, UK. Tracking the human phosphoproteome.

156. 3 September 2007 - Workshop Course - Discovery – Select European Biomarkers Summit and Proteomics Europe Conference. Principal Instructor and Coordinator. Amsterdam, Holland. Mining the kineome and phosphoproteome with protein microarrays for biomarker and drug target.

157. 28 October 2007 - Seminar Presentation - Joint meeting of 3rd Czech Proteomic conference and 1st Central and Eastern European Proteomic Conference. Olomouc, Czech Republic. Protein microarrays and phosphoproteomics.

158. 6 December 2007 – Seminar Presentation – Lousiana State University Health Sciences Center – Shreveport, LO, USA – Proteomics methodologies.

159. 6 December 2007 – Seminar Presentation – Lousiana State University Health Sciences Center – Shreveport, LO, USA – The human kineome and phosphoproteome.

160. 9 February 2008 – Visiongain Protein Kinase Conference – London, UK (This meeting was cancelled 4 weeks before, but I was invited as a speaker and chairperson)

161. March 11, 2008 – Max Planck Institute– Berlin, Germany. The human kineome and phosphoproteome.

162. March 12, 2008 - Informa 7th Protein Kinase Congress – Berlin, Germany. Antibody-based phosphoproteomics for biomarker and drug target identification. (Speaker and panelist)

163. March 27, 2008 - Canadian-Dutch Dementia Colloquium, University of British Columbia, Vancouver. Proteomic approaches for the diagnosis of Alzheimer's disease: What is the rationale and what are the prospects?

164. April 17, 2008 – Department of Biochemistry, Vanderbilt University, Nashville, TN, USA. The human kineome and phosphoproteome.

165. July 4-17, 2008 – In collaboration with the Japanese company Cosmo-Bio, I gave 90 to 120 minute scientific presentations to the following 13 companies. The number of scientists at these presentations ranged from about 6 to 40. The talk was entitled: Tracking the human kineome and phosphoproteome.

Daiichi-Sankyo Pharma (Tokyo)

Ono Pharma (Tsukuba)

Ono Pharma (Osaka)

Astella Pharma (Tsukuba)

Banyu Pharma (Merck) (Tsukuba)

Takeda Pharma (Tsukuba)

Takeda Pharma (Osaka)

Tanabe-Mitsubishi (Saitama)

Japan Tobacco (Osaka)

Dainippon-Sumitomo Pharma (Osaka)

Santen Pharma (Nara)

Shionogi Pharma (Osaka)

Nippon Shinyaku (Kyoto)

167. September 8-10 - Informa Drug Discovery Summer School in Cambridge, UK with Dr. Pelech as an invited speaker and chairperson. (This workshop was cancelled 6 weeks before it was to have transpired).

168. September 24, 2008 - IBC ACT 2008: Protein Kinase Target Conference, San Diego, CA. Mapping the human phosphoproteome. (Speaker, panelist and chair)
169. October 23, 2008 – Omeros Pharmaceuticals, Inc., Seattle, WA, USA. Kinase Inhibitors in the Clinic. Tracking the human kinome and phosphoproteome.
170. February 3, 2009 – University of Washington, Seattle, WA, USA. Breakfast Club Seminar. Tracking the kineome and phosphoproteome.
171. March 3, 2009 – Informa 8th Annual Protein Kinase Congress. Barcelona, Spain. Validation of protein kinase drug targets and drug leads with microarray approaches. (Speaker, panelist and chair)
172. May 8, 2009 – Prostate Centre Grand Round at VGH. Vancouver, BC. Mapping the human kineome and phosphoproteome by protein microarray and bioinformatics analyses.
173. August 6, 2009 – Select Biosciences Microarray World Congress. South San Francisco, CA, USA. Antibody microarrays for biomarker discovery and kinase microarrays for drug screening.
174. December 10, 2009 – Bristol Meyer Squibb. Princeton, NJ, USA. Kinase Inhibitors in the Clinic. Phosphoprotein biomarker and kinase drug target discovery with protein microarrays.
175. February 1, 2010 – University of British Columbia, Coop Program Networking Workshop. Vancouver, B.C.
176. June 21-23, 2010 - Cambridge Healthtech "Next–gen kinase inhibitors: Oncology and Beyond" Meeting. Cambridge, MA, USA. Mapping protein kinase networks and drug interactions with protein microarrays and predictive bioinformatics. (Speaker, panelist and chair)
177. March 24, 2010 – University of British Columbia, Department of Biochemistry Career Workshop. Vancouver, B.C.
178. September 10, 2010 – Global Biomarker Conference & Workshop. Vancouver, B.C. Mapping the human kineome and phosphoproteome with predictive bioinformatics and protein microarrays.
179. September 26 to 30, 2010 - International Society of Hypertension 23rd Scientific Meeting (ISH 2010). Vancouver, B.C. Mapping protein kinase networks for diagnostics and therapeutics development.
180. October 29, 2010 – Select Biosciences – Microarray World Congress, La Jolla, CA, USA. Protein and peptide microarrays for tracking human protein kineome regulation.
181. February 27, 2011 – Student Biotechnology Network. University of Victoria, Victoria, BC. Mapping and tracking the human kineome and proteome.
182. June 9, 2011 – Experimental Medicine Research Day Keynote Talk. University of British Columbia. Vancouver, BC. Confronting the uncertain future of biomedical research and the biotechnology industry in this decade.
183. September 30, 2011 – Select Biosciences – Microarray World Congress. South San Francisco, CA, USA. Protein kinase and phosphosite biomarker discovery and validation with protein microarrays with antibodies, lysates, protein kinases and substrate peptides.
184. February 10, 2012 – Bristol-Meyer-Squibb, Wallingford, CT, USA. Signalling network analyses and biomarker discovery and validation with protein and peptide microarrays.
185. March 7, 2012 – Department of Biochemistry Career Workshop. University of British Columbia. Vancouver, B.C.
186. July 10, 2012 - Merck Molecular Biomarkers: Translational Research Deep Dive Conference. Long Branch, NJ, USA. Tracking the human Kineome, Phosphatome and Phosphoproteome for

biomarkers with antibody-based array technologies.

187. July 11, 2012 – Johnson & Johnson Pharmaceuticals. Springfield, PA, USA. Tracking the human Kineome, Phosphatome and Phosphoproteome for biomarkers with antibody-based array technologies.

188. July 12, 2012 - Bristol Myer-Squibb. Princeton, NJ, USA. Tracking the human Kineome, Phosphatome and Phosphoproteome for biomarkers with antibody-based array technologies.

189. July 13, 2012 – Novartis Institute for Biomedical Research Inc., Cambridge, MA, USA. Tracking the human Kineome, Phosphatome and Phosphoproteome for biomarkers with antibody-based array technologies.

190. October 2, 2012 – Purdue University, Department of Biochemistry. West Lafayette, IN, USA. Mapping the human Kineome, Phosphatome and Proteome with cell lysate, antibody and peptide microarrays.

191. March 8, 2013 – University of Missouri, Biochemistry Department. Columbia, MO, USA. Hierarchical molecular, cellular and social intelligence systems in the evolution of life.

192. July 17, 2013 – OMICS Group 3rd International Conference on Proteomics and Bioinformatics. Philadelphia, PA, USA. SigNET KnowledgeBank Workshop.

193. May 29, 2014 – BioConference Live Clinical Diagnostics & Research. On-line, CA, USA. Navigating the complexities of the human oncoproteome with the SigNET KnowledgeBank.

194. August 5, 2014 – OMICS Group 4th International Conference on Proteomics and Bioinformatics. Northbrook (Chicago), IL, USA. Phosphoproteomics and the origin and operations of the kineome. (also session chair)

195. August 6, 2014 – OMICS Group 4th International Conference on Proteomics and Bioinformatics. Northbrook (Chicago), IL, USA. Oncoproteomics for uncovering cancer biomarkers and therapeutics targets. (1 hour workshop)

196. September 10, 2014 – Biochemistry, Biology and Pathology of MAP Kinase II Conference. Vilnius, Lithuania. Navigating human phosphorylation networks with SigNET suite of on-line knowledge bases.

197. September 11, 2014 – Biochemistry, Biology and Pathology of MAP Kinase II Conference. Vilnius, Lithuania. Regulatory roles of conserved phosphorylation sites in the activation T-loop of the MAP kinase ERK1.

198. May 6, 2015 – Division of Neurology, University of British Columbia. Vancouver, BC. The protein kineome: Tracking and manipulating the predominant molecular intelligence system of cells with proteomics and bioinformatics.

199. September 29, 2015 – Human Proteome Organization (HUPO) Conference. Vancouver, BC. Profiling protein expression, modifications and interactions with antibody microarrays.

200. March 14, 2016 – Cure Huntington's Disease Initiative (CHDI) Foundation. Los Angeles, CA, USA. Overview of the Kinexus integrated proteomics and bioinformatics services platform.

201. March 29, 2016 – OMICS Group World Proteomics 6th Meeting. Atlanta, GE, USA. Two oral presentations: The SigNET KnowledgeBank - A series of on-line, open-access proteomics websites for biomarker identification and drug development; Tracking protein expression, modifications and interactions with antibody microarrays. (I also chaired two oral sessions)

202. July 18, 2016 – International Union of Molecular Biology and Biochemistry Meeting. Vancouver, BC. Positive and negative control of protein-serine/threonine kinases by phosphorylation in the catalytic domain T-loop. (I also chaired two oral sessions)

203. February 6, 2017 – Samsung Medical Center. Seoul, Korea. Tracking protein biomarkers in human lung tumour biopsies.

204. February 9, 2017 – 13th Korea Genome Organization (KOGO) Winter Symposium. Vivaldi Park, Korea. Tracking protein expression, modifications and interactions with antibody microarrays.

205. July 24th, 2017 – COSMO Bio. Toyko, Japan. Tracking protein expression, post-translational modifications and interactions with antibody microarrays.

206. July 26th, 2017 – Ono Pharmaceutical. Kyoto, Japan. Tracking protein expression, post-translationa modifications and interactions with antibody microarrays.

207. July 27th and 28th, 2017 – JPrOS 15th JHUPO Conference. Osaka, Japan. Two oral presentations: Tracking protein expression, post-translational modifications and interactions with antibody microarrays; Structure-function analyses of the catalytic domains of eukaryotic protein kinases.

208. August 30, 2017 – Bridging Discovery Research with Therapeutics Conference. Banff, Alberta. Investigations of the multi-site phosphorylation of CTP:phosphocholine cytidylyltransferase in huma cancer cell lines.

209. May 1, 2018 – Vancouver, BC. Tracking cell signalling protein expression, post-translation modifications, interactions and activation with antibody microarrays.

210. July, 2018 – EuroScicon Proteomics Meeting. London, England. Monitoring protein expression, phosphorylation and interactions with high content antibody microarrays. Structure-function studies of the catalytic domains of eukaryotic protein kinases. Meta-analyses of small molecule inhibitors of protein kinases. (Invited chair) (Meeting was cancelled by conference organizers 6 weeks in advance of the meeting)

211. November 19th and 20th, 2018 – 2nd Global Summit & Expo on Proteomics – 2018. Dallas, Texas. Structure-function studies of the catalytic domains of eukaryotic protein kinases. Monitoring protein expression, post-translational modifications and interactions with high content antibody microarrays Workshop – The open-access suite of bioinformatics websites in the SigNET KnowledgeBank. (Invited chair).

212. February 12, 2019 - 15th Korea Genome Organization (KOGO) Winter Symposium. Vivaldi Park, Korea. Tracking protein expression, post-translational modifications and interactions with high content antibody microarrays.

213. February 13, 2019 - Daegu Gyeongbuk Institute of Science and Technology. Daegu, Korea. Trackir protein expression, post-translational modifications and interactions with high content antibody microarrays.

214. January 15, 2021 – Overview of Kinexus Bioinformatics Corporation and the NDR ALS Biomarker Project. Neurodegenerative Disease Research (NDR), Inc. Group via ZOOM in USA

215. October 28, 2021 - Dr Steven Pelech - Science or fear vaccine mandates UBC. UBC Students for Freedom of Expression. Vancouver, B.C.

216. February 2, 2022 – Pandemic of the unvaccinated. Canadian Covid Care Alliance. Live Zoom presentation.

217. April 9, 2022 – Third Annual Med Ed Conference. Lions Gate Hospital Foundation Youth Advisory Committee. My past and your future in medical research and practice. Vancouver, B.C.

218. May 7, 2022 – Unity Conference. COVID-19, natural immunity and vaccines. Kelowna, B.C.

219. May 28 and 29, 2022 - Restore Canada Conference. We Unify Canada. Victoria, B.C.

220. June 22, 2022 – Citizen's Hearing on COVID-19. Canadian COVID Care Alliance, Toronto, Ontario

221. June 23, 2022 – COVID-19 and natural immunity: Do I need to get vaccinated. Langley, B.C.

222. June 30, 2022 – Progress report for the Kinexus Bioinformatics Corporation and the NDR ALS Biomarker Project. Neurodegenerative Disease Research (NDR), Inc. Group via ZOOM in USA

223. September 10, 2022 – Natural versus COVID-19 vaccine-induced immunity. Victory Canada Candlelight Vigil. Vancouver Art Gallery Plaza. Vancouver, B.C.

224. September 26, 2022 – Conference on Idaho Victims of Pandemic Policy and Law. Prevalence of natural and COVID-19 vaccine induced immunity: What does SARS-CoV-2 antibody testing show Via Zoom in USA.

225. October 1, 2022 – White Rock SDA Church. Natural immunity ... Science or science fiction? Part 1 and Part 2. White Rock, B.C.

226. December 10, 2022 – Vancouver Art Gallery Plaza. Natural Immunity versus COVID-19 vaccine-induced immunity. The risks are so great. Vancouver, B.C. https://www.canadiancovidcarealliance.org/all/20628/

227. January 18, 2023 – David Eby Constituent Office. Why Bill 36 is dangerous to our healthcare system. Vancouver, B.C.

228. January 21, 2023 – UBC Cancer Association. The discovery of the molecular basis of cancer. UBC SUB Nest, Vancouver, B.C.

229. January 23, 2023 – Fraserview Community Hall. Natural versus COVID-19 vaccine-induced immunity ... The Dwindling case for vaccination. Maple Ridge, B.C.

230. January 29, 2023 – Heritage Hall. Natural versus COVID-19 vaccine-induced immunity ... The Dwindling case for vaccination. Canadian Film Workers for Human Rights & Ethics Association Town Hall. Vancouver, B.C.

231. February 4, 2023 - White Rock SDA Church. The crumbling case for COVID-19 vaccination. White Rock, B.C.

232. February 18, 2023 - World Wide Rally for Freedom at 999 Robson Street. Vancouver, B.C.

233. March 13, 2023 – Neurodegenerative diseases – From their molecular basis to societal impacts. KINE 495-Neuro-motor movement control and rehabilitation. Capilano University. North Vancouver, B.C.

234. May 3, 2023 – The COVID-19 Pandemic...What Really Happened. Testimony at the National Citizen's Inquiry in Canada's COVID-19 Response. Langley, B.C. https://www.canadiancovidcarealliance.org/all/dr-pelechs-nci-presentation/

235. May 20, 2023 – World Freedom Rally at 999 Robson Street. Vancouver, B.C.

236. May 26-28, 2023 – Natural and COVID-19 vaccine-based immunity. WeUnify Reclaiming Canada Conference. Victoria, B.C. https://www.youtube.com/watch?v=iCB-h9Cd550 Starting at 1:09:00

237. September 16, 2023 – White Rock SDA Church. Natural Immunity – Update #3. Q&A with Dr. Steven Pelech. White Rock, B.C. https://livestream.com/accounts/23819274/events/9259494/videos/237604548

238. November 26, 2023 – Christine Anderson Canadian Tour – Freedom Rising. Maple Ridge, B.C. https://rumble.com/v3z5r6j-dr.-steven-pelech-documenting-the-science-around-covid-19.html Starting at 3:14

239. March 18, 2024 – Neurodegenerative diseases – From their molecular basis to societal impacts. KINE 495-Neuro-motor movement control and rehabilitation. Capilano University. North Vancouver, B.C.

240. September 21, 2024 – Bills, bills, bills – The taking of your rights and the ability to tell you so. Town Hall, Thompson Community Centre, Richmond, B.C.

241. October 3, 2024 – Bill 36 – The Health Professions and Occupations Act. White Rock Seventh-Day Adventis Church. White Rock, B.C.

242. December 7, 2024 – Bills 36, C63 and C293 – Dealing with the next pandemic. Town Hall Meeting, 5383 Granville Street, Vancouver, B.C.

243. January 22, 2025 – Masks – More harm than good? B.C. Rising Meeting by Zoom. B.C.

(e) Other Presentations

(f) Other - Poster (only Poster Presentations from 2016 are listed)

1. April 16, 2016 – American Association for Cancer Research Annual Meeting. New Orleans, LA, USA. Steven Pelech, Lambert Yue, Jeff White, Ryan Hounjet, and Dirk Winkler. Profiling signalling protein expression,
modifications and interactions with multi-dimensional antibody microarrays.
2. April, 2016 – Federation of American Societies for Experimental Biology Annual Meeting. San Diego, CA, USA. Two posters: Steven Pelech, Lambert Yue, Jeff White, and Dirk Winkler. Modifications and interactions with multi-dimensional antibody microarrays; Steven Pelech, Lambert Yue, Shenshen Lai, Dirk Winkler, Jane Shi and Hong Zhang. Production and Characterization of polyclonal generic phosphotyrosine-specific antibodies.
3. July 18, 2016 – International Union of Molecular Biology and Biochemistry Meeting. Vancouver, BC. Two posters: Lambert Yue and Steven Pelech - Multi-dimensional analyses of protein expression, modifications and interactions with high content antibody microarrays (PP01.108); Steven Pelech,

Shenshen Lai, Javad Safaei and Lambert Yue - Positive and negative regulation of protein-serine/threonine kinases by their phosphorylation upstream of subdomain VIII in the T-loop (CS02.04).

4. **April 2017 – American Association for Cancer Research Annual Meeting. Washington, DC. Poster: Lambert Yue and Steven Pelech - Tracking expression, post-translational modifications and interactions of EGF signalling proteins in A431 cells with antibody microarrays.**

5. April 2018 – Canadian National Proteomics Network Annual Meeting. Vancouver, BC. Two posters: Kevin Gonzales, Lambert Yue and Steven Pelech - Phosphorylation of CTP:phosphocholine cytidylyltransferase (PCYT1A); Dirk Winkler, Lambert Yue, Javad Safaei, Zhoung Hua and Steven Pelech - Identification of optimal substrate peptides for protein kinases.

6. October 2019 - Canadian Association of Neuropathologists. Kingston, ON. Poster: Koeppen, A., Travis, A.M., Sutter, C., Pelech, S., and Mazurkiewicz, J.E. - Friedreich cardiomyopathy is a secondary desminopathy.

7. November 13-16, 2019 - International Ataxia Research Conference. Washington, DC. Poster: Koeppen, A.H., Travis, A.M., Qian, J., Mazurkiewicz, J.E., Gelman, B.B., Pelech, S., Sutter, C. The tissue proteome of dorsal root ganglia in Friedreich ataxia.

8. December 11-14, 2021 - American Society for Hematology. Atlanta, GA. Oral presentation: Yen, R, Yue, L. Pelech, S., Jiang, X. Identification of a highly deregulated eIF4F translation initiation complex in drug-resistant BCR-ABL^{+} cells by a phospho-proteomic antibody microarray.

9. June 3, 2022 – American Peptide Society 2022 Symposium. Whistler, B.C. Poster: Winkler, D.F.H., Atrey, A., Kraft, J.C., Wang, J., Zhao, J.Z., Pelech, S. Investigation into the antibody responses of COVID-19 positive individuals.

10. June 24-29, 2023 - American Peptide Society 2022 Symposium. Scottsdale, Arizona. Poster P248: Winkler, DF.H., Pelech, S. SPOT synthesis – Advantages, Challenges, Limitations.

11. 2024 – Monterey, California. Poster: Koeppen, A.H., Mazurkiewicz, J.E., Feustel, P.J., Pelech, S., Sutter, C., Ahmad, S., Khan, H. Cellular proliferation in dorsal root ganglia of Friedreich ataxia.

12. March 5-9, 2024 – Alzheimer's and Parkinson's Diseases Conference. Lisbon, Portugal. Poster: Tânia Soares Martins, T.S., Pelech, S., Ferreira, M., Breitling, B., Hansen, N., Esselmann, H., Wiltfang, J., da Cruz e Silva, O.A.B. Ana Gabriela Henriques, A.G. Blood-derived extracellular vesicles proteome and phosphoproteome profiling in Alzheimer's disease through microarray analysis.

(g) Conference Participation (Organizer, Keynote Speaker, etc.)

1 1991 - Vancouver organizing committee for 1991 Society for the Study of Reproduction International Conference

2 25 October 1992 - Keystone, Colorado A.S.B.M.B. Symposium, Chairperson

3 1996 - 1997 Vancouver organizing committee for 1997 International Society for Heart Research International Conference

10.1 SERVICE TO THE UNIVERSITY

(a) Memberships on committees, including offices held and dates

Departmental

1 1988 - 2023 - Univ. of B.C. Dept. Medicine - Experimental Medicine Graduate Program Committee

In 2022, I attended two formal meetings of the Committee, reviewed over 80 scholarship applications, as well as faculty and student admissions to the graduate program

2 1993 - 1997 - Univ. of B.C. Department of Medicine Grant Review Committee - Active Member

3 1998 - 2002 - Univ. of B.C. Dept. Medicine - Academic Appointments, Reappointments, Promotions and Tenure Committee, Co-chair

4 July 24, 2000 - VHHSC Grant Panel

5 Brain Research Centre – Space Planning Committee – Meetings: April 8, 2009; May 1, 2009;

Divisional

6 1998 - 2004 - Brain Research Centre - Space Planning Committee - Active Member

7 1987 - 1996 - Univ. of B.C. Biomedical Research Centre - Safety Committee - Active Member

Faculty

8 1998 - 2001 - Faculty of Medicine MD/PhD Graduate Program Committee

9 2000 - 2003 - Faculty of Medicine Research Advisory Committee - Member

10 2003 - 2007 - Faculty of Medicine Senior Academic Appointments, Reappointments, Promotions and Tenure Committee - Member

11 2006-2008 – Faculty of Medicine Internal Reviewer (HeRRO) of grants prior to submission to C.I.H.R. (1 grant per year). In 2008, I reviewed a grant application prepared by Dr. Brian Kwon. He was successful in funding.

12 2004-2008 – TAG Workshop Instructor for Preparation of Teaching Dossiers (2-3 workshops per year). In 2008, one was given on March 5 at VGH and another was given on September 22 at Richmond General Hospital.

13 November, 2014 – Reviewer for VCHRI Top Graduate Doctoral Student Award – Preparation of reports for 7 applicants.

14 April 18, 2017 and May 10, 2017 – Facilitator for UBC Responsible Conduct Course

15 January 23, 2018 and February 6, 2018 – Facilitator for UBC Responsible Conduct Course

University

16 1998 - 2007 - Brain Research Centre - Space Planning Committee - Active Member

17 March 14, 1992 Judge - Second Annual Research Workshop, Reproductive & Developmental Sciences Program, Dept. Obstetrics & Gynaecology, U.B.C.

18 June 22, 2000 - Chairman of the Degree Validation Panel convened to review the Proposal for a joint British Columbia Institute of Technology/University of British Columbia Program for a Bachelor

of Science degree in Biotechnology

19 2001 - 2004 - Faculty of Medicine Research Planning Committee - Member

20 2001 - 2003 - University of British Columbia Research Awareness Committee Member

21 May 2, 2001 - Canada Research Chairs Selection Committee Member

22 March 12, 2002 - Vancouver Hospital Health Sciences Centre Salary Awards Panel

23 January 24, 2008 – Judge – UBC Faculty of Dentistry Graduate Research Poster Competition

24 February 27, 2008 – Panelist - UBC Department of Biochemistry and Molecular Biology Careers
25 Evening

March 13, 2014 – Panel member for 2014 Science Career Information Fair (SCIFair) at the Life Sciences Centre, UBC.
26
March 19, 2014 – Panel member for 2014 Biochemistry Careers Night for the Department of Biochemistry and Molecular Biology at the Abdul Ladha Science Student Centre, UBC.

27 January 11, 2017 – Poster judge for the Faculty of Dentistry Graduate Student Program

28 November 7, 2018 – Poster judge for the UBC Faculty of Medicine and VGH Research Expo

29 January 17, 2019 – Panelist – UBC Computer Science/Life Sciences Panel – Careers Evening

30 March 9, 2019 – Panelist and speaker at 2 workshops - Operation Med School Vancouver (OMS) – Career event for high school students at the Robert H. Lee Alumni Centre

31 October 1, 2020 – present – UBC Senate. Faculty of Graduate and Postdoctoral Studies Representation. Also served on the Senate Admissions Committee, and the Senate Admissions Appeals Committee (2020-2023); the Senate Academic Policy Committee, and the Senate Nominating Committee (2023-present)

(b) Other service, including dates

1 October 25, 1991 Medical Research Council representative for Scholarships Day at UBC

2 September 24, 1992 Medical Research Council Representative for Scholarships Day at UBC

3 October 29, 2008 - Representative for Brain Research Centre for strategic discussion meeting in Waterfront Hotel in downtown Vancouver with Deputy Minister David Molony from Industry Canada to review government support for translational research

4 December 11, 2008 – Representative for UBC for strategic discussion meeting with N.S.E.R.C. at Pinnacle Marriott Hotel in downtown Vancouver to review government support for translational research

5 September 29, 2014 – Panel member for biotechnology curriculum development at the Langara College – Teaching and Curriculum Development Centre

6 October 15, 2020 to December 31, 2022– Panel member for Langara College B.Sc. in Bioinformatics Advisory Committee

Dissertation Committee and Examinations

Ph.D. & M.Sc. Supervisory Committee Membership

1 Dr. Paul Sunga - Dept. of Medicine (1989-1992 until Ph.D.)

Dr. Yong Hei - Pharmaceutical Sciences (1990-1993 until Ph.D.)
Ms. Elham Ettehadieh - Dept. of Biochemistry (1990-1993)
Mr. Brett Gabelman - Dept. of Anatomy (1990-1992 until M.Sc.)
Mr. Liren Tang - Dept. of Zoology (1991-1995 until Ph.D. & Ph.D. Examiner)
Ms. Rachel Zhande - Dept. of Biochemistry (1991-1998 until Ph.D.)
Mr. Aswin Patel - Pharmaceutical Sciences (1992-1996 until Ph.D.)
Ms. Patricia Herrera-Velt - Dept. of Microbio. Immunol. (1992-1997 until Ph.D.)
Mr. Sep Farahbakhian - Pharmaceutical Sciences (1992-1994 until M.Sc.)
Ms. Marie-Terese Little - Dept. Obsteterics & Geynecology (until 1993)
Mr. Patrick Tang - Dept. Microbio. Immunol. (1993-1997 until Ph.D.)
Mr. Mohammed Hasham - Dept. of Medicine (1994-1995 until M.S.)
Ms. Krista McCutcheon - Dept. of Anatomy (1994-1996 until M.Sc.)
Mr. Allen Young - Dept. of Oral Biology (1995-1997)
Mr. Brent Hehn - Dept. of Oral Biology (1995-1997 until Ph.D.)
Mr. Steven Drew - Dept. of Medicine (1995-1998 until M.Sc.)
Mr. Alaa El-Husseini - Dept. of Psychiatry (1995-1997 until Ph.D.)
Ms. Julia Mills - Dept. of Psychiatry (1995-1998 until Ph.D.)
Ms. Claire Sutherland - Dept. Microbiology Immunology (1995-1999 until Ph.D.)
Ms. Rochelle Starhe - Dept. of Medicine (1996-2001 until Ph.D.)
Mr. Mark Ware - Dept. of Medicine (1996-2000)
Mr. Vijay Viswanathan - Dept. Psychiatry (1998-2004 until Ph.D.)
Mr. Olaf Heisel - Dept. of Medicine (1999-2001 until Ph.D.)
Mr. Godfrey Miles - Dept. of Plant Sciences (1999-present)
Mr. Jan Ehses - Dept. of Physiology (1999-2003 Ph.D.)
Ms. Shu Hong Li - Pharmaceutical Sciences (2000 until 2001 Ph.D.)
Ms. Doris Chiu - Dept. of Medicine (2000-until 2001 M.Sc.)
Ms. Lucy Marzban - Pharmaceutical Sciences (2000 until 2001 Ph.D.)
Ms. Somrudee Sritubtim - Dept. Plant Sciences (2000 until 2005 Ph.D.)
Mr. Steven Drews - Dept. of Medicine (2000-2003 until Ph.D.)
Mr. Farrell MacKenzie - Dept. of Pathology (2001-2003 until M.Sc)
Ms. Jiehong Ju - Dept. of Kinesiology, Simon Fraser University (2001-2004 until Ph.D.)
Ms. Mannie Fan - Neuroscience Program (2002-2008 until Ph.D.)
Ms. Gina Rossi - Dept of Medicine (2002-2010)
Ms. Michelle Woo - Dept. Medicine (2003-2007 until Ph.D.)
Ms. Catherine Tucker - Dept. Medicine (2004-2007 until Ph.D.)
Mr. Tyson Brust – Neuroscience Program (2005-2008 until Ph.D.)
Mr. Philip Ly – Dept. Medicine (2005-2007 until M.Sc.)

39 Mr. Ebrima Gibbs – Dept. Medicine (2005-2008 until Ph.D.)
40 Ms. Shirley Chen – Dept. Medicine (2005-2009)
41 Mr. Scott Widenmaier – Dept. Cellular Physiological Sciences (2006-2010 until PhD)
42 Mr. Gobind Sun – Dept. Medicine (2006-2007 until transfer to new supervisor)
43 Ms. Amy Lai - Dept. Medicine (2007-2008 until transfer to new supervisor)
44 Ms. Arezoo Ostenehe – Dept. Medicine (2009-2013)
45 Ms. Shenshen Lai - Dept. Medicine (2009-2015 until Ph.D.)
46 Mr. Dominik Sommerfeld - Dept. Medicine (2010-2012 until transfer to new supervisor)
47 Mr. Javad Safaei – Dept. Mathematics & Computer Science (2008-2015 until Ph.D.)
48 Ms. Trisha Kostesky – Dept. Medicine (2010-2011 until M.Sc.)
49 Mr. Mazyar Ghaffari – Dept. Medicine (2011-2015)
50 Ms. Valerie Poirier - Dept. Medicine (2011-2015 until Ph.D.)
51 Mr. Dennis Wong - Dept. Medicine (2011-2013)
52 Ms. Melissa Richard-Greenblat - Dept. Medicine (2012-2016 until Ph.D.)
53 Ms. Anna Cecilia Sjoestroem – Dept. Medicine (2013-2014 until M.Sc.)
54 Mr. Franco Cavaleri - Dept. Medicine (2014-2017)
55 Mr. Bisher Hassan Abuyassin – Dept. Pharmacology (2015-2018)
56 Mr. Lambert Yue - Dept. Medicine (2016-2020)
57 Ms. Anam Nan Nan Liu – Dept. Pathology and Laboratory Medicine (2017-2019)
58 Mr. Ryan Yen – Dept. Medicine (2017-2022)

Directed Research Studies or Practicum Supervision

1 Mr. Gordon Cheung – 4th year Zoology (2003-2004) 8 months
2 Ms. Nastaran Mohammadi – 5th year unclassified (2006) 7 months
3 Ms. Sharon Zhao – Department of Mathematics & Computer Sciences, Simon Fraser University. Ph.D. graduate student. Joint MITACS project supervision. (2005-2006) 8 months
4 Mr. Mazyar Ghaffari – 1st year graduate student (2008) 6 months starting March 1
5 Mr. Javad Safaei – Department of Mathematics & Computer Sciences, Simon Fraser University. Ph.D. graduate student. Joint MITACS project supervision. (2008-2015)
6 Ms. Parisa Shoosht – Department of Mathematics & Computer Sciences, Simon Fraser University. Ph.D. graduate student. Joint MITACS project supervision. (2008)
7 Mr. M. Shabab Hossain – Department of Computer Science, University of B.C., M.Sc. graduate student. Joint MITACS project supervision. (2011)
8 Mr. Alireza Davoodi - Department of Computer Science, University of B.C., M.Sc. graduate student. Joint MITACS project supervision. (2013-2014)
9 Ms. Nishima Arora – Biotech Biotechnology, Vellore Institute of Technology, India., undergraduate student. Six months full-time directed research studies (January 1 – June 30, 2015).

10 Mr. Lambert Yue – Department of Biology, University of B.C. 5th undergraduate student. Four months full-time directed research studies (January 1 – April 30, 2016).

11 Mr. Kevin Gonzales – Department of Biology, University of B.C. 5th year undergraduate. Eight months, part-time directed research studies (September 1, 2017-April 30, 2018).

12 Mr. Abiel Kwok – Integrated Sciences Program, University of B.C. 4th year undergraduate. Eight months, part-time directed research studies (September 1, 2019-April 30, 2020).

13 Mr. Kevin Wong – Department of Biology, University of B.C. 3th year undergraduate. Eight months, part-time directed research studies (September 1, 2019-April 30, 2020).

14 Mr. Samuel Bakteria – Pharmaceutical Sciences, University of B.C., 4th year undergraduate. Two months, full-time directed research studies (May 1-June 30, 2023), Four months, Honours Thesis, January 1-April 27, 2024).

15 Ms. Elizabeth Grountseva – Pharmaceutical Sciences, University of B.C., 4th year undergraduate practicum. Three months, full-time directed research studies (September 1-December 7, 2024). Four

16 months, Honours Thesis, January 1-April 27, 2025).

Ms. Delia Tjokroardi – Pharmaceutical Sciences, University of B.C., 4th year undergraduate practicum. Three months, full-time directed research studies (September 1-December 7, 2024).

B.Sc. Honours Thesis Examiner

1 Ms. Maryam Baghannazary - Dept. of Biology, University of B.C. (1992)

2 Mr. Danny Leung - Dept. of Biochemistry, Simon Fraser University (1994)

3 Ms. Monika Aluweilla - Dept. of Biochemistry, Simon Fraser University (1995)

4 Mr. Samuel Bakteria – Pharmaceutical Sciences, University of B.C. (2024)

M.Sc. Thesis Examiner

1 Mr. Jonathan Kao - Dept. of Medicine (1990)

2 Ms. Rachel Zhande - Dept. of Biochemistry (1991)

3 Mr. Peter Dreyden - Dept. of Medicine (1992)

4 Mr. John Stingl - Dept. of Anatomy (1992)

5 Mr. Brett Gabelman - Dept. of Anatomy (1992)

6 Mr. Sep Farahbakhian - Pharmaceutical Sciences, U.B.C (1994)

7 Mr. Mohammed Hasham - Dept. of Medicine, UBC (1996)

8 Ms. Krista McCutcheon - Dept. of Anatomy, UBC (1996)

9 Mr. Steven Drew - Dept. of Medicine (May 19, 1998)

10 Ms. Shu Hong Li - Pharmaceutical Sciences, UBC (May 23, 2000)

11 Mr. Tom Yokogawa - Dept. of Medicine (October 10, 2000)

12 Ms. Doris Chiu - Dept. of Medicine (October 4, 2001)

13 Mr. Farrell Mackenzie - Dept. Pathology (April 23, 2003)

14 Mr. Geoff Karjala – Dept. of Biochemistry & Molecular Biology (November 30, 2004)

15 Mr. Philip Ly – Dept. of Medicine (October 9, 2007)
16 Ms. Trisha Kostesky – Dept. Medicine (June 21, 2011)
17 Ms. Anna Cecilia Sjoestroem – Dept. of Medicine (October 7, 2013)
18 Ms. Anam Lui - Dept. of Medicine (September 30, 2019)

Ph.D. Oral Comprehensive Examiner

1 Ms. Marie Terese Little - Dept. Obstetrics & Gynaecology (June 10, 1991)
2 Dr. Amanda Jones - Dept. Medicine (December 11, 1991)
3 Ms. Patricia Herrarez - Dept. Microbiol. Immunol. (December 14, 1992)
4 Ms. Julia Mills - Dept. Psychiatry (June 21, 1995)
5 Mr. Alaa El-Husseini - Dept. Psychiatry (January 24, 1996)
6 Ms. Rochelle Starhe - Dept. of Medicine (May 27, 1997)
7 Mr. Olaf Heisel - Dept. of Medicine (2000)
8 Mr. Vijay Viswanathan - Dept. Psychiatry (June 15, 2000)
9 Mr. Godfrey Miles - Dept. Plant Sciences (September 15, 2000)
10 Mr. Jan Ehses - Dept. of Physiology (November 21, 2000)
11 Mr. Mohamed Sayed - Dept. of Medicine (December 19, 2000)
12 Mr. Steven Drews - Dept. of Medicine (February 7, 2001)
13 Mr. Kelvin Chang - Dept. of Obstetrics and Gynaecology (April 17, 2002)
14 Ms. Gina Rossi - Dept. Medicine (Sept 17 and Nov 10, 2004)
15 Mr. Gobind Sun – Dept. Medicine (May 28, 2007)
16 Mr. Scott Weidermaier – Dept. of Physiology (September 30, 2008)
17 Ms. Arezoo Astenehe – Dept. of Medicine (April 17, 2009)
18 Mr. Dennis Wong – Dept. of Medicine (September 30, 2009)
19 Mr. Darryl Bannon - Dept. of Medicine (November 10, 2011)
20 Ms. Valerie Poirer - Dept. of Medicine (November 25, 2011)
21 Ms. Shenshen Lai - Dept. of Medicine (December 14, 2011)
22 Mr. Darryl Bannon - Dept. of Medicine (May 17, 2012)
23 Ms. Joanna Triscott - Dept. of Medicine (June 4, 2012)
24 Ms. Melissa Richard – Dept. of Medicine (February 7, 2013)
25 Mr. Franco Cavaleri – Dept. of Medicine (April 17, 2015)
26 Mr. Bisher Hassan Abuyassin – Dept. of Medicine (December 12, 2016)
27 Mr. Ryan Yen – Dept. of Medicine (January 17, 2019)

Ph.D. Thesis Examiner

1 Mr. Grant Hatch - Dept. of Biochemistry, University of Manitoba (1989)

Dr. Poul Sorenson - Dept. of Pathology, UBC (1990)
Ms. Alice Mui - Dept. of Pathology, UBC (1992)
Mr. Paul Sunga - Dept. of Medicine, UBC (1992)
Dr. Jong Hei - Pharmaceutical Sciences, UBC (1993)
Mr. Guy Mordret - Dept. of Biochemistry, University of Brest, France (1993)
Ms. Corinne Reimer - Dept. of Anatomy, UBC (1994)
Mr. John Hill - Dept. of Pathology, UBC (1994)
Ms. Ruth Lanius - Dept. of Opthomology, UBC (1994)
Mr. Ashwin Patel - Pharmaceutical Sciences, UBC (1996)
Mr. Patrick Rebstein - Dept. of Microbiol. Immunol., UBC (1996)
Ms. Patricia Herrera-Velt - Dept. Microbio. Immunol, UBC (1997)
Mr. Xi-Long Zheng - Dept. of Medical Biochemistry, University of Calgary (June 23, 1997)
Mr. Vuk Stambolic - Dept. of Biochemistry, University of Toronto (August 7, 1997)
Mr. Alaa El-Husseini - Dept. of Psychiatry, UBC (October 17, 1997)
Ms. Rachel Zhande - Dept. of Biochemistry, UBC (December 1, 1997)
Mr. David Ng - Dept. of Microbio. Immunol., UBC (April 24, 1998)
Mr. Jeffrey Posaconi - Dept. of Chemistry, UBC (June 19, 1998)
Ms. Adrienne Boone - Dept. Biochemistry, UBC (April 5, 2000)
Ms. Zahara Jaffer - Dept. Microbiol. & Immunology, UBC (August 14, 2000)
Mr. Abdulaziz Al-Fahim - Dept. of Medicine, UBC (August 11, 2000)
Ms. Ravenska Wagey - Dept. of Medicine (December 14, 2000)
Ms. Amy Dambrowitz - Dept. of Biochemistry (June 6, 2001)
Ms. Rochelle Heisel - Dept. of Medicine (July 30, 2001)
Ms. Lucy Marzban - Faculty of Pharmaceutical Sciences (September 6, 2001)
Mr. Mohamed Sayed - Dept. of Medicine (October 26, 2001)
Ms. Xiaoli Cheng - Dept. of Biochemistry (December 10, 2002)
Mr. Steven Drews - Dept. Medicine (June 24, 2003)
Mr. Jan Ehsus - Dept. Physiology (July 18, 2003)
Mr. Kelvin Cheng - Dept. Gynaecology and Obstretics (Feb 4, 2004)
Ms. Sherri Christian - Dept. Microbiology and Immunology (May 5, 2004)
Ms. Elizabeth Slow - Dept. Medicine (November 26, 2004)
Ms. Rita Maghsoodi – (January 17, 2005) - Chair
Ms. Tanya Griffith – Department of Biochemistry and Molecular Biology (January 27, 2006) - Chair
Ms. Zhou Hongyan – University of Hong Kong (November 12, 2006) – External Examiner
Ms. Justine Karst – Department of Botany (July 9, 2007) - Chair
Mr. Robert Ferdman – Department of Astronomy (December 13, 2007) - Chair
Ms. Catherine Tucker – Department of Medicine (December 21, 2007)

39 Ms. Jin Suk Lee – Department of Botany (January 18, 2008) – University Examiner
40 Mr. Ebrima Gibbs – Dept. of Medicine (August 22, 2008)
41 Mr. Mark Romanish – Faculty of Science (July 22, 2009) – Chair
42 Mr. Douglas Sweeney – Faculty of Engineering (Nov. 12, 2009) - Chair
43 Mr. Scott Widenmaier – Dept. Cellular Physiological Sciences (June 30, 2010)
44 Mr. David Morin – Dept. of Medicine (December 22, 2011) - Chair
45 Ms. Grace Lee Kam – Dept. of Medicine (December 23, 2011)
46 Ms. Valerie Poirier – Dept. of Medicine (January 23, 2015)
47 Mr. Too Jin Park – Dept. of Medicine (February 10, 2015)
48 Ms. Shenshen Lai – Dept. of Medicine (March 25, 2015)
49 Mr. Javad Safaei – Dept. of Computer Science and Mathematics (April 9, 2015)
50 Ms. Melissa Richard – Dept. of Medicine (June 28, 2016)
51 Ms. Sylvia Cheung – Dept. of Surgery (September 15, 2016)
52 Mr. Saleem Iqbal – Crystallography and Biophysics, University of Madras, Chennai, India (November 9, 2018) – External Examiner
53 Mr. Bisher Hassan Abuyassin – Dept. of Medicine (December 21, 2018)
54 Mr. Ryan Yen – Dept. of Medicine (August 25, 2022)
55 Mr. Andrew Santos – Dept. Microbiology and Immunology (December 15, 2022)

10.2 SERVICE TO THE HOSPITAL

(a) Memberships on committees, including offices held and dates
(b) Other service, including dates

11. SERVICE TO THE COMMUNITY

(a) Memberships on scholarly societies, including offices held and dates

1 1990-present Canadian Society for Biochemistry and Molecular Biology - Active Member
2 1990-1992 Society for the Study of Reproduction (on local organizing committee for 1991 S.S.R. International Conference)
3 1996-1997 International Society for Heart Research (on local organizing committee for 1997 I.S.H.R. Conference)
4 1996-1999 American Society for Microbiology - Active Member
5 2016-2018 American Society for Biochemistry and Molecular Biology – Active Member

(b) Memberships on other societies, including offices held and dates

1 1980-1987, Canadian for Health Research - Active Member

2 1996-2002, 2008 Vancouver Public Aquarium - Active Member

2021-present, Vice-President, Co-chair of the Scientific and Medical Advisory Committee, Canadian Citizens Care Alliance (formerly Canadian Covid Care Alliance)

(c) Memberships on scholarly committees, including offices held and dates

1 1992-present Lunar Society - Active Member

(d) Memberships on other committees, including offices held and dates

1 1980-1983 - Executive Committee of B.C. Chapter of Canadian for Health Research

2 1991-1993 - M.R.C. of Canada Studentship Committee

3 1991-1994 – Canadian Heart & Stroke Foundation Operating Grant Panel

4 1994-1995 - Committee for West Vancouver High Schools Cooperative Education Program

5 1994- M.R.C. of Canada Program Grant Committee

6 1994- American Heart Association Grant Panel

7 1995-1996 -M.R.C. of Canada Operating Grant Committee - Biochem. Mol. Biol. Panel B

8 May 29-31, 2000 - Invited Member Strategic Planning Committee for the National Research Council of Canada Industrial Research Assistance Program

9 November 6-9, 2000 - Canadian Institute for Health Research - Operating Grant Committee - Cardiovascular Panel

10 July 31, 2001 - Michael Smith Foundation for Medical Research Senior Scholars and Scientist Award Committee

11 2001 - 2006 - Member Advisory Committee for the National Research Council of Canada Industrial Research Assistance Program

12 2001-2006 - Genome Prairie Scientific Advisory Board

13 2002 - 2007 - Simon Fraser University Biotechnology Advisory Council - Member

14 2003-2005 - Canadian Bioinformatics Resource Initiative - Chairman

15 2004-2010 - National Research Council of Canada Genome Health Initiative Expert Panel. In 2009, I attended the Annual Meeting of the GHI in Montreal in June 1st and 2nd, and provided mid-term reviews of 5 GHI projects for the NRC at an Expert Panel Meeting in Ottawa on December 6. In 2010, I judged new GHI projects on September 27 & 28 in Ottawa.

16 2005-2007 - Simon Fraser University Master of Technology Advisory Board

17 2005 - U.S. National Institutes of Health Director's Roadmap Initiatives, Technology Centers for Networks and Pathways (TCNP) Grant Panel (I was invited to join this panel again in 2008, but declined due to a timing conflict.)

18 2006 – Alberta Cancer Board Grant Review Panel for Programs of Distinction

19 2009 – Canadian Institutes for Health Research - Catalyst Grant: Invention and High-Risk, High-Benefit Research Panel. June 3-5 in Ottawa.

20 2010 – Canadian Institutes for Health Research - Catalyst Grant: Invention and High-Risk, High-Benefit Research Panel. June 3-5 in Ottawa.

21 2021 – 2022 Langara University Bioinformatics Advisory Committee

(e) Reviewer (journal, agency, etc. including dates) wec - Peer-reviewer of grant-in-aid applications

1 Medical Research Foundation of Canada: 1988 - 4; 1989 - 9; 1990 - 4; 1991 - 2; 1993 - 5; 1994 - 20; 1995 - 21; 1996 - 19; 1997 - 11; 1998 -6; 1999 -10; 2000 -5

2 Alberta Heritage Foundation: 1988 - 1; 1990 - 1; 1991 - 3; 1992- 2; 1993 - 4; 1994 -1; 1995 -2; 2000 - 4; 2001-1; 2005-1

3 Canadian Diabetes Association: 1988 - 1; 1990 - 1; 1993 -1; 1994 -2; 1995 - 2; 1996 -1; 2002-2; 2003-3

4 Canadian Arthritis Society: 1988 - 1; 1989 - 1

5 National Cancer Institute of Canada: 1988 - 1; 1995 -1; 2001 -8

6 Heart & Stroke Foundation of Canada: 1988 - 1; 1990 - 1; 1991 - 16; 1992 - 16; 1993 - 16, 1994 - 12; 1998 -1; 1999 -3; 2000-4; 2002-1

7 Kidney Foundation of Canada: 1989 - 1; 1990 - 1

8 Natural Sciences & Research Council of Canada: 1990 - 1; 1995 -1; 1996 -1; 2002-1; 2004-2; 2006-1; 2015-1; 2016-1

9 Manitoba Health Research Council: 1992 - 1; 1993 -1; 1994 -1; 1997-2

10 National Science Foundation (USA): 1992 - 1; 1993 - 4; 1994 -2; 1996 -1; 1997 -2; 1998 -2; 2004-1

11 American Diabetes Association: 1994-1

12 Israel Science Foundation: 1994-1; 1996 - 4

13 American Heart Association (USA): 1994 - 5

14 Alberta Cancer Board: 1996 - 2; 2000 –1; 2007-2

15 U.S.-Israel Binational Science Foundation: 1996 -1

16 British Columbia Health Research Foundation: 1999 -7

17 Canadian Institute for Health Research: 2000 -11; 2001-5; 2002-2; 2003-2; 2004-1; 2005-1; 2009-12; 2010-13

18 Hong Kong Research Granting Council: 2000 -1; 2003-2

19 Vancouver Hospital Health Sciences Centre: 2000 -2; 2002-5; 2005-1; 2006-1

20 Michael Smith Foundation Health Research: 2001-4; 2003-1

21 GenomePrairie: 2001-21; 2003-3; 2004-5; 2006-2

22 B.C. Lung Assoc.: 2002-1

23 Canadian Blood Services: 2002-1

24 Carcinogenesis: 2002-2

25 Biotechniques: 2002-1

26 Scottish Rite Charitable Foundation: 2003-1

27 International Cancer Research Agency: 2004-1

28 Biotechnology and Biological Sciences Research Council (United Kingdom): 2004-1
29 National Research Council of Canada: 2004-5; 2006-5; 2007-16; 2009-5; 2010-3
30 U.S. National Institutes of Health: 2005-13
31 Singapore Biomedical Research Council: 2010-1
32 Genome Alberta: 2012-4
33 Cancer Research UK: 2012-1

(f) Reviewer (journal, agency, etc. including dates) - Peer-reviewer of scientific manuscripts

1 Analytical Chemistry: 2005 - 2
2 Biochem. Cell Biology: 1989 - 1; 1990 - 1; 1992 - 1; 1993 -2
3 Biochim. Biophys. Acta: 1989 - 9; 1990 - 5; 1991 - 4; 1992 - 3; 1993 -1; 1994 - 3; 1995 - 3; 1998 -1; 2000 –1; 2005 - 2
4 Brain Research: 2005 - 1
5 Molecular Cellular Biology: 1989 - 2; 1992 - 1; 1993 - 5; 1994 - 3; 1995 -2; 1996-1; 2003-1
6 Science: 1989 - 1; 1991 - 1, 1992 - 1; 1993 -1; 1994 - 2
7 Digestive Diseases & Sciences: 1990 -1; 1991 -1
8 Endocrinology: 1990 -1
9 Experimental Eye Research: 1990 - 1
10 FEBS Reviews: 2005 - 1
11 Journal Biol. Chem.: 1989 - 1, 1997 -1
12 Journal of Interferon Research: 1990 - 1
13 Journal Clinical Invest.: 1992 - 1
14 Journal of Immunology: 1992 - 2, 1995 -1
15 Nature: 1992 - 2, 1993 - 4
16 Proc. Natl. Acad. Sci. USA: 1992 -1, 1994 - 3; 1995 -1
17 American Journal of Physiology: 1993 - 1
18 Developmental Biology: 1993 -2
19 Diabetes: 1993 -1
20 European J. Biochemistry: 1994-2, 1995-1
21 Blood: 1993 -1; 1995 -1; 1998 -1;1999 -1
22 Analytical Biochemistry: 1996 - 2
23 Trends in Cardiovascular Medicine: 1996 -1
24 Cancer Res.: 1997 -1
25 Journal of Neurochemistry: 1997- 2; 2001-1
26 Neurobiology of Aging: 1998 -1
27 Biochemistry: 2000 -1

28 Journal of Endotoxin Research: 2000 -2
29 Life Sciences: 2000 -1
30 Carcinogenesis: 2007-1
31 Public Library of Science (PloS): 2008-1
32 Journal of Neurological Sciences: 2010-1
33 Science – Cell Signaling: 2010-1
34 Systems Biology of Free Radicals and Anti-oxidants – 2012-1
35 Proteomics – 2016-1
36 Molecular and Cellular Proteomics – 2016-1
37 Journal of Proteome Research – 2017 -1
38 Cell Signalling – 2019-1
39 J. Alzheimer's Disease – 2021 - 1
40 Vaccines – 2022 – 2; 2023 - 1; 2024 – 1; 2025 - 1
41 Journal of Radiology and Oncology – 2023 - 1
42 Exploration of Drug Science – 2023-1
43 International Journal of Molecular Science – 2023-1
44 Medicina – 2024-1
45 Life Sciences – 2024-1
46 Viruses – 2024-1
47 Pathogens – 2024-1
48 Children – 2024-1
49 Microorganisms – 2024-1

(g) External examiner (indicate universities and dates)

1 1989 Ph.D. Defence of Grant Hatch - Dept. of Biochemistry, Univ. of Manitoba
2 1993 Ph.D. Defence of Guy Mordret - Dept. of Biochemistry, Univ. of Brest, France
3 1997 Ph.D. Defence of Xi-Long Zheng - Dept. of Medical Biochemistry, Univ. of Calgary
4 1997 Ph.D. Defence of Vuk Stambolic - Dept. of Biochemistry, Univ. of Toronto
5 2006 Ph.D. Defence of Zhou Hongyan - Department of Biochemistry, Univ. of Hong Kong
6 2018 Ph.D. Defence of Saleem Iqbal – Crystallography and Biophysics, Univ. of Madras, Chennai, India

(h) Consultant (indicate organization and dates)

1 1991-1999 Upstate Biotechnology Inc., Lake Placid, N.Y.
2 1995-present Kinections Consulting Ltd, Richmond, B.C.
3 1995-1999 Biozyme, Vancouver, B.C. (member of scientific advisory board)
4 1996-2000 Viratest, Burnaby, B.C. (member of scientific advisory board)

1997-2000 StressGen, Victoria, B.C.

1999 - present Kinexus Bioinformatics Corporation, Vancouver, B.C. (member Board of Directors)

2001 - 2006 GenomePraire Scientific Advisory Board

2001 - ARC Pharmaceuticals, Vancouver BC (member of Scientific Advisory Board)

2018 - present – GLG, Austin, Texas and London, UK (member of advisory council for industry)

2020 – present – Neurodegenerative Disease Research, Inc. (member of research consortium)

(i) Other service to the community

1990-present - Cooperative Education Program - Simon Fraser University

1991-2007 - Scientist in The School Program - coordinated by Science World

1992 – 2010 - Cooperative Education Program - University of Victoria

March 9, 1993 - Volunteer for Careers Presentation - Science World, Vancouver.

February 14, 1993 - Scientists and Innovators in the Schools, Kitsilano Secondary School, Vancouver

1994-present - Cooperative Education Program - West Vancouver Secondary Schools

1994-present - Mentor for B.C. Institute of Technology Biotechnology Program

1996-present Cooperative Education Program - University of B.C.

March 1, 1996 - Volunteer for Careers Presentation - Science World, Vancouver.

January 24, 1997 - Scientists & Innovators in the Schools, Gladstone Secondary School, Vancouver.

April 2, 1998 - Judge for 1998 Greater Vancouver Regional Science Fair at the University of BC

February 4, 1999 - Judge for 1999 BC Biotechnology Alliance Awards

April 8, 1999 - Judge for 1999 Greater Vancouver Regional Science Fair at the University of BC

April 19, 1999 - Judge for 1999 Connaught Biotechnology Science Fair, Vancouver

February 8, 2000 - Judge for 2000 BC Biotechnology Alliance Awards

April 6, 2000 - Judge for 2000 Greater Vancouver Regional Science Fair at the University of BC

2001 - Judge for 2001 Aventis Biotechnology Science Fair

February 1, 2001 - Judge for 2001 BC Biotechnology Alliance Awards

April 26, 2001 - Judge for 2001 Aventis Biotechnology Science Fair

March 2002 - Scientists & Innovators in the Schools, University Hill Secondary School, Vancouver.

21 2002 - Judge for 2002 Aventis Biotechnology Science Fair

22 January 17, 2019 - Invited Panelist – UBC Computer Science/Life Sciences Panel – Careers Evening

23 March 9, 2019 - Invited Speaker at Operation Med School Vancouver (OMS) Workshop for high school students. Career mentoring workshop (2 x 30 minute sessions) held at the Robert H. Lee Alumni Centre at UBC

24 September 1, 2020 – 2022 – Langara College Bioinformatics Advisory Board member

12. AWARDS AND DISTINCTIONS

(a) Awards for Teaching (indicate name of award, awarding organizations, date)

1 2001 Faculty of Medicine Distinguished lecturer - Basic Sciences

(b) Awards for Scholarship (indicate name of award, awarding organizations, date)

2 1975 Killarney Secondary School Scholarship, Killarney Sec. School, Vancouver

3 1975 B.C. Government Scholarship, Killarney Sec. School, Vancouver

4 1977 Canadian Found. for Diseases of the Liver Summer Studentship, Univ. of B.C.

5 1978 Natural Sciences and Engineering Research Council of Canada Postgraduate Scholarship, Univ. of B.C.

6 1979-1982 Medical Research Council of Canada Studentship, Univ. of B.C.

7 1982 Univ. of B.C. Graduate Student Speaker Competition (1st Place)

8 1982 Izaak Walton Killam Postdoctoral Fellowship

9 1982-1984 M.R.C. of Canada Postdoctoral Fellowship

10 1985 M.R.C. of Canada 1967 Centennial Fellowship

11 1988-1993 M.R.C. of Canada Scholarship Award

12 1993-1996 M.R.C. of Canada Scientist Award

13 1996-1998 M.R.C. of Canada Industrial Scientist Award

(d) Other Awards

14 1993 Canadian Soc. for Biochem. & Molec. Biol. Merck-Frosst Award - for outstanding research in the area of biochemistry and molecular biology in Canada

15 1993 Martin M. Hoffman Award - Univ. of B.C. Hospital Site for Research in Dept. of Medicine

16 1996 Business in Vancouver Top Forty Under Forty Award for Business Achievement

17 1998 International Who's Who

18 2001 Faculty of Medicine 2001 Distinguished Lecturer, University of BC

Fellowship Awards (won by Post-Doctoral Fellows under supervision)

19 Lefebrve, D. - MRC Fellowship 1995-1996

20 Sahl, B. -MRC Fellowship 1995-1997
21 Bhanot, S. - BC Heart & Stroke Fellowship 1995-1997
22 Bhanot, S. - MRC Fellowship (declined) 1995-1997
23 Koide, B. - MRC Fellowship 1995
24 Xu, Yan-Jun - MRC Fellowship 1998-1999
25 Zhang, Hong - NSERC Industrial Fellowship 2003-2004

Studentship Awards (won by Graduate Students under supervision)

26 Palaty, C. - NSERC Studentship 1991-1994
27 Samiei, M. - MRC Studentship 1992-1994
28 Charest, D. L. - Walter Babicki Studentship 1992
29 Charlton, L. - NSERC Studentship 1992-1995
30 Charest, D. L. - MRC Studentship 1993-1997
31 Morrison, D. L. - MRC Studentship 1993-1997
32 Tudan, C. - MRC Studentship 1993-1996
33 Kim, S. - MRC Studentship 1993-1997
34 Palaty, C. - Walter Babicki Studentship 1995
35 Charlton, L. - Killam Studentship 1996-1997
36 Wagey, V. - University Graduate Fellowship 1997-1998
37 Marotta, A. - Evelyn Martin Fellowship 1998-1999
38 Sayed, M. - MRC Studentship 2000-2002
39 Shenshen Lai – University of B.C. Graduate Fellowship 2010-2014
40 Lambert Yue – UBC Experimental Medicine Graduate Program Entrance Award (2016); NSERC Graduate Fellowship 2017-2018; UBC 4YF Scholarship 2018-2020
41 Hamidreza Galavi - UBC Experimental Medicine Graduate Program Entrance Award (2020); UBC 4YF Scholarship 2020-2023; Vanier Award 2022-2024

13. OTHER RELEVANT INFORMATION (Maximum One Page)

1992-1998 - President, CEO and major stock owner of Kinetek Pharmaceuticals, Inc.

Kinetek was a private, early stage biotechnology company that employed 15 Ph.D./M.D. level scientists and 25 other technical and other supporting personnel at the time that I left the company. It was engaged in the discovery and development of drugs for the treatment of cancer, diabetes and other chronic diseases of aging. The Kinetek activities occupied over 18,000 square feet at two locations in south Vancouver. It was acquired by QLT, Inc. in 2004.

1995 - present - President and major stock owner of Kinections Consulting Ltd.

Kinections is a private company that provides consulting advise related to cellular signal transduction and the biotechnology industry. Its services also include the preparation of scientific reports and

illustrations.

1999 - present - Founder, President, Chief Scientific Officer and major stock owner of Kinexus Bioinformatics Corporation

Kinexus Bioinformatics is a private company that provides analytical services related to the tracking of protein kinases and bioinformatics related to protein kinases. It has provided proteomics services to over 2000 laboratories in 40 countries. Over 200 of the company's clients are in companies. Twenty-nine of the top 30 pharmaceutical companies in the world have been clients of Kinexus.

2021 – present – Founder, Vice-President, Co-Chair of the Scientific and Medical Advisory Committee (SMAC) of the Canadian Citizens Care Alliance (CCCA) (originally called the Canadian Covid Care Alliance). The CCCA was founded to provide balanced, evidence-based and scientifically sound analyses of recommendations related to COVID-19 with respect to it diagnosis, prevention and treatment. It has over 1700 members across Canada, which includes over 600 research scientists, professors, medical doctors and other health practitioners, and lawyers amongst other professionals. I participated in weekly meetings throughout 2021, 2022, 2023 and 2024, Tuesdays 4:00 pm - 5:00 pm – SMAC meetings, Tuesdays 5:00 pm - 8:00 pm – Steering Committee meetings, Wednesdays 5:00 pm - 8:00 pm – General Membership meetings. These meetings are now biweekly.

14. SCIENTIFIC PUBLICATIONS

Total Peer Reviewed in Published in Journals: 201 + 1 submitted
Total Reviews, Book Chapters, Pre-prints Published: 76 + 2 books as an editor with authored chapters
Patents Applied and Issued: 3
Websites: 9

i. REFEREED PUBLICATIONS IN PEER-REVIEWED JOURNALS

1. PELECH, S.L., Pritchard, P.H., and Vance, D.E. cAMP analogues inhibit phosphatidylcholine biosynthesis in cultured rat hepatocytes. J. Biol. Chem. 256: 8283-8286 (1981).

2. Pritchard, P.H., PELECH, S.L., and Vance, D.E. Analogues of cAMP inhibit phosphatidylethanolamine N-methylation by cultured rat hepatocytes. Biochim. Biophys. Acta 666: 301-306 (1981).

3. PELECH, S.L. and Vance, D.E. Regulation of rat liver cytosolic CTP:phosphocholine cytidylyltransferase by phosphorylation and dephosphorylation. J. Biol. Chem. 257: 14198-14202 (1982).

4. PELECH, S.L., Pritchard, P.H., and Vance, D.E. Prolonged effects of cyclic AMP analogues on phosphatidylcholine biosynthesis in cultured rat hepatocytes. Biochim. Biophys. Acta 713:260-269 (1982).

5. PELECH, S.L., Pritchard, P.H., Brindley, D.N. & Vance, D.E. Fatty acids promote translocation of CTP:phosphocholine cytidylyltransferase to the endoplasmic reticulum and stimulate rat hepatic phosphatidylcholine synthesis. J. Biol. Chem. 258: 6782-6788 (1983).

6. PELECH, S.L., Jetha, F. & Vance, D.E. Trifluoperazine and other anaesthetics inhibit rat liver CTP: phosphocholine cytidylyltransferase. FEBS Lett. 158: 89-92 (1983).

7. PELECH, S.L., Pritchard, P.H., Brindley, D.N. & Vance, D.E. Fatty acids reverse the cyclic AMP inhibition of triacylglycerol and phosphatidylcholine synthesis in rat hepatocytes. Biochem. J. 216: 129-136 (1983).

8. PELECH, S.L., Power, E. and Vance, D.E. Activities of the phosphatidylcholine biosynthetic enzymes in rat liver during development. Can. J. Biochem. Cell Biol. 61: 1147-1152 (1983).

9. Audubert, F., PELECH, S.L. & Vance, D.E. Fatty acids inhibit N-methylation of phosphatidylethanolamine in rat hepatocytes and liver microsomes. Biochim. Biophys. Acta 792: 348-357 (1984).

10. PELECH, S.L., Pritchard, P.H., Sommerman, E.F., Percival-Smith, A. & Vance, D.E. Glucagon inhibits phosphatidylcholine biosynthesis via the CDP-choline and transmethylation pathways in cultured rat hepatocytes. Can. J. Biochem. Cell Biol. 62: 196-202 (1984).

11. PELECH, S.L., Cook, H.W., Paddon, H.B. & Vance, D.E. Membrane-bound CTP: phosphocholine cytidylyltransferase regulates the rate of phosphatidylcholine synthesis in HeLa cells treated with unsaturated fatty acids. Biochim. Biophys. Acta 795: 433-440 (1984).

12. PELECH, S.L. & Vance, D.E. Trifluoperazine and chlorpromazine inhibit phosphatidylcholine biosynthesis and CTP:phosphocholine cytidylyltransferase in HeLa cells. Biochim. Biophys. Acta 795: 441-446 (1984).

13. PELECH, S.L., Paddon, H.B. & Vance, D.E. Phorbol esters stimulate phosphatidylcholine biosynthesis by translocation of CTP: phosphocholine cytidylyltransferase from cytosol to microsomes. Biochim. Biophys. Acta 795: 447-451 (1984).

14. PELECH, S.L., Cohen, P., Fisher, M.J., Pogson, C.I., El-Maghrabi, M.R. & Pilkis, S.J. The protein phosphates involved in cellular regulation: Glycolysis, gluconeogenesis and aromatic amino acid breakdown in rat liver. Eur. J. Biochem. 145: 39-49 (1984).

15. PELECH, S.L. & Cohen, P. The protein phosphatase involved in cellular regulation: Modulation of protein phosphatases-1 and 2A by histone H1, protamine, polylysine and heparin. Eur. J. Biochem. 148: 245-251 (1985).

16. Tung, H.Y.L., PELECH, S., Fisher, M.J., Pogson, C.I. & Cohen, P. The protein phosphatases involved in cellular regulation: Influence of polyamines on the activities of protein phosphatase-1 and protein phosphatase-2A. Eur. J. Biochem. 149: 305-313 (1985).

17. Alemany, S., PELECH, S., Brierley, C.H. & Cohen, P. The protein phosphatases involved in cellular regulation: Evidence that dephosphorylation of glycogen phosphorylase and glycogen synthase in glycogen and microsomal fractions of rat liver are catalysed by the same enzyme: protein phosphatase-1. Eur. J. Biochem. 156: 101-110 (1986).

18. PELECH, S.L., Ozen, N., Audubert, F. & Vance, D.E. Regulation of rat liver phosphatidylethanolamine N-methyltransferase by cytosolic factors- Examination of a role for reversible protein phosphorylation. Biochem. Cell Biol. 64: 565-574 (1986).

19. PELECH, S.L., Olwin, B.B. & Krebs, E.G. Fibroblast growth factor treatment of Swiss 3T3 cells activates an S6 kinase which phosphorylates a synthetic peptide substrate. Proc. Natl. Acad. Sci. U.S.A. 83:5968-5972 (1986).

20. PELECH, S., Meier, K. & Krebs, E.G. A rapid microassay for protein kinase C translocation in mitogen-treated Swiss 3T3 cells. Biochemistry 25: 8348-8353 (1986).

21. PELECH, S.L. & Krebs, E.G. Mitogen-activated S6 kinase is stimulated via protein kinase C-dependent and independent pathways in Swiss 3T3 cells. J. Biol. Chem. 262:11598-11606 (1987).

22. PELECH, S.L., Meijer, L. & Krebs, E.G. Characterization of maturation-activated histone H1 and ribosomal S6 kinases in sea star oocytes. Biochemistry 26:7960-7968 (1987).

23. Meijer, L., PELECH, S.L. & Krebs, E.G. Differential regulation of histone H1 and ribosomal S6 kinases during sea star oocyte maturation. Biochemistry 26:7968-7974 (1987).

24. Cicirelli, M.F., PELECH, S.L. & Krebs, E.G. Kinase activation during the burst in protein phosphorylation that precedes meiotic cell division in Xenopus oocytes. J. Biol. Chem. 263:2009-2019 (1988).

25. PELECH, S.L., Tombes, R.M., Meijer, L. & Krebs, E.G. Activation of myelin basic protein kinases during echinoderm oocyte maturation and egg fertilization. Devel. Biol. 130:28-36 (1988).

26. Cicirelli, M.F., PELECH, S.L. & Krebs, E.G. Insulin and progesterone activate a common ribosomal protein S6 peptide kinase in Xenopus oocytes. FEBS Lett. 241:195-201 (1988).

27. PELECH, S.L., Paddon, H.B., Kwong, L.C. & Weeks, G. Characterization of developmentally regulated cAMP/Ca2+-independent protein kinases from *Dictyostelium discoideum*. Dev. Growth. Differ. 31:351-361 (1989).

28. Duronio, V., & PELECH, S.L. Interleukin 3 stimulates the turnover of phosphatidylcholine in the mast cell/megakaryocyte line R6-XE.4. Biochem. Biophys. Res. Commun. 164:804-808 (1989).

29. Sanghera, J.S., Paddon, H.B., Bader, S.A., & PELECH, S.L. Purification and characterization of a maturation-activated myelin basic protein kinase from sea star oocytes. J. Biol. Chem. 265, 52-57 (1990).

30. PELECH, S.L., Charest, D., Howard, S., Paddon, H. B., & Salari, H. Protein kinase C activation by platelet activating factor is independent of enzyme translocation. Biochim. Biophys. Acta 1051:100-107 (1990).

31. PELECH, S.L., Paddon, H.B., Charest, D.L., & Federsppiel, B.S. Interleukin 3 induced activation of protein kinases in the mast cell/megakaryocyte R6-XE.4 line. J. Immunol. 144:1759-1766 (1990).

32. Salari, H., Duronio, V., Howard, S., Demos, M., Jones, K., Reany, A., Hudson, A. T., & PELECH, S. L. Erbstatin blocks platelet activating factor-induced protein-tyrosine phosphorylation, polyphosphoinositide hydrolysis, protein kinase C activation, serotonin secretion and aggregation of rabbit platelets. FEBS Lett. 263:104-108 (1990).

33. Salari, H., Duronio, V., Howard, S., Demos, M, & PELECH, S. L. Translocation-independent activation of protein kinase C by platelet activating factor, thrombin and prostacyclin. Biochem. J. 267:689-696 (1990).

34. Sanghera, J. S., Aebersold, R., Morrison, H. D., Bures, E. J., & PELECH, S. L. Identification of the sites in myelin basic protein that are phosphorylated by maturation-activated p44mpk by solid phase-sequence analysis. FEBS Lett. 273:223-226 (1990).

35. Sanghera, J. S., Paddon, H. B., & PELECH, S. L. Role of protein phosphorylation in the maturation-induced activation of a myelin basic protein kinase from sea star oocytes. J. Biol. Chem. 266:6700-6707 (1991).

36. PELECH, S. L., Sanghera, J. S., Paddon, H. B., Quayle, K., & Brownsey, R. Identification of the major maturation-activated acetyl-CoA carboxylase kinase in sea star oocytes as p44mpk. Biochem. J. 274:759-767 (1991).

37. Posada, J., Sanghera, J. S., PELECH, S. L., Aebersold, R., & Cooper, J. Tyrosine phosphorylation and activation of homologous protein kinases during oocyte maturation and mitogenic activation of fibroblasts. Mol. Cell. Biol. 11:2517-2528 (1991).

38. PELECH, S. L., Samiei, M., Charest, D. L., Howard, S. L., & Salari, H. Production of calcium-independent forms of protein kinase C-□ in phorbol ester-treated rabbit platelets. J. Biol. Chem. 266:8696-8705 (1991).

39. Daya-Makin, M., PELECH, S. L., Levitzki, A., & Hudson, A. T. Erbstatin and tyrophostins block protein-serine kinase activation and meiotic maturation of sea star oocytes. Biochim. Biophys. Acta 1093:87-94 (1991).

40. Clark-Lewis, I., Sanghera, J. S., & PELECH, S. L. Definition of a consensus sequence for peptide substrate recognition by p44mpk, the meiosis-activated myelin basic protein kinase. J. Biol. Chem. 266:15180-15184 (1991).

41. Chung, J., PELECH, S. L., & Blenis, J. Mitogen-activated Swiss mouse 3T3 rsk kinases I and II are related to pp44mpk from sea star oocytes and particpate in the regulation of p90rsk activity. Proc. Natl. Acad. Sci. U.S.A. 88:4981-4985 (1991).

42. Samiei, M., Makin-Daya, M., Clark-Lewis, I. & PELECH, S. L. Platelet activating factor- and thrombin-induced stimulation of p34cdc2/cyclin histone H1 kinase activity in platelets. J. Biol. Chem. 266:14889-14892 (1991).

43. Rossomando, A. J., Sanghera, J. S., Marsden, L. A., Weber, M. J., PELECH, S. L., & Sturgill, T. W. Evidence for a family of serine/threonine protein kinases regulated by tyrosine and serine/threonine phosphorylations. J. Biol. Chem. 266:20270-20275 (1991).

44. Sanghera, J. S., McNabb, C., Tonks, N., & PELECH, S. L. Tyrosyl phosphorylation and activation of the myelin basic protein kinase p44mpk during sea star oocyte maturation. Biochim. Biophys. Acta 1095:153-160 (1991).

45. Sanghera, J. S., Charlton, L., Paddon, H. B., & PELECH, S. L. Purification and characterisation of casein kinase II from sea star oocytes. Biochem. J. 283:829-837 (1992).

46. Mukhopadhyay, N. K., Price, D. J., Kyriakis, J. M., PELECH, S., Sanghera, J. S., & Avruch, J. An array of insulin-activated, proline-directed serine/threonine protein kinases phosphorylate the p70 S6 kinase. J. Biol. Chem. 267:3325-3335 (1992).

47. Charlton, L., Sanghera, J. S., Clark-Lewis, I., & PELECH, S. L. Structure-function analysis of casein kinase 2 with synthetic peptides and anti-peptide antibodies. J. Biol. Chem. 267:8840-8845 (1992).

48. Peter, M., Sanghera, J. S., PELECH, S. L., & Nigg, E. Mitogen-activated protein kinases phosphorylate nuclear lamins and display sequence specificity overlapping that of mitotic protein kinase p34cdc2, Eur. J. Biochem. 205:287-294 (1992).

49. Ettehadieh, E., Sanghera, J. S., PELECH, S. L., Hess-Bienz, D., Watts, J., Shastri, N., & Aebersold, R. Tyosyl phosphorylation and activation of MAP kinases by p56lck. Science 255:853-855 (1992).

50. Daya-Makin, M., Szankasi, P., Tang, MacRae, D., & PELECH, S. L. Regulation of p105wee1 and p34cdc2 during meiosis in Schizosaccharomyces pombe. Biochem. Cell. Biol. 70:1088-1096 (1992).

51. Hinze, E., Michaelis, C., Daya-Makin, M., PELECH, S. & Weeks, G. Immunological characterization of cdc2 and wee1 proteins during the growth and differentiation of Dictyostelium discoideum. Develop. Growth Differ. 33:363-369 (1992).

52. Okuda, K., Sanghera, J., PELECH, S. L., Kanakura, Y., Hallek, M., Griffin, J. D., & Druker, B. J. Granulocyte-macrophage colony stimulating factor, interleukin-3, and steel factor induce rapid tyrosyl phosphorylation of p42 and p44 MAP kinase. Blood 79:2880-2887 (1992).

53. Gold, M. R., Sanghera, J. S., Stewart, J., & PELECH, S. L. Selective activation of p42 MAP kinase in B lymphocytes by membrane immunoglobulin crosslinking. Evidence for protein kinase C-independent and dependent mechanisms of activation. Biochem. J. 287:269-276 (1992).

54. Weinstein, S. L., Sanghera, J. S., Lemke, K., DeFranco, A. L., & PELECH, S. L. Bacterial lipopolysaccharides induces tyrosine phosphorylation and activation of MAP kinases in macrophages. J. Biol. Chem. 267:14955-14962 (1992).

55. Sanghera, J. S., Hall, F. L., Warburton, D., Campbell, D., & PELECH, S. L. Thr-669 phosphorylation site peptide from epidermal growth factor receptor is phosphorylated by distinct MAP kinase isoforms. Biochim. Biophys. Acta 1135: 335-342 (1992).

56. Wu, C. B., PELECH, S. L., & Veis, A. The in vitro phosphorylation of the native rat incisor dentin phosphophoryns. J. Biol. Chem. 267:16588-16594 (1992).

57. Welham, M. J., Duronio, V., Sanghera, J. S., PELECH, S. L., & Schrader, J. W. Multiple hemopoietic growth factors stimulate activation of MAP kinase family members. J. Immunology 149:1683-1693 (1992).

58. Sanghera, J. S., Peter, M., Nigg, E. A. & PELECH, S. L. Immunological characterization of MAP kinases in chicken DU249 cells.: Evidence for nuclear localization. Molecular Biology of the Cell 3:775-787 (1992).

59. Childs, T., Watson, M. H., Sanghera, J. S., Campbell, D. L., PELECH, S. L. and Mak, A. S. Phosphorylation of smooth muscle caldesmon by MAP kinase and expression of MAP kinase in differentiated smooth muscle cells. J. Biol. Chem. 276:22853-22859 (1992).

60. Baraban, J. M., Fiore, R. S., Sanghera, J. S., Paddon, H. B., & PELECH, S. L. Identification of p42 MAP kinase as a tyrosine kinase substrate activated by electroconvulsive treatment in hippocampus. J. Neurochem. 60:330-336 (1993).

61. Charest, D. L., Mordet, G., Harder, K., Jirik, F. & PELECH, S. L. Molecular cloning and characterisation of human p43erk1, a tyrosine-phosphorylated and activated protein-serine/threonine kinase. Mol. Cell. Biol. 13:4679-4690 (1993).

62. Hei, Y., Sanghera, J. S., Diamond, J., McNeill, J. H., & PELECH, S. L. Activation of MAP kinases and S6 kinases in rat skeletal muscle by in vivo administration of insulin. J. Biol. Chem. 268:13203-13213 (1993).

63. Samiei, M., Sanghera, J. S., & PELECH, S. L. Activation of myelin basic protein and S6 peptide kinases in phorbol ester -and PAF-treated sheep platelets. Biochim. Biophys. Acta. 1176:287-298 (1993).

64. Williams, N. G., Paradis, H., Charest, D. L., PELECH, S. L., & Roberts, T. M. Activation of MAP kinase p44erk1 by p21v-ras via Raf-1 in Sf9 insect cells. Proc. Natl. Acad. Sci. U.S.A. 90:5772-5776 (1993).

65. Williams, R., Sanghera, J., Wu, F., Carbonaro-Hall, D., Warburton, D., Campbell, D., PELECH, S. L., & Hall, F. Identification of a human EGF receptor associated protein kinase as a new member of the MAPK/ERK family. J. Biol. Chem. 268:18213-18217 (1993).

66. Watts, J.D., Sanghera, J.S., PELECH, S. L., & Aebersold, R. Phosphorylation of serine-59 of p56lck in activated T cells. J. Biol. Chem. 268:23275-23282 (1993).

67. Fiore, R. S., Bayer, V., PELECH, S. L., Posada, J., Cooper, J. A., & Baraban, J. M. MAP kinase in brain: Prominent localization in neuronal cell bodies and dendrites. Neuroscience 55:463-472 (1993).

68. Fiore, R. S., Murphy, T. H., Sanghera, J. S., PELECH, S. L., & Baraban, J. M. Activation of p42 MAP kinase by glutamate receptor stimulation in rat primary cortical cultures. J. Neurochem. 61:1-8 (1993).

69. Pignata, C., Sanghera, J. S., Cossette, L., PELECH, S. L., & Ritz, J. Interleukin-12 induces tyrosine phosphorylation and activation of 44 kD mitogen-activated protein kinase in human T cells. Blood 83:184-190 (1994).

70. Hei, Y.-J., PELECH, S. L., Chen, X., Diamond, J., & McNeill, J. H. Purification and characterization of a novel ribosomal S6 kinase from skeletal muscle of insulin-treated rats. J. Biol. Chem. 269:7816-7823 (1994).

71. Daya-Makin, M., Sanghera, J. S., Morgentale, T. L., Lipp, M., Parchomchuk, J., Hogg, J. C., & PELECH, S. L. Activation of a tumor-associated protein kinase (p40TAK) and casein kinase 2 in human squamous cell carcinomas and adenocarcinomas of the lung. Cancer Res. 54:2262-2268 (1994).

72. Tang, L., PELECH, S. L. & Berger, J. A cdc2-like kinase associated with commitment to division in Paramecium tetraurelia. J. Euk. Microbiol 41:381-387 (1994).

73. Quamme, G., PELECH, S., Biber, J. & Murer, H. Abnormalities of parathyroid hormone-mediated signal transduction mechanisms in opossum kidney cells. Biochim. Biophys. Acta 1223:107-116 (1994).

74. Tang, L., PELECH, S. L. & Berger, J. Isolation of the cell cycle control gene cdc2 from Paramecium tetraurelia. Biochim. Biophys. Acta 1265:161-167 (1995).

75. Kiyotaka, K., Lazarus, A. H., Sanghera, J.S., Leung Pui Man, G., PELECH, S. L., & Delovitch, T. L. Regulation of BCR- and PKC/Ca2+-mediated activation of the Raf1/MEK/MAPK pathway by protein-tyrosine kinase and tyrosine phosphatase activity. Mol. Immunol. 33:287-296 (1995).

76. Hei, Y.-J., Chen, X., PELECH, S. L., Diamond, J., & McNeill, J. H. Suppression of skeletal muscle mitogen-activated protein kinases and ribosomal S6 kinases in chronic diabetic rats: reversal by vanadium. Diabetes 44:1147-1155 (1995).

77. Lanius, R. A., Paddon, H. B., Mezei, M., Krieger, C., PELECH, S. L., & Shaw, C. A. A role for amplified PKC activity in the pathogenesis of ALS. J. Neurochem. 65:927-930 (1995).

78. Cornell, R., Kalmar, G., Kay, R. J., Johnson, M. A., Sanghera, J. S. & PELECH, S. L. Functions of the C-terminal domain of CTP:phosphocholine cytidylyltransferase; Effects of C-terminal deletions on enzyme activity, intracellular localization and phosphorylation potential. Biochem. J. 310:699-708 (1995).

79. Shemanko C. S., Sanghera, J. S., Milner, R. E., PELECH, S. L., & Michalak, M. Phosphorylation of the carboxyl-terminal of dystrophin by mitogen-activated (MAP) kinase. Mol. Cell Biochem. 152:63-70 (1995).

80. Jovanovic, J. N., Benfenati, F., Siow, Y. L., Sihra, T. S., Sanghera, J. S., PELECH, S. L., Greengard, P., & Czernik, A. J. Neutrophins stimulate phosphorylation of synapsin I by MAP kinase and regulate synapsin I-actin interactions. Proc. Natl. Acad. Sci. U.S.A. 93:3679-3683 (1996).

81. Young, A., Hehn, B., Sanghera, J. S., PELECH, S. L., & Shah, R. Changes in casein kinase activity during development of the secondary palate in hamster. Anatomical Record 245:724-730 (1996).

82. Sanghera, J. S., Weinstein, S., Aluwalia, M., Girn, J., & PELECH, S. L. Activation of multiple proline-directed kinase by bacterial lipopolysaccharide in murine macrophages. J. Immunol. 156:4457-4465 (1996).

83. Sutherland, C. L., Heath, A. W., PELECH, S. L., Young, P. R., & Gold, M. R. Differential activation of the ERK, JNK and p38 mitogen-activated protein kinases by CD40 and the B cell antigen receptor. J. Immunol. 157:3381-3390 (1996).

84. Morrison, D. L., Sanghera, J. S., Stewart, J., Sutherland, C., Walsh, M. P., & PELECH, S. L. Phosphorylation and activation of smooth muscle myosin light chain kinase by the MAP kinase and cyclin-dependent kinase-1. Biochem. Cell Biol. 74:549-557 (1996).

85. Scheid, M. P., Charlton, L., PELECH, S. L., & Duronio, V. Role of p70 S6 kinase in cytokine-regulated hemopoietic cell survival. Biochem. Cell Biol. 74:595-600 (1996).

86. Tao, J.-S., Sanghera, J. S., PELECH, S. L., Wong, G., & Levy, J. G. Stimulation of stress-activated protein kinase and p38 HOG1 kinase in murine keratinocytes following photodynamic therapy with benzoporphyrin derivative. J. Biol. Chem. 271:27107-27115 (1996).

87. Pignata, C., Sanghera, Soiffer, R. J., Chartier, S., Eder, M., PELECH, S. L., & Ritz, J. Defective activation of mitogen-activated protein kinase after allogenic bone marrow transplantation. Blood 88:2334-2341 (1996).

88. Liao, D.F., Duff, J., Daum, G., PELECH, S. L., & Berk, B. Angiotensin II stimulates MAP kinase kinase kinase activity in vascular smooth muscle cells: Role of Raf. Circulation Res. 79: 1007-1014 (1996).

89. Hehn, B. M., Young, A., PELECH, S. L., Sanghera, J. S., & Shah, R. Developmental alterations in casein kinase II activity during the morphogenesis of quail secondary palate. Anatomical Record. 247: 102-108 (1997).

90. Starhe, R., Kikuchi, S., Siow, Y. L., PELECH, S. L., Kim, M., & Kim, S. U. MAP kinase activation and oligodendroglial process extension. J. Neurochem. 68: 945-953 (1997).

91. Jackson, J. K., Tudan, C., PELECH, S. L., & Burt, H. Calcium pyrophosphate dihydrate crystals activate MAP kinase in human neutrophils: Inhibition of MAP kinase, oxidase activation and degranulation responses of neutrophils by taxol. Immunology 90: 502-510 (1997).

92. Krump, E., Sanghera, J. S., PELECH, S. L., Furuya, W., & Grinstein, S. Chemotactic peptide activation of p38 mitogen-activated protein kinase (MAPK) and MAPK-activated protein kinase 2 (MAPKAPK-2) in human neutrophils. J. Biol. Chem. 272: 937-944 (1997).

93. Siow, Y. L., Sanghera, J. S., Kalmar, G. B., Tai, G., Oh, S., & PELECH, S. L. Protein kinase C and PAK indirectly activate MEKK-1; Identification of activating phosphorylation sites in MEKK-1. J. Biol. Chem. 272: 7586-7594 (1997).

94. Kim, S.O., Salh, B., PELECH, S. L., Wong, G., & Katz, S. Activation of MAPKAP kinase-2 by adenosine in rat heart. J. NIH Res. 8:58 (1997).

95. Hasham, M. I., PELECH, S. L., Koide, H., & Krieger, C. Activation of protein kinase C and calcium/calmodulin-dependent protein kinase II by intracellular free calcium in the motoneuron cell line NSC-19. Biochim. Biophys. Acta 1360: 177-191 (1997).

96. Young, A. V., Hehn, B. M., Sanghera, J. S., PELECH, S. L., & Shah, R. M. The activation of MAP kinase during vertical palatal shelf development in hamster. Growth Dev. Aging 61 (1997).

97. Palaty, C. K., Kalmar, G., Clark-Lewis, I., Leung, D. & PELECH, S. L. Characterization of the substrate specificity of the Pim1 proto-oncogene-encoded protein kinase. Biochem. Cell Biol. 75: 153-162 (1997).

98. Palaty, C. K., Kalmar, G. B., Amankawa, L., Affolter, M., Aebersold, R., & PELECH, S. L. Xenopus laevis Pim-1: Identification of autophosphorylation sites using electrospray ionization mass spectrometry. J. Biol. Chem. 272: 10514-10521 (1997).

99. Lanius, R., Wagney, V., Sahl, B., Beattie, B. L., Feldman, H., PELECH, S. L., & Krieger, C. Protein kinase C activity and protein levels in Alzheimer's disease. Brain Research 764: 75-80 (1997).

100. Hasham, M. I., PELECH, S. L., & Krieger, C. Glutamate-mediated activation of protein kinase C in hippocampal neurons. Neuroscience Letters 288: 115-118 (1997).

101. Mills, J., Charest, D. L., Lam, F., Beyreuther, K., Ida, N. PELECH, S. L., & Reiner, P. Regulation of amyloid precursor protein catabolism involves the mitogen-activated protein kinase signal transduction pathway. J. Neuroscience 17:9415-9422 (1997).

102. Rabkin, S. W., Sunga, P. S., Sanghera, J. S., & PELECH, S. L. Reduction of angiotensin II-induced activation of mitogen-activated protein kinase in cardiac hypertrophy. Cellular Molecular Life Sciences 53:951-959 (1998).

103. Schmitz, U., Ishida, M., Ishida, T., Surapisitchat, J., Hasham, M.I., PELECH, S.L., & Berk, B.C. Angiotensin II stimulates p21-activated kinase in vascular smooth muscle cells: role in activation of JNK. Circulation Res. 82:1272-1278 (1998).

104. Tudan, C., Jackson, J.K., Charlton, L., PELECH, S.L., Sahl, B., & Burt, H. Activation of S6 kinase in human neutrophils by calcium pyrophosphate dihydrate crystals: protein kinase C-dependent and phosphatidylinositol-3-kinase-independent pathways. Biochem. J. 331:531-537 (1998).

105. Kim, S.O., Katz, S., & PELECH, S.L. Expression of second messenger- and cyclin-dependent protein kinases during postnatal development of rat heart. J. Cellular Biochem. 69:506-521 (1998).

106. Damen, J.E., Krosl, J., Morrison, D., PELECH, S.L. and Krystal, G. The hyper-responsiveness of cells expressing truncated erythropoietin receptors is contingent upon insulin-like growth factor-1 in fetal calf serum. Blood 92:425-433 (1998).

107. Kim, S.O., Hasham, M., Katz, S., & PELECH, S.L. Insulin regulated protein kinases during postnatal development of rat heart. J. Cellular Biochem. 71: 328-339 (1998).

108. Kim, S.O., Irwin, P., Katz, S., & PELECH, S.L. Regulation of mitogen-activated protein kinase pathways during postnatal development of rat heart. J. Cellular Biochem. 71: 286-301 (1998).

109. Wang, H., Silva, N.L.C.L., Lucchesi, P.A., Haworth, R., Wang, K., Michalak, M., PELECH, S., & Fliegel, L. Phosphorylation and regulation of the Na+/H+ exchanger through mitogen-activated protein kinase. Biochemistry 36:9151-9158 (1998).

110. Wagey, R., PELECH, S. L., Duronio, V., & Krieger, C. Phosphatidylinositol 3-kinase: Increased activity and protein level in amyotrophic lateral sclerosis. J. Neurochem. 71:716-722 (1998).

111. Salh, B., Hoeflick, K., Kwan, W., & PELECH, S. L. GMCSF and IL-3 potentiate γ-interferon mediated endothelin production by human monocytes. Role of PKC. Immunology 95:473-479 (1998).

112. Salh, B., Wagey, R., Marotta, A., Tao, J.S., & PELECH, S. L. Activation of the phosphatidylinositol 3-kinase, protein kinase B and p70 S6 kinase in lipopolysaccharide-stimulated Raw 264.7 cells.

Differential effects of rapamycin, LY294002 and wortmannin on nitric oxide production. J. Immunology 161:6947-6954 (1998).

113. Salh, B., Bergman, D., Marotta, A., & PELECH, S.L. Differential cyclin-dependent kinase expression and activation in human colon cancer. Anticancer Res. 19:741-748 (1999).

114. Salh, B., Marotta, A., Matthewson, C., Ahluwalia, M., Flint, J., Owen, D., & PELECH, S.L. Investigation of the Mek-MAP kinase-Rsk pathway in human breast cancer. Anticancer Res. 19:731-740 (1999).

115. Westphal, R. S., Marotta, A., PELECH, S. L., & Wadzinski, B. E. Identification of kinase/phosphatase signaling modules comprised of p70 S6 kinase/protein phosphatase 2A (PP2A) and p21-activated kinase/PP2A. J. Biol. Chem. 274:687-692 (1999).

116. El-Husseini, A.E.-D., Williams, J., Reiner, P. B., PELECH, S. L., & Vincent, S. R. Localization of the cGMP-dependent protein kinases in relation to nitric oxide synthase in the brain. J. Chem. Neuroanat. 17:45-55 (1999).

117. Lefebrve, D. L., Charest, D.L., Yee, A., Crawford, B., & PELECH, S. L. Characterization of fertilization-modulated myelin basic protein kinases from sea star. J. Cellular Biochem. 75:272-287 (1999).

118. Charlton, L., Sayed, M., Clark-Lewis, I., Aebersold, R. & PELECH, S. L. Purification, characterization and substrate recognition determinants of p70 S6 kinase from maturing seastar oocytes. J. Cellular Biochem. 75:310-326 (1999).

119. Bhanot, S., Salh, B.S., Verma, S., Sidney, M., McNeill, J., & PELECH, S. L. In vivo regulation of protein-serine kinases by insulin in skeletal muscle of high fructose-fed, hyperinsulinemic rats. American J. Physiology 277: E299-E307 (1999).

120. Tudan, C., Jackson, J.K., PELECH, S. L., Attardo, G., & Burt, H. Selective inhibition of protein kinase C, mitogen-activated protein kinase, and neutrophil activation in response to calcium pyrophosphate dihydrate crystals, formyl-methionyl-leucyl-phenylalanine, and phorbol ester by O-(chloroacetyl-carbamoyl) fumagillol (AGM-1470; TNP-470). Biochemical Pharmacology 58, 1869-1880 (1999).

121. Kim, S.O., Baines, C.P., Critz, S.D., PELECH, S.L., Katz, S., Downey, J.M., & Cohen, M.V. Ischemia induced activation of heat shock protein-27 kinases and casein kinase-2 in preconditioned rabbit heart. Biochem. Cell Biol. 77:559-567 (1999).

122. Xu, Y.-J., Kim, S.O., Liao, D.F., Katz, S., & PELECH, S.L. Stimulation of 90- and 70- kDa ribosomal protein S6 kinases by arginine vasopressin and lysophosphatidic acid in rat cardiomyocytes. Biochemical Pharmacology 59: 1163-1171 (2000).

123. Nakano, A., Baines, C., Kim, S.O., PELECH, S.L., Downey, J.M., Cohen, M.V., & Critz, S.D. Ischemic preconditioning activates MAPKAPK2 in the isolated rabbit heart: evidence for involvement of p38 MAPK. Circulation Res. 86: 144-151 (2000).

124. Kim, S.O., Xu, Y.-J., Katz, S., & PELECH, S.L. Cyclic GMP-dependent and independent regulation of MAP kinases by sodium nitroprusside in isolated cardiomyocytes. Biochim. Biophys. Acta 14614, 1-8 (2000).

125. Sayed, M., Kim, S.O., Salh, B.S., Issinger, O.-G, & PELECH, S.L. Stress induced activation of protein kinase CK2 by direct interaction with p38 MAP kinase. J. Biol. Chem. 275, 16569-16573 (2000).

126. Morrison, D.L., Yee, A.Y., Paddon, H.B., Aebersold, R. & PELECH, S.L. Cell cycle regulation of a novel p38 Hog MAP kinase during meiosis and following fertilization of seastar oocytes. J. Biol. Chem. 275, 34236 (2000).

127. Tudan, C., Jackson, J. K., Blanis, L., PELECH, S. L., & Burt, H. M. Inhibition of TNF-alpha-induced neutrophil apoptosis by crystals of calcium pyrophosphate dihydrate is mediated by the extracellular signal-regulated kinase and phosphatidylinositol 3-kinase/Akt pathways upstream of caspase 3. J. Immunol. 165, 5798-5806 (2000).

128. Wagey, R., Lurot, S., Perrelet, D., PELECH, S. L., Sagot, Y. & Krieger, C. Phosphatidylinositol 3-kinase activity in murine motoneuron disease: The progressive motor neuropathy mouse. Neuroscience 103:257-266 (2001).

129. Wong, A. S.T., PELECH, S. L., Rosen, B., Ehlen, T., Leung, P. C K., & Auersperg, N. Coexpression of hepatocyte growth factor-Met: an early step in ovarian carcinogenesis? Oncogene 20:1318-1328 (2001).

130. Zhang, H., Shi, X., Hampong, M., Blanis, L., & PELECH, S. L. Stress induced inhibition of ERK1 and ERK2 by direct interaction with p38 MAP kinase. J. Biol. Chem. 276: 6905-6908 (2001). Accelerated Communication.

131. Zhang, L., PELECH, S. L., Mayrand, D., Grenier, D., Heino, J., & Uitto, V.-J. Bacterial heat shock protein-60 increases epithelial cell proliferation through the ERK1/2 MAP kinases. Exp. Cell Res. 266:11-20 (2001).

132. Sayed, M., PELECH, S., Wong, C., Marotta, A., & Salh, B. Protein kinase CK2 is involved in G2 arrest and apoptosis following spindle damage in epithelial cells. Oncogene 20: 6994-7005 (2001).

133. Wong, A. S. T., Kim, O., Leung, P.C.K., Auersperg, N., & PELECH, S.L. Profiling protein kinases in the neoplastic transformation of human ovarian surface epithelium. Gynaecologic Oncocology 82:305-311 (2001).

134. Salh, B, Marotta, A., Wagey, R., Sayed, M., & PELECH, S. Dysregulation of phosphatidylinositol 3-kinase and downstream effectors in human breast cancer. Int. J. Cancer 98: 148-154 (2002).

135. Khabazian, I., Bains, J.S., Williams, D.E., Cheung, J., Wilson, J.M.B., Pasqualotto, B.A., PELECH, S.L., Andersen, R.J., Wang, Y.-T., Liu, L., Nagai, A., Kim, S.U., Craig, U.K., and Shaw, C.A. Isolation of various forms of sterol b-D-glucoside from the seed of cycas circinalis: Neurotoxicity and implications for ALS-PDC. J. Neurochem. 82:516-528 (2002).

136. Ehses, J. A., PELECH, S.L., Pederson, R.A., & McIntosh, C.H.S. Glucose-dependent insulinotropic polypeptide activates the Raf-Mek1/2-ERK1/2 module via a cyclicAMP/cAMP-dependent protein kinase/Rap1-mediated pathway. J. Biol. Chem. 277:37088-37097 (2002).

137. Zhang, H., Xiaoqing Shi, X., Zhang, Q.-J., Hampong, M., Paddon, H., Wahyuningsih, D. & PELECH, S.L. Nocodozole-induced p53-dependent c-Jun N-terminal kinase activation reduces apoptosis in human colon carcinoma HCT-116 cells. J. Biol. Chem. 277:43648-43658 (2002).

138. PELECH, S.L. & Zhang, H. Plasticity of the kinomes in monkey and rat tisssues. Science Signal Transduction Knowledge Environment website: www.stke.org/cgi/content/full/sigtrans;2002/162/pe50 December 10 (2002).

139. Hu, J., Chernoff, K., PELECH, S. & Krieger, C. Protein kinase and protein phosphatase expression in the CNS of a G93A mSOD over-expressing mouse model of amyotrophic lateral sclerosis. J. Neurochem. 85:422-431 (2003).

140. Hu, J. H., Zhang, H., Wagey, R., Krieger, C. & PELECH, S.L. Protein kinase and protein phosphatase activation in amyotrophic lateral sclerosis spinal cord. J. Neurochem. 85:432-442 (2003).*

141. Ryu J.K., Choi, H.B., Hatori, K., Heisel, R.L., PELECH, S.L., McLarnon, J.G., & Kim, S.U. Adenosine triphosphate induces proliferation of human neural stem cells: Role of calcium and p70 ribosomal protein S6 kinase. J. Neurosci. Res. 72:352-362 (2003).

142. Koivisto, L, Alavian, K., Hakkinen, L,. PELECH, S,. McCulloch, C.A. & Larjava, H. Glycogen synthase kinase-3 regulates formation of long lamellipodia in human keratinocytes. J. Cell. Sci. 116:3749-3760 (2003).

143. Tang, L., Cao, L., PELECH, S., Lui, H. & Shapiro J. Cytokines and signal transduction pathways mediated by anthralin in alopecia areata-affected Dundee experimental balding rats. J. Investig. Dermatol. Symp. Proc. 8:87-90 (2003).

144. Zhang, L., PELECH, S. & Uitto, V.J. Bacterial GroEL-like heat shock protein60 protects epithelial cells from stress-induced death through activation of ERK and inhibition of caspase-3. Exp. Cell. Res. 292:231-240 (2004).

145. Zhang, L., PELECH, S. & Uitto, V.J. Long-term effect of heat shock protein 60 from Actinobacillus actinomycetemcomitans on epithelial cell viability and mitogen-activated protein kinases. Infect. Immun. 72: 38-45 (2004).

146. Tudan, C., Jackson, J., Higo, T.T., Hampong, M., PELECH, S.L. & Burt, H. Calcium pyrophosphate dihydrate crystal-induced neutrophil activation and repression of TNF-alpha induced apoptosis is mediated by the p38 MAP kinase. Cell Signalling 16:211-221 (2004).

147. Zhang, H., Shi, X., Hampong, M., Paddon, H., Dai, W., & PELECH, S.L. Polo-like kinase regulation of centrosomes is mediated through Serine 4 phosphorylation of B23/nucleophosmin. J. Biol. Chem. 279:35726-35734 (2004).

148. Wong, A.S.T., Roskelley, C.D., PELECH, S., Miller, D., Leung, P.C.K. & Auersperg, N. Progressive changes in Met-dependent signaling in a human ovarian surface epithelial model of malignant transformation. Exp. Cell. Res. 299:248-256 (2004).

149. Djeha, H., Todryk, S.M., PELECH, S., Wrighton, C.J., Irvine, A.S., Mountain, A. & Lipinski, K.S. Antitumor immune responses mediated by adenoviral GDEPT using nitroreductase/CB1954 is enhanced by high-level coexpression of heat shock protein 70. Cancer Gene Therapy 12:560-571 (2005).

150. Jia, Z., Barbier, L., Amraei, M., PELECH, S., Dennis, J.W., Metalnikov, P., O'Donnell, P.O. & Nabi, I. R. Tumor cell pseudopodial protrusions: Localized signalling domains coordinating cytoskeleton remodelling, cell adhesion, glycolysis, RNA translocation, and protein translation. J Biol. Chem. 280:30564-30573 (2005).

151. Adams, G., Coffee Jr., R.L., Zhang, H., PELECH, S.L., Strack, S. & Wadzinski, B.E. Positive regulation of Raf/MEK/ERK signaling by protein serine/threonine phosphatase 2A holoenzymes. J. Biol. Chem. 280:42644-42654 (2005).

152. Lipinski, K.S., PELECH, S., Mountain, A., Irvine, A.S., Kraaij, R., Bangma, C., Mills, K.H.G., and Todryk, S.M. Nitroreductase-based therapy of prostate cancer, enhanced by raising expression of heat shock protein 70, acts through increased anti-tumour immunity.Cancer Immunol Immunother. 55:347-354 (2006).

153. Shi, X., Zhang, H., Paddon, H.B., Lee, G. & PELECH, S.L. Phosphorylation of STAT3 serine 727 by cyclin-dependent kinase 1 is critical for nocodazole-induced mitotic arrest. Biochemistry 45:5857-5867 (2006).

154. Klegeris, A., Giasson, B. I., Zhang, H., Maguire, J., PELECH, S., & McGeer, P. L. Alpha-synuclein and its disease-causing mutants induce ICAM-1 and IL-6 in human astrocytes and astrocytoma cells. FASEB J. 20:2000-2008 (2006).

155. Klergis, A., PELECH, S., Giasson, B. I., Maguire, J., Zhang, H., McGeer, E. G., & McGeer, P. L. Alpha-synuclein activates stress signaling protein kinases in THP cells and microglial. Neurobiology of Aging 29:939-952 (2008).*

156. Hoerndli, F.J., PELECH, S, , Papassotiropoulos, A., & Gotz, J. Abeta treatment and P301L tau expression in an Alzheimer's disease tissue culture model act synergistically to promote aberrant cell cycle re-entry. Eur. J. Neurosci. 26:60-72 (2007).

157. Oh, W.-J., Rishi, V., PELECH, S.L., & Vinson, C. Histological and proteomic analysis of reversible H-Ras^{V12G} expression in transgenic mouse skin. Carcinogenesis 28:2244-2252 (2007). ‡

158. Ha, S.-D., Ng, D., PELECH, S.L., & Kim, S.O. Critical role of PI3-K/Akt/GSK3b signaling pathway in recovery from anthrax lethal toxin-induced cell cycle arrest and MEK cleavage in human monocytic cell lines. J. Biol. Chem. 282:36230-36239 (2007).

159. Fan, M. Y., Zhang, H., Hayden, M. R., PELECH, S. L., & Raymond, L. A. Protein expression profiling in cells co-expressing N-methyl-D-aspartate receptors and mutant huntingtin: upregulation of protective stress response pathway. J. Neurochem. 104:790-805 (2008).

160. Parkhouse, W.S., Cunningham, L., McFee, I., Litt Miller, J.M., Whitney, D., PELECH, S. L., & Krieger, C. Neuromuscular dysfunction in the mutant superoxide dismutase mouse model of amyotrophic lateral sclerosis. Amyotroph. Lateral Scler. 9:24-34 (2008).

161. Lu, C., PELECH, S., Zhang, H., Bond, J., Spach, K., Blankenhorn, E. P., & Teuscher, C. Pertusis toxin induces angiogenesis in brain microvascular endothelial cells. J. Neurosci. Res. 86: 2624-40 (2008).

162. Skalnikova, H., Vodicka, P., PELECH, S., Motlik, J., Gadher, S.J., Kovarova, H. Protein signaling pathways in differentiation of neural stem cells. Proteomics. 8: 4547-59 (2008).

163. PELECH, S., Jelinkova, L., Susor, A., Zhang, H., Shi, X., Pavlok, A., Kubelka, M., & Kovarova, H., Antibody microarray analyses of signal transduction protein expression and phosphorylation during porcine oocyte maturation. J. Proteomics Res. 7:2860-71. (2008).

164. Ly, P.T.T., PELECH, S., & Shaw, C.A. Cholesteryl glucoside stimulates activation of protein kinase B/Akt in the motor neuron-derived NSC34 cell line. Neurobiology of Lipids. 7:4 (2008).

165. Mukherjee, S., PELECH, S., Neve, R.M., Kuo, W.L., Ziyad, S., Spellman, P.T., Gray, J.W., & Speed, T.P. Sparse combinatorial inference with an application in cancer biology. Bioinformatics. 25:265-71 (2009).

166. Safaei, J., Manuch, J., Gupta, A., Stacho, L. & PELECH, S. Prediction of human protein kinase substrate specificities. 2010 IEEE International Conference on Bioinformatics and Biomedicine Proceedings. 259-64 (2010).

167. Safaei, J., Manuch, J., Gupta, A., Stacho, L. & PELECH, S. Prediction of 492 human protein kinase substrate specificities. Proteome Sci. 9 Suppl 1:S6 (2011).

168. Safaei, J., Manuch, J., Gupta, A., Stacho, L., & PELECH, S. Evolutionary conservation of human phosphorylation sites. Bioinformatics and Biomedicine (BIBM), 2011 IEEE International Conference on Nov 12-15; Pages 222 - 227 (2011). 10.1109/BIBM.2011.58

169. Rogers, L.D., Brown, N.F., Fang, Y., PELECH, S., & Foster L.J. Phosphoproteomic analysis of Salmonella-infected cells identifies key kinase regulators and SopB-dependent host phosphorylation events. Sci. Signal. 4(191):rs9 (2011).

170. Carter, C.A., Misra, M., & PELECH, S. Proteomic analyses of lung lysates from short-term exposure of Fischer 344 rats to cigarette smoke. J. Proteome Res. 10(8):3720-31 (2011).

171. Davies, A.H., Barrett, I., Pambid, M.R., Hu, K., Stratford, A.L., Freeman, S., Berquin, I.M., PELECH, S., Hieter, P., Maxwell, C., & Dunn, S.E. YB-1 evokes susceptibility to cancer through cytokinesis failure, mitotic dysfunction and HER2 amplification. Oncogene 30(34):3649-60. doi: 10.1038/onc.2011.82 (2011).

172. Fardilha, M., Esteves, S.L., Korrodi-Gregório, L., PELECH, S., da Cruz E Silva, O.A., & da Cruz E Silva, E. Protein phosphatase 1 complexes modulate sperm motility and present novel targets for male infertility. Mol. Hum. Reprod. 17(8):466-77. (2011).

173. Fardilha, M., Ferreira, M., PELECH, S., Vieira, S., Rebelo, S., Korrodi-Gregorio, L., Sousa, M., Barros, A., Silva, V., da Cruz E Silva, O.A., & da Cruz E Silva, E.F. Profiling protein phosphatases in human sperm. OMICS 17 (9):460-72. (2013).

174. McGinnis, L.K., PELECH, S., & Kinsey, W.H. Post-ovulatory aging of oocytes disrupts kinase signaling pathways and lysosome biogenesis. Mol. Reprod. Dev. 81(10):928-45. (2014).

175. Silva, J.V., Freitas, M.J., Correia, B.R., Korrodi-Gregório, L., Patrício, A., PELECH, S., & Fardilha M. Profiling signaling proteins in human spermatozoa: biomarker identification for sperm quality evaluation. Fertil. Steril. 104(4):845-856 (2015).

176. Binukumar, B.K., Shukla, V., Amin, N.D., Bhaskar, M., Skuntz, S., Steiner, J., Winkler, D., PELECH, S.L., & Pant, H.C. Analysis of the inhibitory elements in the p5 peptide fragment of the CDK5 activator, p35, CDKR1 Protein. J. Alzheimers Dis. 48(4):1009-17 (2015).

177. Freitas, M.J., Silva, J.V., Felgueiras, J., Patrício, A., Maia, N., PELECH, S., & Fardilha, M. Protein Profile in Human Prostate Cancer. Medicine. 95(10):e02371. (2015), https://doi.org/10.1097/MD.000000000000237

178. Silva, J.V., Freitas, M.J., Correia, B.R., Korrodi-Gregório, L., Patrício, A., PELECH, S., & Fardilha, M. Signaling fingerprint of the human spermatozoa: correlation with clinical data. Medicine. 95(10):e02371. (2016). https://doi.org/10.1097/MD.000000000000237

179. Lai, S., Safaei, J., & PELECH, S.L. Eukaryotic protein kinases and choline kinases share a common ancestor related to ancient glutaminyl-tRNA synthetase. J. Biol Chem. 291(10):5199-205 (2016).

180. Lai, S. & PELECH, S.L. Regulatory roles of conserved phosphorylation sites in the activation T-loop of the MAP Kinase ERK1. Mol. Biol. Cell 27(6):1040-50 (2016).

181. Bhargava A., PELECH, S.L., Woodard, B., Kerwin, J., Maherali, N., Reproducibility Project: Cancer Biology (Iorns, E., Gunn, W., Tan, F., Lomax, J., Perfito, N., Errington, T.). Registered Report: RAF inhibitors prime wild-type RAF to activate the MAPK pathway and enhance growth. eLife 5. pii: e09976. (2016). https://doi.org/10.7554/eLife.09976

182. Binukumar, B.K., PELECH, S.L., Sutter, C., Shukla, V., Amin, N.D., Grant, P., Bhaskar, M., Skuntz, S., Steiner, J., & Pant, H.C. Profiling of p5, a 24 amino acid inhibitory peptide derived from the CDK5 activator, p35 CDKR1 against 70 protein kinases. J. Alzheimers Dis. 54(2):525-33 (2016).

183. Yue, L., Sam, C., Arora, N., Winkler, F.H.D., & PELECH, S. Antibody microarray and immunoblotting analyses of the EGF signalling phosphorylation network in human A431 epidermoid carcinoma cells. Clinical Proteomics and Bioinformatics. Vol. 2 (1):1-10 (2017). https://doi.org/10.15761/CPB.1000119

184. Evan L., Ardiel, E.L., McDiarmid, T.A., Timbers, T.A., Lee, K.C.Y., Safaei, J., PELECH, S.L., & Rankin, C.H. Insights into the roles of CMK-1 and OGT-1 in interstimulus interval-dependent

habituation in Caenorhabditis elegans. Proceedings Biological Sciences. (14 Nov. 2018) https://doi.org/10.1098/rspb.2018.2084
Timbers, T.A., Ardiel, E.L., Lee, K.C.Y., Safaei, J., PELECH, S.L., & Rankin, C.H. CaMK (CMK-1) and O-GlcNAc transferase (OGT-1) modulate responding to mechanical stimuli and learning in C. elegans. A related manuscript was also published at bioRXiv with the following citation: CaMK (CMK-1) and O-GlcNAc transferase (OGT-1) modulate mechanosensory and habituation in an interstimulus interval-dependent manner in Caenorhabditis elegans. Evan L Ardiel, Troy A McDiarmid, Tiffany A Timbers, Kirsten Lee, Javad Safaei, Steven L Pelech, Catharine H Rankin. (March 27, 2018). https://doi.org/10.1101/115972

185. Yue, L. & PELECH, S. Applications of high content antibody microarrays for biomarker discovery and tracking cellular signaling. Adv. Proteomics Bioinform. APBI-107 (2018). https://doi.org/10.29011/APBI -107. 100007

186. Yue, L., McPhee, M.J., Gonzalez, K., Charman, M., Lee, J., Thompson, J., Winkler, J., Cornell, R.B., PELECH, S. & Ridgway, N.D. Differential dephosphorylation of CTP:phosphocholine cytidylyltransferase upon translocation to nuclear membranes and lipid droplets. Mol. Biol. Cell. 31(10):1047-1059 (2020). https://doi.org/10.1091/mbc.E20-01-0014

187. Felgueiras, J., Vieira Silva, J., Nunes, A., Fernandes, I., Patrício, A., Maia, N., Pelech, S., & Fardilha, M. Investigation of spectroscopic and proteomic alterations underlying prostate carcinogenesis. J. Proteomics 226:103888 (2020). https://doi.org/10.1016/j.jprot.2020.103888

188. Majdoubi, A., Christina Michalski, C., O'Connell, S.E., Dada, S., Narpala, S., Gelinas, J., Disha Mehta,D., Claire Cheung,C., Winkler, D.F.H., Basappa, M., Liu, A.C., Görges, M., Barakauskas, V.E., Irvine, M., Mehalko, J., Esposito, D., Sekirov, I., Jassem, A.N., Goldfarb, D.M., PELECH, S., Douek, D.C., McDermott, A.B., & M. Lavoie, P.M. A majority of uninfected adults show preexisting antibody reactivity against SARS-CoV-2. JCI Insight. 6(8):e146316 (2021). DOI: 10.1172/jci.insight.146316. https://doi.org/10.1172/jci.insight.146316.

189. Karrow, N.A., Shandilya, U.K., PELECH, S. Wagter-Lesperance, McLeod, D., Bridle, B. & Mallard, B.A. Maternal COVID-19 vaccination and its potential impact on fetal and neonatal development. Vaccines (2021), 9, x. https://doi.org/10.3390/xxxxx

190. McGuire, B.E., Mela, J.E., Thompson, V.C., Cucksey, L.R., Stevens, C.E., McWhinnie, R.L., Winkler, D.F.H., PELECH, S., & Nano, F.E. Escherichia coli recombinant expression of SARS-CoV-2 protein fragments. Microbial Cell Factories. 21:21 (2021). https//doi.org/10.1186/s12934-022-01753-0. Also published in bioRxiv as a pre print. https://doi.org/10.1101/2021.06.22.449540

191. Koeppen, A.H., Rafique, R. F., Mazurkiewicz, J.E., PELECH, S., Sutter, C., Lin, Q., & Qian, J. Friedreich cardiomyopathy is a desminopathy. Free Neuropathology 2:34 (2021). https://doi.org/10.17879/freeneuropathology-2021-3679

192. Errington, T.M., Denis, A., Allison, A.B., Araiza, R., Aza-Blanc, P., Bower, L.R., Campos, J., Chu, H., Denson, S., Donham, C., Harr, K., Haven, B., Iorns, E., Kwok, J., McDonald, E., PELECH, S., Perfito, N., Pike, A., Sampey, D., Settles, M., Scott, D.A., Sharma, V., Tolentino, T., Trihn, A., Tsui, R., Willis, B., Wood, J., & Young, L. Experiments from unfinished Registered Reports in the Reproducibility Project: Cancer Biology. eLife 2021;10:e73430. https://doi.org/10.7554/eLife.73430

193. PELECH, S., Gallagher, C., Sutter, C., Yue, L., Kerwin, J., Bhargava, A., Iorns, E., Tsui, R., Denis, A., Perfito, N., & Errington, T.M. Replication Study: RAF inhibitors prime wild-type RAF to activate the MAPK pathway and enhance growth. bioRxiv preprint 2021; doi: https://doi.org/10.1101/2021.11.30.470372

194. McLeod, D., Martins, I., PELECH, S., Beck, C., & Shaw. C.A. Dispelling the myth of a pandemic of the unvaccinated. Int. J. Vaccine Theory Practice Res. 2(1):267-286. (2022).

195. Saleh, B., Srikanth, K.D., Sneh, T., Yue, L., PELECH, S., Elliot, E., & Gil-Henn, H. FAK-mediated signaling controls amyloid beta overload, learning and memory deficits in a mouse model of Alzheimer's disease. Int. J. Mol. Sci. 23(16), 9055 (2022). https://doi.org/10.3390/ijms23169055

196. Shapira, T., Rens, C., Pichler, V., Rees, W., Steiner, T., Jean, F., Winkler, D.F.H., Sarai, I., PELECH, S., & Av-Gay, Y. Inhibition of glycogen synthase kinase-3-beta (GSK3β) blocks nucleocapsid phosphorylation and SARS-CoV-2 replication. *Molecular Biomedicine* 3, 43 (2022). https://doi.org/10.1186/s43556-022-00111-1

197. Vicker, D.M., Hardie, J., Eberspaecher, S., Chaufan, C., & PELECH, S. Opinion: Counterfactuals of effects of vaccination on COVID-19 cases in Canada: what could have happened? Frontiers in Public Health. 11:1173673 (2023) https://doi.org/10.3389/fpubh.2023.1173673

198. Nascimento-Gonçalves, E., Seixas, F., Palmeira, C., Martins, G., Fonseca, C., Duarte, J.A., Faustino-Rocha, A.I., Colaco, B., Pires, M.J., Neuparth, M.J., Moreeira-Goncalves, D., Fardilha, M., Henriques, M.C., Patricio, D., PELECH, S., Ferreira, R., & Oliveira, P.A. Lifelong exercise training promotes the remodelling of the immune system and prostate signalome in a rat model of prostate carcinogenesis. GeroScience (2023). https://doi.org/10.1007/s11357-023-00806-5

199. Foster, J., McPhee, M., Yue, L., Dellaire, G., PELECH, S., & Ridgway ND. Lipid- and Phospho-Regulation of CTP:Phosphocholine Cytidylyltransferase α Association with Nuclear Lipid Droplets. Mol. Biol. Cell. mbcE23090354 (2024). https://doi.org/10.1091/mbc.E23-09-0354

200. Martins, T.S., PELECH, S., Ferreira, M., Pinho, B., Leandro, K., de Almeida, L.P., Breitling, B., Hansen, N., Esselmann, H., Wiltfang, J., da Cruz e Silva, O.A.B, Henriques, A.G. Phosphoproteomics of blood-derived EVs reveals putative biomarker candidates for Alzheimer's disease. Int. J. Mol. Sci. 25(3): 1584 (2024) https://doi.org/10.3390/ijms25031584

201. Pena-Diaz, S., Chao, J.D., Rens, C., Haghdadi, H., Flangan, K., Ko, M., Richter, A., Duc, K.D., PELECH, S., Av-Gay, Y. Glycogen synthase kinase 3 controls *Mycobacterium tuberculosis* infection. Science. 27(8): 110555 (2024). https://doi.org/10.1016/j.isci.2024.110555

ii. MANUSCRIPTS SUBMITTED

201. Koeppen, A.H., Mazurkiewicz, J.E., Feustel, P.J., PELECH, S., Sutter, C. Kit and its ligand, mast/stem cell factor, contribute to the pathogenesis of the lesion in dorsal root ganglia in Friedreich ataxia. J. Neurochem. (submitted).

iii. MANUSCRIPTS IN PREPARATION

Lai, S., Sommerfeld, D., Safaei, J., Winkler, D., Shi, J., Zhang, H., Sanghera, J., Yan, J., and PELECH, S. Determination of the specificities of 200 protein kinases with peptide microarrays.

PELECH, S. and Safaei, J. Quantification of amino acid interactions in protein complexes.

Safaei, J., Manuch, J., Gupta, A., Stacho, L. and PELECH, S. Prediction of 970,000 human protein phosphorylation sites.

PELECH, S. and Zhang, H. Hyperphosphorylation drives protein turnover.
Safaei, J., Manuch, J., Gupta, A., Stacho, L. and PELECH, S. Prediction of the phosphotyrosine binding specificities of 200 human SH2 and PTB domains.

Shi, J., Zhang, H., Sun, G., Paddon, H.B., Cheung, G., Mirzaei, S., and PELECH, S.L. Meta-analysis of the kineome, phosphatome and phosphoproteome during seastar oocyte maturation.

Zhang, H., Shi, J., Paddon, H.B., Cheung, G., Swarup, S., Mohammodi, N., Stith, B.B., and PELECH, S. L. Meta-analysis of the phosphoproteome in maturing and fertilized Xenopus laevis oocytes with 234 phospho-site-specific antibodies.

Zhang, H., Shi, J., Paddon, H.B., Clendening, B., and PELECH, S.L. Meta-analysis of the protein kinases and phosphatases and their substrates during meiotic maturation of Xenopus laevis oocytes by antibody microarrays and immunoblotting.

Shi, J., Zhang, H., Paddon, H.B., and PELECH, S.L. Growth factor induced tyrosine phosphorylation of glycogen synthase kinase 3 (GSK3) via the Mek1/2 MAP kinase kinases.

Lai, S., Zhang, H., Shi, J., Winkler, D., Lambert Yue and PELECH, S. Production method and evaluation of a new generic polyclonal phosphotyrosine antibody.

iv. REVIEWS, BOOK CHAPTERS AND OTHER

1. Vance, D.E., PELECH, S.D., and Choy, P.C. CTP: phosphocholine cytidylyltransferase from rat liver. Methods Enzymol. 71: 576-581 (1981).

2. PELECH, S.L., and Vance, D.E. Regulation of hepatic phosphatidylcholine biosynthesis by reversible protein phosphorylation. In Enzyme regulation by reversible phosphorylation - further advances. (ed. P. Cohen) Elsevier, pp 63-80 (1984).

3. PELECH, S.L., and Vance, D.E. Regulation of phosphatidylcholine biosynthesis. Biochim. Biophys. Acta 779:217-251 (1984).

4. Vance, D.E. and PELECH, S.L. Enzyme translocation in the regulation of phosphatidylcholine biosynthesis. Trends Biochem. Sci. 9, 17-20 (1984). Reprinted in Metabolic Regulation (ed. R.S. ochs, R.W. Hanson and J. Hall) Elsevier Science Pub. Amsterdam pp210-214 (1985).

5. PELECH, S.L., Audubert, F. and Vance, D.E. Regulation of phosphatidylcholine biosynthesis in mammalian systems. Phospholipids In the Nervous System, Vol 2, Physiological Role of Phospholipids In the Nervous System. (eds., Kanfer, J.N. and Porcellati, G.) Raven Press, New York, pp 247-258 (1985).

6. Vance, D.E. and PELECH, S.L. Cellular translocation of CTP:phosphocholine cytidylyltransferase regulates the synthesis of CDP-choline. Novel Biochemical, Pharmacological and Clinical Aspects of Cytidinediphosphocholine (eds., Zappia, V., Kennedy, E.P., Nilsson, B.I. and Galletti, P.) Elsevier, Amsterdam, pp 15-24 (1985).

7. PELECH, S.L., Tinker, D., Chan, C.P. and Krebs, E.G. Role of protein phosphorylation in the mitogenic response to growth factors. In: Insulin-related peptides in the central nervous system (eds., Raizada, M.K., Philips, M.I. and LeRoith, D.) pp 27-46 (1987).

8. Pondaven, P., Meijer, L. and PELECH, S.L. Protein phosphorylation in starfish oocyte meiotic divisions and sea urchin egg mitotic divisions. Advances in Protein Phosphatases 4:229-251 (1987).

9. PELECH, S.L. Oncogenes and anti-oncogenes - The molecular basis of cancer. Future Health/Perspectives Sante - Summer, 4-7 (1987).

10. PELECH, S.L. and Vance, D.E. Signal transduction via phosphatidylcholine cycles. Trends Biochem. Sci. 14:28-30 (1989).

11. PELECH, S.L. Cellular security: How anti-cancer genes turn off tumors. The Sciences (N.Y. Academy of Sciences) 29: 38-44 (1989).

12. PELECH, S. L. When cells divide. Biologists identify the universal pacemaker of mitosis. The Sciences (N. Y. Academy of Sciences) 30:22-28 (1990).

13. PELECH, S. L., Sanghera, J. S., and Daya, M. Protein kinase cascades in meiotic and mitotic cell cycle control. Biochem. Cell Biol. 68:1297-1330 (1990).

14. PELECH, S. L. and Sanghera, J. S. Mitogen-activated protein kinases, versatile transducers in cell signalling. Trends. Biochem. Sci. 17:233-238 (1992).

15. PELECH, S. L. and Sanghera, J. S. Charting signal transduction pathways with MAP kinases. Science 257:1355-1356 (1992).

16. PELECH, S. L. Networking with protein kinases. Current Biology 3:513-515 (1993).

17. PELECH, S. L., Charest, D. L., Mordret, G. P., Siow, Y. L., Palaty, C., Campbell, D., Charlton, L., Samiei, M., and Sanghera, J. S. Networking with mitogen-activated protein kinases. Molecular Cellular Biochem. 127/128: 157-170 (1993).

18. PELECH, S. L. The malignant connection: When its molecular "nervous system" goes awry, a cell can turn cancerous. The Sciences (N. Y. Academy of Sciences) 33:32-36 (1993).

19. DeFranco, A. L., Weinstein, S. L., Sanghera, J. S., PELECH, S. L., and June, C. H. LPS stimulation of protein tyrosine phosphorylation in macrophages. Proceedings of the 2nd Conference of the International Endotoxin Society (Vienna) Elsevier Press (1993).

20. Hei, Y., PELECH, S.L., Diamond, J. and McNeill, J. H. Insulin-stimulated seryl/threonyl protein kinases in diabetic rats and the effects of vanadium treatment. NATO ASI Series Vol. H 76, Tyrosine Phosphorylation/Dephosphorylation and Downstream Signalling (ed L. Heilmeyer) (Heidelberg) Springer-Verlag pp 227-230 (1993).

21. PELECH, S. L. Mitogen-activated protein kinases: At the cross-roads of diverse signal transduction pathways. Bulletin of the Canadian Society of Biochemistry and Molecular Biology Spring:15-19 (1994).

22. PELECH, S. L. Mitogen-activated protein kinase modules in signal transduction. Upstate Biotechnology Inc. Biosignals Summer: 2-16 (1994).

23. PELECH, S. L. and Charest, D. L. MAP kinase-dependent pathways in cell cycle control. Progress in Cell Cycle Research (L. Meijer, S. Guidet, and L. Tung, ed.) (Vol. 1, 33-52, Plenum Press, New York (1995).

24. PELECH, S. L. Cyclin-dependent kinases in cellular signalling. Upstate Biotechnology Inc. Biosignals Winter: 2-16 (1995).

25. PELECH, S. L. The profitable application of starfish oocytes for cancer research. Aquaculture Association of Canada Bulletin (Workshop Proceeding of Aquatech'95, ed. K. Harrison) 95-2: 9-13 (1995).

26. PELECH, S. L. Networking with proline-directed protein kinases implicated in tau phosphorylation. Neurobiol. Aging 16:347-361 (1995).

27. PELECH, S. L. Commentary - Degenerative and protective signaling mechanisms in the neurofibrillary pathology of Alzheimer's disease. Neurobiol. Aging 16:458 (1995).

28. PELECH, S. L. Cellular signal transduction circuitry. Upstate Biotechnology Inc. 1996 Catalog. A series of 20 minireviews accompanied by elaborate signal transduction circuit diagrams.

29. Krieger, C., Lanius, R., PELECH, S. L., and Shaw, C. Amyotrophic lateral sclerosis: A disorder of receptor dynamics. Trends Pharm. Sci. 17: 114-120 (1996).

30. PELECH, S. L. Signalling pathways: Kinase connections in the cellular intranet. Current Biology 6:551-554 (1996).

31. PELECH, S. L., Siow, Y. L., and Koide, H. B. Protein kinase circuitry in neuronal cell signalling. in Receptor Dynamics in Neural Development. (C. A. Shaw, ed.) CRC Press (1996).

32. PELECH, S. L. IBC's Fourth Annual Conference on Signal Transduction Therapy - Novel Targets for Therapeutic Intervention. Meeting Report. Current Drugs ISSN 1365-5884 (1997).

33. PELECH, S.L. Insulin Regulation of Protein Serine Kinases in Diabetic Rats. In International Business Communications Proceeding of the 1997 Signal Transduction Therapy Conference (San Diego) (1997).

34. Charest, D.L., and PELECH, S.L. Intracellular communication via protein kinase networks. in Proceedings of the 1997 Les Houches Biophysical Workshop, "Dynamic Networks in Physics and Biology" 3:189-197 (1998).

35. PELECH, S. In pursuit of the proteome. The proteome mapping game is on. Biotechnology Focus. 4:11-37 (2001).

36. PELECH, S. National Post Editorial. Patently Wrong. (March 6, 2002).

37. PELECH, S., Sutter, C., and Zhang, H. Methods in Molecular Medicine Series: Cancer Cell Signalling Kinetworks™ protein kinase multiblot analysis. (D. Terrian, ed.) vol. 218, 99-111 Humana Press (2003).

38. Krieger, C., Hu, J.-H. and PELECH, S. L. Aberrant protein kinases and phosphoproteins in amyotrophic lateral sclerosis. Trends Pharm. Sci. 24:535-541 (2003).

39. PELECH, S.L. Tracking cell signaling protein expression and phosphorylation by innovative proteomic solutions. Curr. Pharm. Biotech. 5, 69-77 (2004).

40. PELECH, S.L. It's all about communication and control. Cool Companies Magazine 2:44-45 (2006).

41. PELECH, S. Dimerization in protein kinase signaling. J Biol. 19; 5(12): 1-7 (2006).

42. PELECH, S.L. Kinase Profiling; The mysteries unraveled. Future Pharmaceuticals. 1:23-25 (2006).

43. PELECH, S.L. Protein kinase profiling. Commentary: Nature Biotechnology. September (2006).

44. PELECH, S.L. and Zhang, H. Antibody-based proteomics analysis of tumour cell signaling pathways. Principles of Molecular Oncology, Third Edition Edited by M.H. Bronchud, Humana Press Inc., Totowa, NJ. Chapter 6. pages 117-134 (2008).

45. PELECH, S. Biomarker identification for diagnosis of Alzheimer's disease. Expert Opin Medical Devices. 2: 577-591 (2008).

46. PELECH, S. Hitting the right kinase targets. BioForum Europe. 12:36-38 (2008).

47. Shaw, C.A., PELECH, S., and Ly, P.T.T. Paradoxical responses to neurotoxic steryl glycosides: insights from a cell model of ALS-PDC. Neurobiology of Lipids. 8(1):1-5 (2009).

48. Zhang, H., and PELECH, S. Protein microarrays and their potential clinical applications in the era of personalized medicine. Microarrays in Diagnostics and Biomarker Development Current and Future Applications. Edited by Bertrand Jordan. Springer Press inc., Part 2. Chapter 6: 55-80 (2012).

49. Zhang, H., and PELECH, S. Peptide arrays, issues and specific implementations. Microarrays in Diagnostics and Biomarker Development Current and Future Applications. Edited by Bertrand Jordan. Springer Press inc., Part 2. Chapter 7.1: 81-112 (2012).

50. Zhang, H., and PELECH, S.L. Using protein microarrays to study phosphorylation mediated signal transduction. Seminars in Cell and Developmental Biology. 23:872-882 (2012).

51. PELECH, S.L. and Fosse, L. Interview. CEOCFO Magazine. December 24 (2012), 1-4.

52. PELECH, S. Interview. Q&A: Bioinformatics. IPT, Innovations in Pharmaceutical Technology. 45: 48-50 (2013).

53. Zhang, H., Shi, X., and PELECH, S. Monitoring protein kinase expression and phosphorylation in cell lysates with antibody microarrays. Protein kinase screening and Profiling. Edited by Hicham Zegzouti and Said Goueli. Humana Press USA. Methods in Molecular Biology 1360:107-22 (2016).

54. Lai, S., Winkler, D.F.H., Zhang, H. and PELECH, S. Determination of the substrate specificity of protein kinases with peptide micro- and macroarrays. Protein kinase screening and Profiling. Edited by Hicham Zegzouti and Said Goueli. Humana Press USA. Methods in Molecular Biology 1360:183-202 (2016).

55. PELECH, S. Proteins are better biomarkers than genes. (2018). Insightscare. http://insightscare.com/proteins-better-biomarkers-genes/

56. Mallard, B.A., Karrow, N., Bridle, B., Speicher, D., Sturgess, L. Shaw, C., PELECH, S.L. Which is better for future COVID-19 prevention: Immunity following natural infection or vaccine-induced immunity? (October 8, 2021) 1-14. https://www.canadiancovidcarealliance.org/wp-content/uploads/2021/10/Natural-Immunity-vs.-Vaccine-Induced-Immunity-FINAL-Oct-8-2021.pdf

57. Shapira, T., Rens, C., Puchler, V., Rees, W., Steiner, T., Jean, F., Winkler, D., Sarai, I., PELECH, S., Av-Gay, Y. Inhibition of glycogen synthase kinase-3-beta (GSK3□) blocks nucleocapsid phosphorylation and SARS-CoV-2 replication. Research Square. (2021) DOI: https://doi.org/10.21203/rs.3.rs-1197371/v1

58. Bridle, B.W., Martins, I., Mallard, B.A., Karrow, N.A., Speicher, D.J., Chaufan, C., Northey, J.G.B., PELECH, S., Shaw, C.A., Halgas, O. Concerns regarding the efficacy and safety for BNT162b2 mRNA coronavirus disease (COVID-19) vaccine through six months. www.CanadianCovidCareAlliance.org (January 10, 2022) 1-10.

https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/01/Final-CCCA-Critique-Thomas-COVID-19-Vaccines-6-months-NEJM-Jan-10-22.pdf

59 PELECH, S. Open Letter: Pelech letter to UBC president Santa Ono call for end of mandatory masking. (March 15, 2022) 1-3. https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/03/Pelech-Letter-to-UBC-President-Santa-Ono.pdf

60. Payne, E., Rennebohm,R., Bridle, B., Mallard, B., Karrow, N., Massie, B., Northey, K., Shoemaker, C., PELECH, S., Chaufan C., McLeod, D., Hardie, J., Pinto, C., Britz-McKibbin, P., Shaw, C. Request to halt vaccinations of children. www.CanadianCovidCareAlliance.org (July 14, 2022) 1-28 https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/07/CCCA-Halt-vaccination-of-children-Officials-Letter-Jul-14-22.pdf

61. Britz-McKibbin, P., Chaufan, C., Gutschi, L.M., Halgas, O., Hardie, J., Hsiang, Y., Karrow, N.A., Mallard, B., Massie, B., Nakatsu, K., Natsheh, S., Oldfield, P., Payne, E.T., PELECH, S., Pinto, C., Rancourt, D., Shaw. C. Open Letter: Order requiring registration of COVID-19 vaccination status for B.C.'s healthcare workers. (August 10, 2022) 1-13. https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/08/22AU10_Open-Letter-BC-Prov.Health-Officer.pdf

62. Britz-McKibbin, P., Chaufan, C., Gutschi, L.M., Hardie, J., Mallard, B., Nakatsu, K., Oldfield, P., PELECH, S., Shaw. C. Open Letter: To the Health Minister regarding Health Canada's use of the mRNA vaccines. (September 30, 2022) 1-5. https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/10/22SE30_Oldfield-Letter-to-Duclos.pdf

63. Beveridge, C., Britz-McKibbin, P., Chaufan, C., Gutschi, L.M., Halgas, O., Hardie, J., Karrow, N.A., Martin, S.B., Massie, B., McLeod, D., Nakatsu, K., Natsheh, S., Oldfield, P., Payne, E.T., PELECH, S., Pinto, C., Provost, P., Rancourt, D., Shaw. C., Vickers, D. Open Letter: Mandatory COVID-19 vaccination at Canadian universities and colleges. (August 23, 2022) 1-5. https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/08/22AU23-Open-Letter-to-Universities.pdf

64. Gutchi, M., Speicher, D. J., Natsheh, S., Oldfield, P., Britz-McKibbon, P., Palmer, M., Karrow, N., Massie, B., Mallard, B., Chan, G. PELECH, S. An independent analysis of the manufacturing and quality control issues of the BNT162b BioNTech/Pfizer vaccine identified by the European Medicine Agency. www.Canadian Covid Care Alliance.org (October 29, 2022) 1-5. https://www.canadiancovidcarealliance.org/wp-content/uploads/2022/11/22OC29_EMA-Analysis-of-BNT162b-Manufacture.pdf

65. Flanagan, K., PELECH, S., Av-Gay, Y., Duc, K.D. CAT PETR:A Graphical user interface for differential analysis of protein phosphorylation. bioRxiv (2022). doi: https://doi.org/10.1101/2023.01.04.522665

66. Bridle, B., Britz-McKibbin, P., Chaufan, C., Gutschi, L.M., Hardie, J., Hsiang, Y., Karrow, N.A., Mallard, B., Nakatsu, K., Natsheh, S., Oldfield, P., Payne, E.T., PELECH, S., Provost, P., Rancourt, D., Roscoe, W., Shaw. C., Speicher, D., Wagter-Lesperance, L. Open Letter: CCA publication: Fault lines – Expert panel on the socioeconomic impacts of science and health misinformation. (February 6, 2023) 1-8. https://www.canadiancovidcarealliance.org/wp-content/uploads/2023/02/23FE6_CCCA-response-to-CCA-misinformation-report_2023.pdf

67. Nakatsu, K., Beveridge, C., Natsheh, S., Ross, D., PELECH, S., Levins, K. Open Letter: Expanding the therapeutic options for the early treatment of COVID-19. (February 17, 2023) 1-26. https://www.canadiancovidcarealliance.org/wp-content/uploads/2023/09/CCCA-Letter-to-regulatory-colleges-Feb2023.pdf

68. Britz-McKibbin, P., Bridle, B., Chaufan, C., Gutschi, L.M., Hardie, J., Hsiang, Y., Mallard, B., Massie, B., Nakatsu, K., Natsheh, S., PELECH, S., Provost, P., Shaw. C., Speicher, D. Open Letter: Ending "strong recommendation" for masking of children at schools in Ontario. (February 15, 2023) 1-7. https://www.canadiancovidcarealliance.org/wp-content/uploads/2023/02/End_Mask-Policy_CCCA_2023-02.pdf

69. Rinner, C., Chaufan, C., Welsh, D., PELECH, S. Opinion: Is Fauci a Covid vaccine skeptic now too? TroyMedia. (February 27, 2023) https://troymedia.com/health/is-fauci-a-covid-vaccine-skeptic-now-too

70 Bridle, B., Britz-McKibbin, P., Chan, G., Chaufan, C., Hardie, J., Helgas, O., Hsiang, Y., Karrow, N., Mallard, B., Natsheh, S., Oldfield, P., PELECH, S., Provost, P., Rancourt, D., Roscoe, W., Shaw. C., Speicher, D. The building case against COVID-19 vaccination of students in Canada. www.canadiancovidcareallaiance.org website (May 3, 2023) 1-21. https://www.canadiancovidcarealliance.org/wp-content/uploads/2023/05/23MY3_Case-against-C19-vaccine-requirements.pdf

71. PELECH, S. and Scientific and Medical Advisory Committee of the Canadian Covid Care Alliance. Critique of Mitchell *et al.* JAMA publication on COVID-19 patients in Canadian hospitals. www.canadiancovidcarealliance.org website (June 5, 2023) 1-7. https://www.canadiancovidcarealliance.org/wp-content/uploads/2023/06/23JN5_SMACCriticalAnalysis_Mitchell-et-al.pdf

72. PELECH, S., Hardie, J. The effectiveness and risks of masking for COVID-19. www.canadiancovidcarealliance.org website (August 28, 2023) 1-37. https://www.canadiancovidcarealliance.org/wp-content/uploads/2023/08/23AU28_PelechHardie_Effectiveness-of-Masks-for-COVID-19.pdf

73. PELECH, S. Letter to the Editors: A scientific critique of "The Unwelcome Unvaxxed" Winnipeg Free Press. (January 2024) 1-154. https://www.canadiancovidcarealliance.org/featured/letter-to-the-editors-the-winnipeg-free-press/

74. J.M., Hardie, J., PELECH, S. Critique of British Medical Journal articles on Canada's response to the COVID-19 pandemic. www.canadiancovidcarealliance.org website (March 4, 2024) 1-30. https://www.canadiancovidcarealliance.org/wp-content/uploads/2024/04/24MR4_Critique_BMJ_Canada_C19-Response.pdf

75. Nakatsu, K., Hardie, J., Karrow, N., PELECH, S. Vitamin D is essential for optimal health: Are you getting enough. www.cccalliance.ca website. (March 10, 2024) 1-35. https://www.cccalliance.ca/wp-content/uploads/2024/12/24MR10_Canada_Vitamin-D_Campaign.pdf

76. PELECH, S. Situation update: The ongoing monkeypox pandemic. www.cccalliance.ca website. (August 27, 2024) 1-8. https://ia601708.us.archive.org/24/items/24-au-27-ongoing-monkeypox-pandemic-pelech/24AU27_Ongoing%20Monkeypox%20Pandemic_Pelech.pdf

77. PELECH, S., Shaw, C.A. (Editors). Down the COVID-19 rabbit hole: Independent scientists and physicians unmask the pandemic. Skyhorse Publishing, New York. (2024) ISBN: 9781510779600
https://www.skyhorsepublishing.com/9781510779600/down-the-covid-19-rabbit-hole/
Chapter 1. Why this book? PELECH, S.
Chapter 2. COVID-19 and Science: Information, Misinformation, and the "Truth." Hardie, J., J.M., PELECH, S.
Chapter 3. Agents and Transmission of Infectious Diseases. Hardie, J., PELECH, S.
Chapter 4. Pre-COVID-19 Coronaviruses and Other Respiratory Disease Viruses. PELECH, S.
Chapter 5. The SARS-CoV-2 Virus. PELECH, S., Roscoe, W.
Chapter 6. The Pathology of COVID-19. Hsiang, Y., PELECH, S., Shaw, C.A., Chan, G.
Chapter 7. The Effectiveness and Risks of Masks. PELECH, S., Hardie, J.
Chapter 8. The Body's Defenses Against Infectious Pathogens. PELECH, S., Mallard, B., Karrow, N.
Chapter 9. Tracking SARS-CoV-2 and the Immune Response. PELECH, S.
Chapter 10. Evaluating the Efficacy and Safety of Vaccines. PELECH, S.
Chapter 11. Production of COVID-19 Vaccines. Gutschi, L.M., Speicher, D.J., Natsheh, S., Oldfield, P., Britz-McKibbon, P., Karrow, N., Massie, B., Mallard, B., Chan, G., PELECH, S.
Chapter 12. Effectiveness of COVID-19 Vaccines. PELECH, S.
Chapter 13. Safety of COVID-19 Vaccines. PELECH, S., Shaw, C.A.
Chapter 14. Therapeutic Treatment of COVID-19. Shaw, C.A., PELECH, S., Oldfield, P., Kreynes, A., Roscoe, W., Nataksu, K.

78. PELECH, S., Shaw, C.A. (Editors). COVID-19 Pandemonium: A pandemic of ignorance, fear and greed. The capture of our institutions. Ekstasis Press, Victoria, Canada. (2025) ISBN: 9781771715843
https://ekstasiseditions.com/index.html
Chapter 1. Introduction. Shaw. C.A. PELECH, S.
Chapter 2. The Origin of SARS-CoV-2. PELECH, S., Oldfield, P.
Chapter 3. Effectiveness of Public Health Containment Measures to Curtail COVID-19. Shaw, C.A., Eberspaecher, S., Chaufan, C., Watteel, R., PELECH, S.
Chapter 6. The Response of Public Agencies to COVID-19. Shaw, C.A., PELECH, S.
Chapter 8. The Capture of Mainstream Media in Canada. Shaw. C.A., PELECH, S., Palmer, R.
Chapter 10. The Response of the Public to COVID-19 Policies. Shaw, C.A., PELECH, S., Hardie, J., Natsheh, S., Massie, B.

v. PATENTS

1. PELECH, S.L. Algorithm for elucidation of structure of protein kinase networks. U.S. Issued 2005. (also issued in United Kingdom 2007). This patent describes an algorithm to map out cell signalling pathways using the data collected from the quantifying protein levels in diverse cell/tissue extracts using the Kinetworks™ methodology that was developed in my UBC lab and licensed to Kinexus.

2. PELECH, S. L., Feldman, H., and Zhang, H. Biomarkers of Alzheimer's Disease. US Provisional Application – Jan. 30, 2008.

3. Shapira, T., Rens, C., Puchler, V., Rees, W., Steiner, T., Jean, F., Winkler, D., Sarai, I., PELECH, S., Av-Gay, Y. Inhibition of glycogen synthase kinase-3-beta (GSK3□) blocks nucleocapsid

phosphorylation and SARS-CoV-2 replication. Provisional Application to UBC UILO in November 2021.

U.S. Provisional Patent Application Serial No. 63/286,632, filed December 7, 2021, entitled "GSK3 compounds and antiviral activity."

International Patent PCT/CA2022/051784, filed December 7, 2022, issued June 15, 2023, entitled Glycogen synthase kinase-3 (GSK3) inhibitor compounds for use as antiviral agents.

vi. WEBSITES

In the last few years, I have begun to develop on-line, open-access databases and knowledgebases with comprehensive information on proteins, their mRNA and protein expression as well as their phosphorylation. While many people have been involved in the coding of the interfaces for these websites, I have personally devoted much of my time into their conception, design, data annotation, data inspection and coordinating their production. The following is a listing of these websites.

1. KiNET-IB – Kinetworks™ Immunoblotting DataBase (www.kinet.ca)
First in 2006, KiNET-IB features over 200,000 measurements of the expression and phosphorylation states of hundreds of signal transduction proteins from over 6000 Kinetworks™ multi-immunoblots performed with control and treated tissue/cell samples. Immunoblotting remains the gold standard for protein quantification and the Kinetworks™ methodology was originally developed in my UBC lab. KiNET-IB is a useful tool for evaluating proteins that may participate in the control of diverse cellular processes and their connection with other proteins in signaling pathways. Over 95% of this data has been previously unpublished.

2. KiNET-AM – Kinex™ Antibody Microarray DataBase (www.kinet-am.ca)
First launched in 2011, KiNET-AM features the quantitative results from nearly 2000 Kinex™ Antibody Microarray analyses with over 1.5 million measurements of 650 to 800 hundred different signalling proteins and phosphosites tracked per microarray. The data can be queried based on biological samples, treatments, specific proteins and phosphosites. Over 98% of this data has not been previously unpublished and was produced from analyses performed at Kinexus.

3. PhosphoNET – Human Phosphorylation Site KnowledgeBase (www.phosphonet.ca)
First launched in 2010, PhosphoNET is the world's largest repository of known and predicted information on human phosphorylation sites, their evolutionary conservation and the identities of protein kinases that may target these sites. PhosphoNET presently holds data on over 970,000 known and putative phosphorylation sites (P-sites) in over 20,000 human proteins that have been collected from the scientific literature and other reputable websites. Over 177,000 of these phosphosites have been experimentally validated. The rest have been predicted with a novel Phosphosite Predictor algorithm developed at Kinexus. With the PhosphoNET Evolution module, this website also provides information about cognate proteins in over 20 other species that may share these human phospho-sites. This helps to define the most functionally important phosphosites as these are expected to be highly conserved in nature. With the Kinase Predictor module, listings are provided for the top 50 human protein kinases that are likely to phosphorylate

each of these phospho-sites using another proprietary kinase substrate prediction algorithm that I helped to develop at Kinexus. With the Phosphosite Match module added in 2017, it is possible to identify phosphosites that are highly related in amino acid sequence. This helps to identity phosphosites that may be detected in cross-reactive off target proteins with phosphosite-specific antibodies. Over 8 million kinase-substrate phospho-site pairs are quantified in PhosphoNET, and over 200 signalling pathway maps are available.

4. TranscriptoNET – Human mRNA Expression KnowledgeBase (http://207.150.202.175)
First launched in 2011, TranscriptoNET features comprehensive information on the mRNA expression levels of about 21,000 genes in about 600 types of human organs, tissues and cells as measured with gene microarrays. The original data used in TranscriptoNET was retrieved from the National Center for Biotechnology Information Gene Expression Omnibus (NCBI GEO), which serves as a repository of experimental gene microarray results submitted by diverse academic and industrial laboratories around the world. We normalized the data from over 900 different studies with over 6000 biological specimens to permit investigations of gene expression and potential interactions that can only be undertaken with such a large dataset of over 125 million gene expression measurements. This normalization process was based on the identification of 60 genes that were commonly and highly expressed in all of the biological samples. This site was first posted in 2013.

5. DrugKiNET – Human Kinase Drug Interaction KnowledgeBase (www.drugkinet.ca)
First launched in 2013, DrugKiNET is an open-access, online resource to foster the identification and characterization of inhibitors of protein kinases for academic and industrial research. It features comprehensive information on over 850 compounds that have been experimentally determined to inhibit human protein kinases. This includes the retrieval of the lowest reported compound IC50, Ki and Kd values from several sources, including the National Center for Biotechnology Information (NCBI) PubChem Compound database, the Kinase SARfari database from the European Molecular Biology Laboratory (EMBL) European Bioinformatics Institute, The International Centre for Kinase Profiling at the University of Dundee, Ambit Biosciences and hundreds of original research publications. In some cases, estimates for IC50 values were derived from limited measurements of kinase inhibition at only one to three different concentrations of the compounds. Using over 105,000 experimentally tested, non-redundant kinase-compound pairs for training, we have developed two kinase inhibitor prediction algorithms to further predict another 200,000 kinase-compound interactions. In 2017, we added a new module to DrugKiNET that provides information on the bond distances between the atoms of over 1500 drugs and the atoms in protein kinases as determined from their x-ray crystallographic structures.

6. OncoNET – Human Cancer Protein KnowledgeBase (www.onconet.ca)
This website features comprehensive information on the mutations and mRNA expression levels for about 3,000 genes in diverse types of human cancers. The mRNA expression data used in OncoNET was originally retrieved from the National Center for Biotechnology Information Gene Expression Omnibus (NCBI GEO), which serves as a repository of experimental gene microarray results submitted by diverse academic and industrial laboratories around the world. We normalized the data from hundreds of different gene microarray studies using a normalization protocol based on the identification of 60 genes that were commonly and highly expressed in all of the biological samples. To explore the mutation of human cancer-related genes, we relied primarily on the collection of data from the Wellcome Trust Sanger Institute's Catalogue of Somatic Mutations in Cancer (COSMIC) database. Further information on these genes and their encoded proteins was annotated from several other sources, including UniProt and the Atlas of

Genetics and Cytogenetics in Oncology and Haematology websites. I have used this database to identify new potential oncogenes, tumour suppressor genes and tumour requiring protein genes. This site was first posted in 2013.

7. KinaseNET – Human Protein Kinase KnowledgeBase (www.kinasenet.ca)
KinaseNET features comprehensive information on 536 human protein kinases, including their primary and tertiary structure, regulation, distribution, evolutionary conservation, protein substrate targets, pathway maps, sensitivities to compounds and linkages to human diseases. Each protein kinase is represented with a separate webpage. KinaseNET also serves as a portal to many other useful websites with additional data about protein kinases. This site was first posted in 2015 and updated in 2017.

8. Kinetica Online – E-journal for Intelligence Systems Research (www.kinexus.ca/kinetica)
This website has not yet been officially launched, but a beta-version is available for viewing since 2013. This unique resource features commentaries, original research publications, databases and knowledgebases, and it also serve as portal to hundreds of other websites that should be useful to researchers engaged in the investigation of cell signalling. All of the articles in Kinetica Online have been published elsewhere.

9. KinATLAS – Human Protein Interaction Altas
(http://kinatlas.ca:8080/KinAtlas/KinaseDrugQuery.html)
This website is in development and a beta version with the first (Kinase-drug interactions) and second modules (Protein-protein interactions) are available for viewing since 2016. The underlying database is complete, and the web interface is still in the process of being coded for the third module (Kinase-substrate interactions). It will show tissue/cell-specific maps of protein-protein and kinase-drug interactions. The kinase-substrate interactions are prioritized using our updated kinase prediction algorithms, and the viewer will contain filters to permit generation of more customized maps.

10. DrugProNET – Human Protein – Drug Interaction KnowledgeBase (www.drugpronet.ca)
This website provides for the identification of the most critical atomic interactions between drugs and their protein targets based on 3D x-ray crystallographic analyses. Defining the key amino acid residues for drug binding in proteins permits the prediction of specific mutations in human genomes that will affect the sensitivities of individuals to these compounds. The bond distances in Angstroms between the closest protein and drug atoms in each crystal complex are provided in downloadable tables, along with definition of the closest amino acid residue side-chains. The single nucleotide variants (SNV's) that would affect these critical amino acid residues involved in drug interactions are also identified in DrugProNET. This website features comprehensive information on over 2000 compounds that have been co-crystallized with over 480 different human proteins in over 4400 protein-compound structures retrieved from the Research Collaboratory for Structural Bioinformatics (RCSB) Protein Databank (PDB).

11. KiNector – Human Protein Kinase-Protein Substrate+Phosphosite Interaction KnowledgeBase (www.kinector.ca)
Over 21,450 human kinase-substrate relationships (KSRs) were retrieved from several sources, including the PhosphoNET, PhosphoSitePlus and PhosphoNetworks websites and the scientific literature. The data are presented in a graphic format as maps, and full functional information was provided for at least 6000 of these KSRs. KiNector shows both direct and indirect linkages between a starting protein kinase and a phosphoprotein target that acts downstream in signalling

pathways. KiNector also serves as a portal to other reputable websites that contain detailed information on these kinases and substrates, and provides direct links to the Kinexus Products website, which features over 3500 images of full Western blots performed with lysates from diverse rodent tissue panels and human cancer cell lines. In January 2025, development began on the third phase of the KiNector website to permit the identification of connections between extracellular mediators, such as hormones and cytokines, with cellular receptors. This is slated to be completed by the end of March, 2025.

vii. ARTISTIC WORKS

1. Smith, J., Xu, Y., and PELECH, S.L. Human protein kineome. (2006) [This is a large wall chart that contains the identification of all of the known domains and phosphorylation sites in 515 human protein kinases. It was printed and distributed by Kinexus Bioinformatics Corporation.]

2. PELECH, S.L. and Bowyer, C. The human operating system. (2008) [This is a large wall chart that features over 180 cell signalling pathways. It was printed and distributed by Kinexus Bioinformatics Corporation.]

4. PELECH, S.L, Smith, J., and Xu, Y. Human protein kineome. (2010) [This is an updated, large wall chart that contains the identification of all of the known domains sites in 515 human protein kinases, along with Uniprot, size and substrate specificity information. It was printed and distributed by Kinexus Bioinformatics Corporation.]

5. PELECH, S. L. Human Cancer Protein Interaction Network. (2017). This is a wall chart that shows how over 100 of the most frequently mutated oncoproteins and tumour suppressor proteins interact with each other. It was presented and distributed at the 2017 American Association for Cancer Research Meeting and is downloadable from the Kinexus website (http://www.kinexus.ca/pdf/OncoNET_Poster.pdf).

viii. BLOG COMMENTARIES

Over the last decade, I have written commentaries on over 300 blogs as part of an outreach effort to inform the broader scientific community on a wide range of issues ranging from career development to genomics to biotechnology. I have only listed those commentaries that appeared primarily at the GenomeWeb website. Unfortunately, these, like all previous commentaries, are no longer accessible at the GenomeWeb site, but mine can be viewed at www.kineticaonline.ca in the Blog Comments section.

1. Lazy Snobs and Conflict of Interest (1/29/2010). http://www.genomeweb.com/blog/lazy-snobs-and-conflict-interest
2. Not So Useful? (2/17/2010). http://cdnwww.genomeweb.com/blog/not-so-useful
3. 'Grantwriter's Agony' (2/19/2010). http://www.genomeweb.com/blog/grantwriters-agony

4. A Link Between Breast Cancer and Estrogen (3/3/2010). http://www.genomeweb.com/blog/study-provides-insight-breast-cancers-link-estrogen
5. The Surprising Variability of Mitochondrial DNA (3/9/2010). http://cdnwww.genomeweb.com/blog/surprising-variability-mitochondrial-dna
6. The Human Genome Bubble (3/17/2010). http://www.genomeweb.com/blog/human-genome-bubble
7. Creatures of the Deep Provide Insight into Diabetes (3/23/2010). http://www.genomeweb.com/blog/creatures-deep-provide-insight-diabetes
8. Arguing Over the Epigenome (3/31/2010). http://www.genomeweb.com/blog/arguing-over-epigenome
9. Rocket Scientists, Brain Surgeons, and All That (4/15/2010). http://cdnwww.genomeweb.com/blog/rocket-scientists-brain-surgeons-and-all
10. Paul Nurse on Funding (4/26/2010). http://www.genomeweb.com/blog/paul-nurse-funding
11. Free Personal Genome, with a Catch (4/27/2010). http://www.genomeweb.com/blog/free-personal-genome-catch
12. Study: Discoveries in Non-Human Species Could Directly Benefit Man (4/28/2010). http://www.genomeweb.com/blog/study-discoveries-non-human-species-could-directly-benefit-man
13. Oh, the Vanity (5/3/2010). http://www.genomeweb.com/blog/oh-vanity
14. Because That Would Make Too Much Sense (5/5/2010). http://www.genomeweb.com/blog/because-would-make-too-much-sense
15. Letting Go of the Details (5/10/2010). http://www.genomeweb.com/blog/letting-go-details
16. HIV Makes Music (5/13/2010). http://www.genomeweb.com/blog/hiv-makes-music
17. The Changing Roles of 'The Sequencers' (5/17/2010). http://cdnwww.genomeweb.com/blog/changing-roles-sequencers
18. 'Overstepping Your Authority' With Online Comments? (5/21/2010). http://www.genomeweb.com/blog/careers-overstepping-your-authority-online-comments
19. Why Craig Venter Isn't Actually God (5/28/2010). http://www.genomeweb.com/blog/why-craig-venter-isnt-actually-god
20. Quality vs. Quantity (6/3/2010). http://www.genomeweb.com/blog/quality-vs-quantity
21. GSA: 'Cardinal' Organisms to Human Biology (6/14/2010). http://www.genomeweb.com/blog/gsa-cardinal-organisms-human-biology
22. Small Prize, Big Question (6/18/2010). http://cdnwww.genomeweb.com/blog/small-prize-big-question
23. The Genome and the Economy (6/18/2010). http://www.genomeweb.com/blog/genome-and-economy
24. deleted
25. The Benefit of a Grant (6/21/2010). http://www.genomeweb.com/blog/benefit-grant
26. The Evolution of Evolution (7/2/2010). http://www.genomeweb.com/blog/evolution-evolution-0
27. What About Hedgehog, Buttonhead, and Bride of Sevenless? (7/8/2010). http://www.genomeweb.com/blog/what-about-hedgehog-buttonhead-and-bride-sevenless
28. The Sound of Genetics (7/12/2010). http://www.genomeweb.com/blog/sound-genetics
29. What to Do About Review (7/12/2010). http://www.genomeweb.com/blog/what-do-about-review
30. New Blog on the Block (7/14/2010). http://www.genomeweb.com/blog/new-blog-block
31. Ain't Nothing Gonna Break My Stride (7/20/2010). http://www.genomeweb.com/blog/aint-nothing-gonna-break-my-stride
32. The Human Collective (7/21/2010). http://www.genomeweb.com/blog/human-collective
33. Too Much to Read (7/21/2010). http://www.genomeweb.com/blog/too-much-read
34. Are Leaders Born or Taught? (7/23/2010). http://www.genomeweb.com/blog/are-leaders-born-or-taught
35. Taking the Conflict-of-Interest Heat (8/4/2010). http://cdnwww.genomeweb.com/blog/taking-conflict-interest-heat
36. Speculating on the Significance of the Sponge Genome (8/5/2010). http://www.genomeweb.com/blog/speculating-significance-sponge-genome
37. A Waste of Time? (8/11/2010). http://www.genomeweb.com/blog/waste-time

38. Planning, Precision, and Profit Margins (8/11/2010). http://www.genomeweb.com/blog/planning-precision-and-profit-margins
39. Francis Collins' Funding Problem (8/13/2010). http://www.genomeweb.com/blog/francis-collins-funding-problem
40. Make Way (8/16/2010). http://www.genomeweb.com/blog/make-way
41. A Good Biomarker Is Hard to Find (8/17/2010). http://www.genomeweb.com/blog/good-biomarker-hard-find
42. Dissecting DIY Letters of Rec (8/17/2010). http://www.genomeweb.com/blog/dissecting-diy-letters-rec
43. Mysteries of the Human Brain (8/19/2010). http://www.genomeweb.com/blog/mysteries-human-brain
44. Making a Case for Lab Rotations (8/23/2010). http://www.genomeweb.com/blog/making-case-lab-rotations
45. The Genome of Sitting Bull (8/23/2010). http://www.genomeweb.com/blog/genome-sitting-bull
46. Six Degrees of Scientific Misconduct (8/30/2010). http://www.genomeweb.com/blog/six-degrees-scientific-misconduct
47. The 'Arbimagical' Goal of the $1,000 Genome (8/30/2010). http://www.genomeweb.com/blog/arbimagical-goal-1000-genome
48. A Dispassionate Look at Gene Patenting (8/31/2010). http://www.genomeweb.com/blog/dispassionate-look-gene-patenting
49. Do We Really Need Posters? (8/31/2010). http://www.genomeweb.com/blog/do-we-really-need-posters
50. Tips for Successful Grants (9/1/2010). http://www.genomeweb.com/blog/tips-successful-grants
51. 'How Not to Get a Postdoc' (9/2/2010). http://www.genomeweb.com/blog/careers-how-not-get-postdoc
52. Craig Venter, "Hopeless Businessman" (9/6/2010). http://www.genomeweb.com/blog/craig-venter-hopeless-businessman
53. It Was the Best of Times, It Was the Worst of Times... (9/8/2010). http://www.genomeweb.com/blog/it-was-best-times-it-was-worst-times
54. The Misunderstood Gene (9/9/2010). http://www.genomeweb.com/blog/misunderstood-gene
55. Suggestions for Drug Approvals (9/14/2010). http://cdnwww.genomeweb.com/blog/suggestions-drug-approvals
56. George Williams Dies (9/16/2010). http://www.genomeweb.com/blog/george-williams-dies
57. The Money of Sequencing (9/16/2010). http://www.genomeweb.com/blog/money-sequencing
58. Systems Biology Meets 'Real' Biology (9/17/2010). http://www.genomeweb.com/blog/systems-biology-meets-real-biology
59. Graphs on Grants (9/17/2010). http://www.genomeweb.com/blog/graphs-grants
60. Save Data to Gene (9/20/2010). http://www.genomeweb.com/blog/save-data-gene
61. Early-Warning DNA Sequencing System (9/21/2010). http://www.genomeweb.com/blog/early-warning-dna-sequencing-system
62. Evolution of a Fruit Fly, Evolution of a Human (9/22/2010). http://www.genomeweb.com/blog/evolution-fruit-fly-evolution-human
63. A Look at Chemical Biology (9/23/2010). http://cdnwww.genomeweb.com/blog/look-chemical-biology
64. Scooped (9/24/2010). http://www.genomeweb.com/blog/scooped
65. The Hard Decisions (9/28/2010). http://www.genomeweb.com/blog/hard-decisions
66. Hey Scientists! (Don't) Get a Life! (10/5/2010). http://www.genomeweb.com/blog/hey-scientists-dont-get-life
67. What to Do with All That Data? (10/7/2010). http://www.genomeweb.com/blog/what-do-all-data
68. Human Genome Times 50 in One Small Flower (10/8/2010). http://www.genomeweb.com/blog/human-genome-times-50-one-small-flower
69. Move Aside, Genome ... It's the Interactome's Time to Shine (10/11/2010). http://www.genomeweb.com/blog/move-aside-genome-...-it's-interactome's-time-shine
70. Going 'Beyond the Genome' (10/14/2010). http://www.genomeweb.com/blog/going-beyond-genome

71. Bias in the Peer-Review Buddy System? (10/19/2010). http://www.genomeweb.com/blog/bias-peer-review-buddy-system
72. Genotype-Phenotype Correlations Confer 'Chaotic' Evolution (10/19/2010). http://www.genomeweb.com/blog/genotype-phenotype-correlations-confer-chaotic-evolution
73. Bigger Not Always Better (11/9/2010). http://www.genomeweb.com/blog/bigger-not-always-better
74. The Business of Basic Research (11/9/2010). http://www.genomeweb.com/blog/business-basic-research
75. Make Your Application Memorable (11/10/2010). http://www.genomeweb.com/blog/make-your-application-memorable
76. What Work/Life Balance? (11/11/2010). http://www.genomeweb.com/blog/what-worklife-balance
77. The Happy Medium (11/19/2010). http://www.genomeweb.com/blog/happy-medium
78. (Don't) Be Still My Beating Heart (11/22/2010). http://cdnwww.genomeweb.com/blog/dont-be-still-my-beating-heart
79. Something You Don't See Every Day (Anymore) (11/23/2010). http://www.genomeweb.com/blog/something-you-dont-see-every-day-anymore
80. The Rise of Asia (11/24/2010). http://www.genomeweb.com/blog/rise-asia
81. Quantification Quandary (12/2/2010). http://www.genomeweb.com/blog/quantification-quandary
82. Arsenic? Yes, Please! (12/3/2010). http://www.genomeweb.com/blog/arsenic-yes-please
83. How Come My Gel Bands Aren't that Discrete? (12/8/2010). http://www.genomeweb.com/blog/how-come-my-gel-bands-arent-discrete
84. Collins 'a Guy in a Hurry' for Translational Research (12/14/2010). http://www.genomeweb.com/blog/collins-guy-hurry-translational-research
85. What's the Point? (12/17/2010). http://www.genomeweb.com/blog/whats-point
86. Science: The Outsourcing (1/7/2011). http://www.genomeweb.com/blog/science-outsourcing
87. Stupendous! Amazing! 'Astonishing!' (1/20/2011). http://www.genomeweb.com/blog/stupendous-amazing-astonishing
88. Journal Impact Versus Paper Impact (1/24/2011). http://www.genomeweb.com/blog/journal-impact-versus-paper-impact
89. Maybe You're Born With It? (1/27/2011). http://cdnwww.genomeweb.com/blog/maybe-youre-born-it
90. The Rise and Fall of RNAi (2/8/2011). http://www.genomeweb.com/blog/rise-and-fall-rnai
91. Blogger: Three Years is Plenty (2/11/2011). http://www.genomeweb.com/blog/blogger-three-years-plenty
92. Glug, Glug, Glug ... (2/11/2011). http://www.genomeweb.com/blog/glug-glug-glug-...
93. The Politics of Science (2/18/2011). http://www.genomeweb.com/blog/politics-science
94. A Challenge for Scientists (2/21/2011). http://cdnwww.genomeweb.com/blog/challenge-scientists
95. 'CEOmics' (2/22/2011). http://cdnwww.genomeweb.com/blog/ceomics
96. Faster, Faster! (2/24/2011). http://www.genomeweb.com/blog/faster-faster
97. Animal Research Provokes Some 'Misgivings' (2/25/2011). http://cdnwww.genomeweb.com/blog/animal-research-provokes-some-misgivings
98. Happy Is as Happy Does (3/7/2011). http://www.genomeweb.com/blog/happy-happy-does
99. A Clinical Option (3/8/2011). http://www.genomeweb.com/blog/clinical-option
100. High-Tech Biology (3/10/2011). http://www.genomeweb.com/blog/high-tech-biology
101. Survival of the Fittest ... Labs (3/17/2011). http://www.genomeweb.com/blog/survival-fittest-...-labs
102. Fine, Be That Way (3/21/2011). http://www.genomeweb.com/blog/fine-be-way
103. Eric Schadt's Network (3/24/2011). http://www.genomeweb.com/blog/eric-schadts-network
104. Who's Paying For This? (3/24/2011). http://www.genomeweb.com/blog/whos-paying
105. Devils' Disease and Diversity (3/25/2011). http://www.genomeweb.com/blog/devils-disease-and-diversity

106. 'That Doesn't Sound So Terrible' (3/29/2011). http://www.genomeweb.com/blog/doesnt-sound-so-terrible
107. Will It Be Good or Bad for Science? (5/5/2011). http://www.genomeweb.com/blog/will-it-be-good-or-bad-science
108. What Do Your Telomeres Say About You? (5/9/2011). http://www.genomeweb.com/blog/what-do-your-telomeres-say-about-you
109. Reports Tout Return on NIH's Investment (5/11/2011). http://cdnwww.genomeweb.com/blog/reports-tout-return-nihs-investment
110. A Return to Decency (5/20/2011). http://www.genomeweb.com/blog/return-decency
111. It's Everyone's Problem (5/20/2011). http://www.genomeweb.com/blog/its-everyones-problem
112. Scores and Output (6/6/2011). http://cdnwww.genomeweb.com/blog/scores-and-output
113. Nancy Drew and the Mystery of the Whole Genome (6/16/2011). http://www.genomeweb.com/blog/nancy-drew-and-mystery-whole-genome
114. Where No Genome Has Gone Before (6/17/2011). http://www.genomeweb.com/blog/where-no-genome-has-gone
115. Of the People, By the People (6/27/2011). http://www.genomeweb.com/blog/people-people
116. Evolution in Action (6/28/2011). http://www.genomeweb.com/blog/evolution-action
117. Not So Much 'R' and Not So Much 'D' (6/28/2011). http://www.genomeweb.com/blog/not-so-much-r-and-not-so-much-d
118. Saving Lives (7/5/2011). http://cdnwww.genomeweb.com/blog/saving-lives
119. An App for Papers? (7/14/2011). http://www.genomeweb.com/blog/app-papers
120. Why Compete? Collaborate! (7/22/2011). http://www.genomeweb.com/blog/why-compete-collaborate
121. Print to PDF (7/26/2011). http://www.genomeweb.com/blog/print-pdf
122. Take it Easy (8/3/2011). http://www.genomeweb.com/blog/take-it-easy
123. Take That Back (8/12/2011). http://www.genomeweb.com/blog/take-back
124. Dreamless? (8/19/2011). http://www.genomeweb.com/blog/dreamless
125. That's Called Thinking Ahead (9/1/2011). http://www.genomeweb.com/blog/thats-called-thinking-ahead
126. Oh, the Pressure (9/6/2011). http://www.genomeweb.com/blog/oh-pressure
127. Has Anyone Seen the Superglue? (9/12/2011). http://www.genomeweb.com/blog/has-anyone-seen-superglue
128. Positive Results Can Be Negative (9/13/2011). http://www.genomeweb.com/blog/positive-results-can-be-negative
129. A Cap on Grant Applications — Does it Work? (9/14/2011). http://www.genomeweb.com/blog/cap-grant-applications——does-it-work
130. Animators Aid Science (9/20/2011). http://www.genomeweb.com/blog/animators-aid-science
131. The Long and Short of It (10/4/2011). http://www.genomeweb.com/blog/long-and-short-it
132. Not Worth It Anymore (10/7/2011). http://www.genomeweb.com/blog/not-worth-it-anymore
133. Is This the End? (10/14/2011). http://www.genomeweb.com/blog/end
134. Solutions for the Peer Review Problem (10/31/2011). http://www.genomeweb.com/blog/solutions-peer-review-problem
135. Trim or 'Fatten' the Pyramid? (11/2/2011). http://www.genomeweb.com/blog/trim-or-fatten-pyramid
136. Where Science Meets Foreign Policy (11/3/2011). http://www.genomeweb.com/blog/where-science-meets-foreign-policy
137. The Synthetic Surge (11/8/2011). http://www.genomeweb.com/blog/synthetic-surge
138. Healthcare Costs Sap Biotech VC (11/17/2011). http://www.genomeweb.com/blog/healthcare-costs-sap-biotech-vc
139. The Originality of Humans (11/21/2011). http://www.genomeweb.com/blog/originality-humans
140. Lynn Margulis Dies (11/23/2011). http://www.genomeweb.com/blog/lynn-margulis-dies
141. Whole-Genome Liability (11/25/2011). http://www.genomeweb.com/blog/whole-genome-liability

142. In Your Food (11/28/2011). http://www.genomeweb.com/blog/your-food
143. NHGRI's Early Independents (12/1/2011). http://www.genomeweb.com/blog/nhgris-early-independents
144. It Lives! (12/9/2011). http://www.genomeweb.com/blog/it-lives
145. Investment in China (12/13/2011). http://www.genomeweb.com/blog/investment-china
146. Nothing Is Sacred (12/22/2011). http://www.genomeweb.com/blog/nothing-sacred
147. Now You See it, Now You Don't (1/6/2012). http://www.genomeweb.com/blog/now-you-see-it-now-you-dont
148. To the Committee (1/12/2012). http://www.genomeweb.com/blog/committee
149. Turn 'Oops' into 'Oooh' (1/18/2012). http://www.genomeweb.com/blog/turn-oops-oooh
150. The Other Side (1/30/2012). http://www.genomeweb.com/blog/are-they-bad-guys
151. Hold the Arsenic (2/3/2012). http://www.genomeweb.com/blog/hold-arsenic
152. Cuts at AstraZeneca (2/3/2012). http://www.genomeweb.com/blog/cuts-astrazeneca
153. Let the Games Begin (2/8/2012). http://www.genomeweb.com/blog/let-games-begin-0
154. CIHR Peer Review (2/14/2012). http://cihr-irsc.cl0.vanillaforums.com/discussion/15/peer-review-discussions-discussions-a-propos-de-levaluations-par-les-pairs#Item_4
155. CIHR Peer Review (2/14/2012). http://cihr-irsc.cl0.vanillaforums.com/discussion/21/early-career-component#Item_4
156. Cancer-causing mutations yield their secrets (2/15/2012). http://www.nature.com/news/cancer-causing-mutations-yield-their-secrets-1.10029
157. A Bargain Made (2/23/2012). http://www.genomeweb.com/blog/bargain-made
158. 'A Lie and a Sham' (3/2/2012). http://www.genomeweb.com/blog/lie-and-sham
159. The State of Sequencing (3/5/2012). http://www.genomeweb.com/blog/state-sequencing
160. The Cellular CPU (3/5/2012). http://www.genomeweb.com/blog/cellular-cpu
161. Chinese Scientists Celebrate (3/6/2012). http://www.genomeweb.com/blog/chinese-scientists-celebrate
162. Kitchen Biology (3/7/2012). http://www.genomeweb.com/blog/kitchen-biology
163. Blurry Lines and the Cost Curve (3/8/2012). http://www.genomeweb.com/blog/blurry-lines-and-cost-curve
164. Stop That! (3/14/2012). http://www.genomeweb.com/blog/stop
165. Extended Employment (3/14/2012). http://www.genomeweb.com/blog/careers-extended-employment
166. US Universities Hold Strong (3/15/2012). http://www.genomeweb.com/blog/careers-us-universities-hold-strong
167. The Real-time In-depth-ome (3/16/2012). http://www.genomeweb.com/blog/narciss-ome
168. Is the US Losing its Edge in Science? (3/16/2012). http://www.genomeweb.com/blog/losing-our-edge
169. The Next Big Frontier? (3/16/2012). http://www.genomeweb.com/blog/next-big-frontier
170. Containing the Deluge (3/19/2012). http://www.genomeweb.com/blog/containing-deluge
171. Prometheus Struck Down by the Gods ... (3/21/2012). http://www.genomeweb.com/blog/prometheus-struck-down-gods-...
172. It's Not a Pet (3/22/2012). http://www.genomeweb.com/blog/its-not-pet
173. Going Back to Go Forward (3/23/2012). http://www.genomeweb.com/blog/going-back-go-forward
174. Test the Waters (3/26/2012). http://www.genomeweb.com/blog/test-waters
175. Learn a Lesson from the Past (3/27/2012). http://www.genomeweb.com/blog/learn-lesson-past

176. Cellular Computations (3/28/2012). http://www.genomeweb.com/blog/cellular-computations
177. Down with Dry Writing (3/28/2012). http://www.genomeweb.com/blog/down-dry-writing
178. Poop Speaks (3/30/2012). http://www.genomeweb.com/blog/poop-speaks
179. Mind the Gaps (4/2/2012). http://www.genomeweb.com/blog/mind-gaps
180. 'Like Insider Trading' (4/10/2012). http://www.genomeweb.com/blog/insider-trading#comment-8006
181. Questioning Science (4/11/2012). http://www.genomeweb.com/blog/new-law-tennessee
182. Going, Going, Gone? (4/16/2012). http://www.genomeweb.com/blog/going-going-gone
183. Well, This Is Awkward (4/18/2012). http://www.genomeweb.com/blog/well-awkward
184. Pity the Poor Fraudster? (4/19/2012). http://www.genomeweb.com/blog/pity-poor-fraudster
185. In Defense of Risk (4/27/2012). http://www.genomeweb.com/blog/defense-risk
186. Cloudy, With a Chance of (Data) Showers (5/09/2012). http://www.genomeweb.com/blog/cloudy-chance-data-showers
187. Global Scientific Principles (5/16/2012). http://www.genomeweb.com/blog/global-scientific-principles
188. Where Are You From? (6/6/2012). http://www.genomeweb.com/blog/where-are-you-0
189. Transit Distortion (8/6/2012). http://news.nationalgeographic.com/news/2012/06/pictures/120607-best-space-pictures-199-venus-sun-enterprise-science-shuttle/
190. Total Biomass of Adults is 287 Million Tons (18/6/2012). http://www.laboratoryequipment.com/news/2012/06/total-biomass-adults-287-million-tons
191. Lab-Less Research (18/7/2012). http://www.genomeweb.com/blog/lab-less-research
192. Sperm Seq (20/7/2012). http://www.genomeweb.com/blog/sperm-seq
193. But What Does That Really Mean? (30/7/2012). http://www.genomeweb.com/blog/what-does-really-mean
194. Are You Sure? (31/7/2012). http://www.genomeweb.com/blog/are-you-sure
195. Strength in Numbers (8/8/2012). http://www.genomeweb.com/blog/strength-numbers
196. Core Concept (27/8/2012). http://www.genomeweb.com/blog/core-concept
197. A Happy Sequencing Ending (27/8/2012) http://www.genomeweb.com/blog/happy-sequencing-ending
198. The Biofueled Military (28/8/2012). http://www.genomeweb.com/blog/biofueled-military
199. 'Gene Machines' (3/9/2012). http://www.genomeweb.com/blog/gene-machines
200. Bits of Mystery DNA, Far From 'Junk,' Play Crucial Role (5/9/2012). http://www.nytimes.com/2012/09/06/science/far-from-junk-dna-dark-matter-proves-crucial-to-health.html?pagewanted=1&_r=1&hp
201. ENCODE Explosion (6/9/2012). http://www.genomeweb.com/blog/encode-explosion
202. Deeper Impact (7/9/2012). http://www.genomeweb.com/blog/deeper-impact
203. Giant Viruses Are Ancient Living Organisms (14/9/2012). http://www.laboratoryequipment.com/news/2012/09/giant-viruses-are-ancient-living organisms?et_cid=2849147&et_rid=54647672&linkid=http%3a%2f%2fwww.laboratoryequipment.com%2fnews%2f2012%2f09%2fgiant-viruses-are-ancient-living-organisms
204. Giant viruses coexisted with the cellular ancestors and represent a distinct supergroup along with superkingdoms Archaea, Bacteria and Eukarya (14/9/2012) http://www.biomedcentral.com/1471-2148/12/156
205. The Alien Genome (18/10/2012) http://www.genomeweb.com/blog/alien-genome
206. Science Philanthropy for the 99 Percent (25/10/2012). http://www.genomeweb.com/blog/science-philanthropy-99-percent

207. Mapping the Brain's 'Symphony' (6/11/2012). http://www.genomeweb.com/blog/mapping-brains-symphony
208. Early Arrival (7/11/2012). http://www.genomeweb.com/blog/early-arrival
209. The Repurpose (29/11/2012). http://www.genomeweb.com/blog/repurpose
210. A Case for the Ages (11/1/2013). http://www.genomeweb.com/blog/case-ages
211. Gross, but Appears to Work (17/1/2013). http://www.genomeweb.com/blog/gross-appears-work
212. A Good Return (14/2/2013). http://www.genomeweb.com/blog/good-return
213. Billion-Dollar Brain Map (18/2/2013). http://www.genomeweb.com/blog/billion-dollar-brain-map
214. Brain Project Draws Presidential Interest (12/2/2013). http://news.sciencemag.org/scienceinsider/2013/02/brain-project-draws-presidential.html
215. The Proteoform (6//3/2013). http://www.genomeweb.com/blog/proteoform
216. Night of the Living Dead Pigeon (15/3/2013). http://www.genomeweb.com/blog/night-living-dead-pigeon
217. Learnt Lessons (25/3/2013). http://www.genomeweb.com/blog/learnt-lessons
218. BRAIN Game (2/4/2013). http://www.genomeweb.com/blog/brain-game
219. The Microbes You Share (19/4/2013). http://www.genomeweb.com/blog/microbes-you-share
220. After the Test (14/5/2013). http://www.genomeweb.com/blog/after-test
221. Return on Investment (12/6/2013). http://www.genomeweb.com/blog/return-investment
222. Microbes of Cancer (28/6/2013). http://www.genomeweb.com/blog/microbes-cancer
223. Surrounded by Viruses (5/9/2013). http://www.genomeweb.com/blog/surrounded-viruses
224. The Sum of Your Experiences (9/9/2013). http://www.genomeweb.com/blog/sum-your-experiences
225. Share Alike (10/9/2013). http://www.genomeweb.com/blog/share-alike
226. See One, Do One, Teach One (12/9/2013). http://www.genomeweb.com/blog/see-one-do-one-teach-one
227. Trusting Consumer Genomics (14/1/2014). http://www.genomeweb.com/blog/trusting-consumer-genomics
228. The Reject Pile (17/1/2014). http://www.genomeweb.com/blog/reject-pile
229. Oh! The Pressures of Demonstrated Productivity with Publication (18/12/2014). https://www.genomeweb.com/scan/easier-doing-work
230. 100,000 White Elephants On a Pathway to No Where (23/12/2014). https://www.genomeweb.com/scan/front
231. The Elusive Good Genes (29/12/2014). https://www.genomeweb.com/scan/good-mutations
232. Don't Skip the Broccoli Yet! (2/1/2015). https://www.genomeweb.com/scan/new-major-cancer-agent-identified-bad-luck
233. Forget the genomics data, give me the proteomics test results!. (10/1/2015). http://www.genomeweb.com/scan/high-hopes
234. The Ethics and Economics of Mammoth Resurrection. (10/2/2015). http://www.genomeweb.com/scan/bringing-back-mammoth-lets-just-hold-second
235. Let's Peer-Review Productivity Rather than Science Fiction. (12/2/2015). http://www.genomeweb.com/scan/adds?

236. Double-blind at Review but not Publication. (23/2/2015). http://www.genomeweb.com/scan/double-blind-review
237. Distrust in Science Goes Deeper than Conservatism and Pessimism. (2/3/2015). http://www.genomeweb.com/scan/sequencer-half-full-or-half-empty?
238. An Aspirin A Day Can Do More Harm Than Help. (18/3/2015). http://www.genomeweb.com/scan/pill-day-may-or-may-not-work-check-your-genes?
239. GATTACA Here We Come? (26/3/2015). http://www.genomeweb.com/scan/called-due-genetics
240. Personalized Medicine is Not New, Just Getting Better. (29/4/2015). http://www.genomeweb.com/scan/price-personalized
241. Phenotype Better Reflects Proteomics than Genomics. (21/5/2015). http://www.genomeweb.com/scan/its-both
242. DNA-based Visual Profiling for Litterbugs is Rubbish! (22/5/2015). http://www.genomeweb.com/scan/litterbugs-beware
243. There is Nothing Artificial About Emerging Computer Intelligence. (27/5/2015). http://www.nature.com/news/silicon-smarts-1.17618?WT.ec_id=NATURE-20150528
244. Commercial Antibodies - Buyer Beware. (27/5/2015). http://www.nature.com/news/reproducibility-crisis-blame-it-on-the-antibodies-1.17586
245. A Lot of Little Science is Better Than a Little Big Science. (28/5/2015). http://www.genomeweb.com/scan/shadow-big-science
246. Whose Conflict of Interest Is It? (3/6/2015). http://www.genomeweb.com/scan/oh-conflict
247. Disease-Causing Mutations in Healthy People. (8/6/2015). http://www.the-scientist.com//?articles.view/articleNo/43189/title/Disease-Causing-Mutations-in-Healthy-People/
248. Me Too Research is Okay. (29/7/2015). http://www.genomeweb.com/scan/and-again
249. Anticipating Artificial Intelligence (17/04/2016). http://www.nature.com/news/anticipating-artificial-intelligence-1.19825
250. Beware! The Modern Fortune Tellers are Coming. (09/05/2016). http://www.genomeweb.com/scan/da-vincis-code
251. Antibodies Potency and Cross-reactivity Issues. (29/9/2016). http://www.genomeweb.com/scan/so-what-exactly-are-those-cells
252. Why Not Just DNA Sequence Everybody and Everything? (17/02/2017). http://www.genomeweb.com/scan/yep-everybody
253. Environment Also Influences Stem Cell Division & DNA Replication. (17/03/2017). http://www.genomeweb.com/scan/week-science-114
254. Continuing Evolution of the Human Species. (09/06/2017). http://www.genomeweb.com/scan/continuing-evolution
255. Why I Will Not Have My DNA Sequenced. (29/10/2017). http://www.genomeweb.com/scan/just-dont-tell-me
256. Life to Earth. (04/10/2017). http://www.genomeweb.com/scan/beginning
257. Care For The Living, Not The Dead. (17/10/2017). http://www.genomeweb.com/scan/mammoth-competition
258. Predicting the Future is Risky Business. (24/10/2017). http://www.genomeweb.com/scan/manipulation-all

259. Genetic Selection Would Little Impact IVF Embryo Intelligence. (03/11/2017). http://www.genomeweb.com/scan/crystal-ball-embryos
260. Not so Compelling Reasons for Manipulation of Human Germlines. (16/11/2017). http://www.genomeweb.com/scan/fix-it
261. Great Things from Humble Beginnings. (09/01/2018). http://www.genomeweb.com/scan/google-doodle-central-dogma-researcher
262. The Problem of Genetic Tests for Cancer Risk. (12/01/2018). http://www.genomeweb.com/scan/similar-survival?
263. Earth's Life's First Ancestor. (01/02/2018). http://www.genomeweb.com/scan/hardy-single-celled-ancestor
264. Alzheimer's Disease Blood Test Not So Simple. (02/02/2018). http://www.genomeweb.com/scan/possible-blood-test-alzheimers
265. Starfish in the Deep Sea Can See. (07/02/2018). http://www.the-scientist.com/?articles.view/articleNo/51569/title/Starfish-in-the-Deep-Sea-Can-See
266. Big Difference Between Possibly Getting Cancer and Having Cancer. (10/04/2018). http://www.genomeweb.com/scan/wojcicki-says-consumers-can-handle-results
267. The "Angelina Jolie" Effect. (10/04/2018). http://www.genomeweb.com/scan/wojcicki-says-consumers-can-handle-results
268. There are Simpler Ways to Make Proteins for Vaccines. (17/07/2018). http://www.genomeweb.com/scan/fax-it-over
269. Since When is Love a Crime. (08/08/2018). http://www.genomeweb.com/scan/just-never
270. Genome Sequence has Little Value without Genome Knowledge. (30/08/2018). http://www.genomeweb.com/scan/not-nebulous
271. Molecular Complexity of the Cell Remains a Barrier. (30/08/2018). http://www.genomeweb.com/scan/not-nebulous
272. Protection for Genetic Information Promotes Commercialization. (18/09/2018). http://www.genomeweb.com/scan/whales-urchins-algae
273. Under-Funded Cancer Research. (19/7/2019). https://www.genomeweb.com/scan/some-more-others
274. Publication in Top Tier and Predatory Journals. (31/7/2019). https://www.genomeweb.com/scan/avoid-predators
275. On-line commentary - Contamination of Life on Mars. (4/10/2019). https://www.genomeweb.com/scan/do-it-purpose?
276. The Brighter Side of Biomedical Espionage. (5/11/2019). https://www.genomeweb.com/scan/economic-espionage-or-racism
277. Are Men More Positive than Women About Their Research Results? (18/12/2019). https://www.genomeweb.com/scan/good-spin
278. Project to Sequence COVID-19 Patients. (13/05/2020). https://www.genomeweb.com/scan/project-sequence-covid-19-patients
279. SARS-CoV2 antibody test variabilities. (28/05/2020). https://www.genomeweb.com/scan/not-making-it-clearerhttps://www.genomeweb.com/scan/uk-covid-19-disparities-report
280. COVID-19 differences in morbidity and mortality. (22/10/2020). https://www.genomeweb.com/scan/uk-covid-19-disparities-report

ix. MEDIA INTERVIEWS (including podcasts)

1. Can We Map the Brain? (21/2/2013). To the Point with Warren Olney. On National Public Radio KCRW. Topic - President Obama wants to do for the human brain what the Human Genome Project did for Genetics. But even scientists backing the idea concede that "mapping the brain" is orders of magnitude more complex. How should it be funded? Is it possible? Would it give scientists powers nobody wants them to have? Guests: John Markoff: New York Times, @markoff; Terrence Sejnowski: Salk Institute, @sejnowski; Steven Pelech: Kinexus Bioinformatics Corporation; Simon Tripp: Battelle Technology Partnership Practice, @battelle. http://www.kcrw.com/news/programs/tp/tp130221can_we_map_the_brain

2. The Evolution of Life and Kinases. (7/3/2016). Interview on Round House Radio in Vancouver with Kirk LaPointe. bit.ly/1LM0HYR

3. Overview of Kinexus Bioinformatics Corporation and the NDR ALS Biomarker Project for Neurodegenerative Disease Research (NDR), Inc. Posted on You-tube on January 15, 2021.https://youtu.be/zGyReyoWJmk

4. COVID-19 and vaccinations (6/2021). Doctor Talks with host Wayne Peters and "What's Up Canada." https://www.facebook.com/WhatsUpCanadians/videos/1392691891123832/

5. Canadian doctors who speak out are being attacked but will still speak & stand up for our children (16/7/2021). Take Action Canada. Panel discussion with host Didi Vergados and Drs. Steven Pelech, Charles Hoffe, Francis Christian, Mark Trozzi, Paul Alexander and Stephen Malthouse. https://www.bitchute.com/video/f0do2DOXG4x9/

6. Dr. Steven Pelech – ProVax Scientist and UBC Professor Speaks Out (27/7/21). Children's Health Defense Canada. Interview with Sherry Strong, Alberta Provincial Director of Children's Health Defense Canada. https://rumble.com/vkepmv-dr.-steven-pellech-provax-scientist-and-ubc-professor-speaks-out.html

7. Medical and Scientific Expert Panel (29/7/2021) Canadian Peoples Union. NFP. Interviews with host Nicole Lebrasseur and Drs. Steven Pelech, Ira Bernstein, Harvey Risch, Howard Tenenbaum, Bonnie Mallard and Paul Alexander. https://www.facebook.com/CPUFREEDOM2017/videos/1475008056199105

8. Doctors Talking Variants (9/8/2021) Doctor Talks with host Wayne Peters and "What's Up Canada." Panel discussions with Drs. Steven Pelech, Paul Alexander and Harvey Risch. https://www.facebook.com/642959389451042/videos/199723008704299

9. Professor Steven Pelech (30/8/2021) Shawn Newman Podcast Ep. 197 (Lloydminister Alberta/Saskatchewan) https://anchor.fm/shaun-newman/episodes/Ep--197---Professor-Steven-Pelech-e16kiua/a-a6edme0

10. 75th Anniversary of the Nuremberg Trials. Vancouver Art Gallery Plaza (1/8/2021). Organized by Common Ground.

11. Universities in the Time of Covid and Vaccine Mandates (13/10/2021). Civitas Canada with True North podcast with host Lindsay Shepard and Drs. Steven Pelech, Julie Ponesse, Allison Pejovic and Benjamin Gabbay. https://www.facebook.com/watch/?v=222043673325034

12. Dr. Steven Pelech Science or Fear Vaccine Mandates UBC (28/10/2021). UBC Students for Freedom of Expression. https://peoplesworldwar.com/dr-steven-pelech-science-or-fear-vaccine-mandates-ubc/

13. Natural Immunity Part 1. The Hill with MP Dean Alliston (21/10/2021). Embed.vhx.tv show with host MP Dean Alliston and Dr. Steven Pelech and Niel Karrow. https://embed.vhx.tv/videos/1827963?autoplay=1&api=1&authorization=VRxgQxQ3wjPpzGtx2531WkyZ3dgtQwR9&color=9E8959&title=0&sharing=1#

14. Natural Immunity Part 2. The Hill with MP Dean Alliston (21/10/2021). Embed.vhx.tv show with host MP Dean Alliston and Dr. Steven Pelech and Niel Karrow. https://embed.vhx.tv/videos/1838887?autoplay=1&api=1&authorization=VRxgQxQ3wjPpzGtx2531WkyZ3dgtQwR9&color=9E8959&title=0&sharing=1#

15. A Deep Dive into the Real Facts about Natural Immunity: Immunologist Dr. Steven Pelech (4/11/2021). Strong and Free Canada podcast with host Will Dove. https://strongandfreecanada.org/vlog/7646/

16. Dr. Steven Pelech, Ph.D. – The Missing Science that You Need to Know About Antibody Immunity, with Dr. Michael Thiessen Liberty Coalition (25/11/2021) Canada Podcast. https://tv.gab.com/channel/libertycoalitioncanada/view/dr-steven-pelech-phd-the-missing-61de3eb7bedad6c2ac1bb847

17. The Griffin Talks with Dr. Steven Pelech (23/12/2021). With Dr. Bruce Girdler of Novometrix Podcast. https://www.youtube.com/watch?v=QPCKE5JeKMA

18. The Pfizer Inoculation for COVID-19 – More Harm than Good – Co-created with Deanna McLeod, Amy McConnell, Steven Pelech and Byram Bridle (14/12/2021) Canadian Covid Care Alliance. https://www.canadiancovidcarealliance.org/media-resources/the-pfizer-inoculations-for-covid-19-more-harm-than-good-2/ This video had over 1.3 million views on Rumble.

19. Dr. Steven Pelech – UBC professor on COVID shots. Students Against Mandates interview in December 2021 (12/2021) https://rumble.com/vwsinp-dr.-steven-pelech-full-interview-dec-2021.html?mref=7ju1&mrefc=5

20. Dr. Steven Pelech explains why thousands want Canada to stop COVID-19 shots for pregnant women and children. Interview with Drea Humphrey of Rebel News (5/1/2022). https://www.rebelnews.com/dr_steven_pelech_petition_canada_stop_covid-19_shots_for_pregnant_women_and_children

21. Should you vaccinate your children? An interview with BC radio personality Kid Carson with Dr. Steven Pelech (5/3/2022). https://podcasts.apple.com/si/podcast/16-should-you-vaccinate-your-children/id1506974121?i=1000552984530

22. Masking: Following the Science. Episode 2. Interview with Teen Talks Freedom with Dr. Sarah Musavi (11/5/2022). https://www.youtube.com/watch?v=OBhrL9EK8Os

23. Citizens' Hearing June 2022. Examining Canada's COVID-19 response – Natural immunity. An independent inquiry into Canada's response to COVID-19 held in Toronto, June 22-24, 2022. (22/6/2022) Day 1. 2 hours 7 minutes to 2 hours 31 minutes in second video for Pelech testimony. https://vantagevenues.zoom.us/rec/play/YgWrScCmTrGnGHvgjHaqllhH1a_IpjNVDdWQ_dyBktDaCusRVbUeyd9DVOxpOknv9FoZO_A0r4dJ2g8p.6tpCs8bth4gEi2Ct?_x_zm_rhtaid=999&_x_zm_rtaid=stLONZc-RP68tjckDufsnA.1655939403378.4a1d6ad726688f0f363c07c24a2f1eae&autoplay=true&continueMode=true&startTime=1655919870000

24. Vaccine Mandates: Science or Fear? Dr. Steven Pelech. Walnut Grove Freedom Rising - Quo Vadis TV – Langley, B.C. Lecture (23/6/2022) https://rumble.com/v1i9bpv-vaccine-mandates-science-or-fear-.html
https://www.canadiancovidcarealliance.org/media-resources/dr-pelech-vaccine-mandates-science-or-fear/

25. Comparing Natural Immunity to Vaccine-Induced Immunity. Interview with Dr. Julie Ponesse (27/6/2022) (https://rumble.com/v1a5oej-comparing-natural-immunity-to-vaccine-induced-immunity-dr.-steven-pelech-an.html)

26. Insights on the COVID-19 pandemic and vaccine with Dr. Steven Pelech of UBC. A Biblical Frame: Current Events in Perspective. Panel discussion with Dr. Ed Gerber, Dr. Jens Zimmermann, Dr. Douglas Farrow, and Ivan DeSilva (7/11/2022). https://abiblicalframe.substack.com/

27. It's time to stop the shots. Co-created with Deanna McLeod, Amy McConnell, Steven Pelech and Byram Bridle (14/7/2022) Canadian Covid Care Alliance https://rumble.com/v1cc9ud-stop-the-shots.html?mref=7ju1&mrefc=3 This video had over 40,000 views on Rumble.

28. UBC prof of Medicine Stephen Pelech speaks out on COVID immunity in vaccinated vs unvaccinated. Interview with Maryann Pousette Gebauer as part of the MaryAnn and the Professor series (7/22/2022). https://www.bitchute.com/video/4UNQCMFOHA12/ and https://www.bitchute.com/video/C9Kuk1CWCGQk/

29. Interview with Dr. Steven Pelech on natural immunity, COVID-19 vaccines, masking and other public health measures. Interview with CANSEL and Rachel Becher (7/26/2022). https://cansef.ca/interviews/interview-with-dr-steven-pelech/

30. Immunity to SARS-CoV-2 – Round Table w/ Drs. Steven Pelech and James Lyons-Weiler. Interview with Liam Sturgess, Mathew Crawford and Jame Lyons-Weiler as part of the Rounding the Earth series (8/1/2022). https://rumble.com/v1efue7-immunity-to-sars-cov-2-round-table-w-drs.-steven-pelech-and-james-lyons-wei.html

31. Dr. Steven Pelech – What you should know about the vaccine. An interview with BC radio personality Kid Carson (2/9/2022). https://www.kidcarson.com/71-dr-steven-pelech-what-you-should-know-about-the-vaccine/

32. What's better, natural or COVID-19 vaccine induced immunity? What does SARS-CoV-2 antibody testing show? Youth and Families with Dr. Sara Masavi (19/9/2022) (https://www.youtube.com/watch?v=QF68pO9vfpE).

33. Prevalence of natural and COVID-19 vaccine induced immunity: What does SARS-CoV-2 antibody testing show? Conference on Idaho Victims of Pandemic Policy and Law. (26/9/2022). This was covered Epoch times, Stew Peters, gateway pundit, Dr. Paul Alexander substack. https://www.theepochtimes.com/victims-of-pandemic-policy-law_4753445.html https://rumble.com/v1llpah-live-hearing-vaccine-injured-speak-out-stew-peters-and-vaxx-injured-testify.html

34. Natural immunity ... Science or science fiction? Part 1 and Part 2. White Rock, B.C. White Rock SDA Church (1/10/2022). https://livestream.com/whiterocksdachurch/events/9259494/videos/233136255

35. Jessica Rose, Ph.D. and Steven Pelech, Ph.D. – Antibody deception. Jessica's Universe - CHD-TV (28/10/2022). http://www.rumble.com/v1qbrwd-good-morning-chd-episode-165-antibody-deception-with-steven-pelech-ph.d.html?mref=6zof&mrefc=2

36. Jessica Rose, Steven Pelech and Bernadette Pajer – It's all about the spike - CHD-TV (1/11/2022). https://live.childrenshealthdefense.org/chd-tv/shows/an-informed-life-radio-with-bernadette-pajer/its-all-about-that-spike-with-jessica-rose-phd--steven-pelech-phd/

37. Steven Pelech and Nathan Barrett – Accountability...Class action certification hearings. (28/11/2022). https://www.instagram.com/reel/ClnZRN9LZn2/?igshid=OTRmMjhlYjM%3D

38. Live with Steven Pelech and Laura-Lynn Tyler-Thompson (13/1/2023). https://www.lauralynn.tv/2023/01/live-with-dr-steven-pelech.html

39. The crumbling case for COVID-19 vaccination. White Rock, B.C. White Rock SDA Church (4/2/2023). https://livestream.com/whiterocksdachurch/events/9259494/videos/234894719

40. Rebel News interview of Dr. Pelech by Tamara Ugolini. (8/3/2023). https://www.canadiancovidcarealliance.org/all/rebel-news-interview-of-dr-pelech/

41. Dr. Steven Pelech and Controversial Topics. Interview with Maryann Pousette Gebauer as part of the MaryAnn and the Professor series (4/8/2023). https://www.bitchute.com/video/qlPJGDln1Pfe/.

42. The COVID-19 Pandemic...What Really Happened. Testimony at the National Citizen's Inquiry in Canada's COVID-19 Response (5/3/2023). https://rumble.com/v2m3z3s-ubc-professor-dr-steven-pelech-gives-presentation-on-the-virus-and-vaccine-.html

42. Canadian doctors testify. Good Morning CHD. Episode 121. Live interview with Drs. Christopher Shaw, Charles Hoffe and Stephen Malthouse. (5/12/2023). https://live.childrenshealthdefense.org/chd-tv/shows/good-morning-chd/canadian-doctors-testify/

43. The power of natural immunity, Bill 36 & Dr. Bonnie Henry's April 6 Public Health Order with mandatory COVID-19 vaccination of all BC health care workers. Live with Steven Pelech and Laura-Lynn Tyler-Thompson (12/6/2023). https://rumble.com/v2tsvtw-live-with-dr.-steven-pelech.html

44. The Real Science: Dr. Steven Pelech. Will Dove Interview. Iron Will Report. (15/6/2023) https://ironwillreport.com/interviews/paged-2/7/

45. Natural and COVID-19 vaccine induced immunity. Canadian Covid Care Alliance Roundtable presentation. (9/8/2023)

46. Organ transplant denied, Dr. Pelech on the death of Sheila Lewis. Interview with Anita Krishna (30/8/2023). https://rumble.com/v3e00ye-organ-transplant-denied-dr.-pelech-on-the-death-of-sheila-lewis..html

47. Elo Wants to Know Podcast with Dr. Steven Pelech. Interview with Éloise Boïes. (30/1/2024). https://youtu.be/MSfjvrx8tK4

48. UBC Canada Chief Scientific Officer Warns of Danger Re: MPOX, Covid and Vaccines! Interview with Odessa Orlewicz of Liberty Talk Canada. (6/9/2024) https://rumble.com/v5dfmys-ubc-canada-chief-scientific-officer-warns-of-danger-re-mpox-covid-and-hpv-v.html?e9s=src_v1_upp

49. COVID-19 Unmasked. Interview with Dr. Christopher Shaw and Bernadette Pajer on Informed Life Radio Health Hour. (1/11/2024). https://live.childrenshealthdefense.org/chd-tv/shows/an-informed-life-radio-with-bernadette-pajer/holistic-oral-health--covid19-unmasked/

50. What Are Coronavirus Antibodies Telling Us? Interview with Dr. Christopher Shaw and Dr. Peter McCullough on Courageous Discourse. (6/11/2024). https://petermccuIloughmd.substack.com/p/what-are-coronavirus-antibodies-telling?utm

51. Down the COVID-19 Rabbit Hole. Interview with Christopher Shaw and the B.C. Rising Group. (20/11/2024). https://rumble.com/v5tq45q-bc-rising-wed-nov-20-2024-drs.-steven-pelech-and-chris-shaw.html

52. Drs. Steven Pelech and Chris Shaw: 24 Experts Weigh In on the False Covid Narrative. Interview with Will Dove. (13/12/2024). https://www.dropbox.com/scl/fi/vrpnxpvmgsx05j3kw6t9o/568-Steven-Pelech-and-Chris-Shaw-safc.mp4?rlkey=8ogcufenyv8hkehc3v8n6pjsy&st=r3fxlf3j&dl=0

53. Celebrating an Important Book Launch with Dr. Pelech and Dr. Christopher Shaw. Interview with Dr. Sara Musavi on the Followingthecovidscience's Newsletter and podcast. (18/11/2024) https://followingthecovidscience.substack.com/p/celebrating-an-important-book-launch

54. Down the COVID-19 Rabbit Hole. Interview with Christopher Shaw and Dr. Brian Hooker on Good Morning CHD. (22/11/2024). https://live.childrenshealthdefense.org/chd-tv/shows/good-morning-chd/down-the-covid19-rabbit-hole--the-geoengineering-report/

55. Down the COVID-19 Rabbit Hole: Scientists and Doctors Unmask the Pandemic. With Zoey O'Toole, Maria Gutschi, York Hsiang, Christopher Shaw, John Hardie, Children's Health Defense. X-space (21/11/2024) https://x.com/i/spaces/1rmGPoqgQNjKN

56. Down the COVID-19 Rabbit Hole: Scientists and Doctors Unmask the Pandemic. With Christopher Shaw and Trish Conlin on TishTalk Podcast. (28/11/2024).

57. COVID-19 Pandemonium. Ekstasis Press Toronto Reading Event with publisher Richard Olafson with Christopher Shaw. (1/12/2024)

58. CCCA + CHD. Interview with Drs. Maria Gutschi, Christopher Shaw, York Hsiang and Sheldon Yakiwchuk of Townhall. (10/12/2024). https://sheldonyakiwchuk.substack.com/p/townhall-full-recording?r=qjp6c&utm_campaign=post&utm_medium=web&triedRedirect=true

59. Catalytic Conversation with Guests Dr. Pelech and Dr. Shaw. Interview with Dr. Rima Laibow on Catalytic Conversation Podcast. (31/12/2024). https://rumble.com/v65xt3p-catalytic-conversations-with-guests.-4th-10-pm-uk-2-pm-pacific-4-pm-central.html?e9s=src_v1_upp

60. Interview with Charles Kovess on the Charles Kovess Show in Australia. (14/1/2025).

61. Live: Save the Ostriches – Fighting Back Against a Heartbreaking Order. Interview with Adrienne Richards of Citizens Oversight and Westward Independent. (18/1/2025). https://www.youtube.com/live/dM5xHTKSzV0

x. TRAINING VIDEOS

1. Kinex KAM-850 Antibody Microarray Kit Components – Directed, scripted and designed by Steven Pelech. Starring Catherine Sutter. Narrated by Catherine Sutter. Filmed and edited by Keefer Pelech. Title and credit animations by Cameron Bowyer. Music by William Campbell. Produced by Kinexus Bioinformatics. Posted on You-tube on Jan 25, 2014. https://www.youtube.com/watch?v=JtMn-Gk0q_4&list=PL15H9uvi7IpGvnpoYaSr62CeBHFgzO28k&index=1
2. Stage 1: Preparation of Lysates from Cultured Cells for Proteomics Analyses – Directed, scripted and designed by Steven Pelech. Starring Dominik Sommerfeld. Narrated by Catherine Sutter. Filmed and edited by Keefer Pelech. Title and credit animations by Cameron Bowyer. Music by William Campbell. Produced by Kinexus Bioinformatics. Posted on You-tube on Jan 25, 2014. https://www.youtube.com/watch?v=0_YdxuOdGhU&list=PL15H9uvi7IpGvnpoYaSr62CeBHFgzO28k&index=2
3. Stage 2: Measurement of Protein Concentrations with the Bradford Protein Assay. Directed, scripted and designed by Steven Pelech. Starring Shenshen Lai. Narrated by Catherine Sutter. Filmed and edited by Keefer Pelech. Title and credit animations by Cameron Bowyer. Music by William Campbell. Produced by Kinexus Bioinformatics. Posted on You-tube on Jan 25, 2014. https://www.youtube.com/watch?v=TAMrj0Z9FOk&list=PL15H9uvi7IpGvnpoYaSr62CeBHFgzO28k&index=3
4. Stage 3: Dye Labelling Cell and Tissue Lysates for the Kinex™ KAM Antibody Microarray. Directed, scripted and designed by Steven Pelech. Starring Jane Shi. Narrated by Catherine Sutter. Filmed and edited by Keefer Pelech. Title and credit animations by Cameron Bowyer. Music by William Campbell. Produced by Kinexus Bioinformatics. Posted on You-tube on Jan 25, 2014. https://www.youtube.com/watch?v=3sMaRnAC7-4&index=4&list=PL15H9uvi7IpGvnpoYaSr62CeBHFgzO28k
5. Stage 4: Incubation of the Kinex™ KAM Antibody Microarray with Dye-Labelled Lysate Protein. Directed and designed by Steven Pelech, and scripted and designed by Hong Zhang and Steven Pelech. Starring Jane Shi. Narrated by Catherine Sutter. Filmed and edited by Keefer Pelech. Title and

credit animations by Cameron Bowyer. Music by William Campbell. Produced by Kinexus Bioinformatics. Posted on You-tube on Jan 25, 2014. https://www.youtube.com/watch?v=LcuQ-1CYJrw&list=PL15H9uvi7IpGvnpoYaSr62CeBHFgzO28k&index=5

6. Stage 5: Kinex™ KAM Antibody Microarray Scanning and Quantitation. Directed, scripted and designed by Steven Pelech. Starring Jane Shi and Winnie So. Narrated by Catherine Sutter. Filmed and edited by Keefer Pelech. Title and credit animations by Cameron Bowyer. Music by William Campbell. Produced by Kinexus Bioinformatics. Posted on You-tube on Jan 25, 2014. https://www.youtube.com/watch?v=wBf0t4xhV5g

xi. EXPERT REPORTS FOR COURT CASES

Over the three years, I have been asked to prepare, expert reports with respect to natural immunity and COVID-19 vaccines for several court and arbitration cases in Canada, South Africa and Ireland. These are usually sworn and notarized documents, and in several cases I have undergone cross-examination in Canadian courts. This is a listing of many of the court cases that I have served in.

1.	COURT FILE NUMBER	210600780
	COURT	COURT OF QUEEN'S BENCH OF ALBERTA
	JUDICIAL CENTRE	LETHBRIDGE
	APPLICANT	HAYLEY NASSICHUK-DEAN
	RESPONDENT	UNIVERSITY OF LETHBRIDGE Cross-examination Feb. 16, 2022
2.	COURT FILE NUMBER	T-1694-21
	COURT	FEDERAL COURT OF CANADA (Trial Division)
	APPLICANT	DAVID LAVERGNE-POITRAS
	RESPONDENTS	ATTORNEY GENERAL OF CANADA (Minister of Public Services and Procurement) – and – PMG TECHNOLOGIES INC. Cross-examination September 8, 2022
3.	COURT FILE NUMBER	T-168-22-ID-1
	COURT	FEDERAL COURT OF CANADA
	APPLICANT	THE HONOURABLE A. BRIAN PECKFORD, LEESHA NIKKANEN, KEN BAIGENT, DREW BELOBABA, NATALIE GRCIC, AND AEDAN MACDONALD
	RESPONDENTS	THE MINISTER OF TRANSPORT and THE ATTORNEY GENERAL OF CANADA Cross-examination May 13 and 16, 2022
4.	COURT FILE NUMBER	2101-13202
	COURT	COURT OF QUEEN'S BENCH OF ALBERTA
	JUDICIAL CENTRE	CALGARY
	APPLICANTS	DR. ERIC T. PAYNE, DR. JOANNE J. MOSER, DR. DAVID W. L. LOEWEN

		and DR. GREGORY CHAN
	RESPONDENTS	ALBERTA HEALTH SERVICES, DR. VERNA YIU IN HER CAPACITY AS CHIEF EXECUTIVE OFFICER OF ALBERTA HEALTH SERVICES, DR. JOHN T. CHMELICEK IN HIS CAPACITY AS POST GRADUATE PROGRAM DIRECTOR, DEPARTMENT OF FAMILY MEDICINE, UNIVERSITY OF ALBERTA -and- THE UNIVERSITY OF ALBERTA
5.	COURT FILE NUMBER	CV-21-00670360-0000
	COURT	SUPERIOR COURT OF JUSTICE ONTARIO
	APPLICANTS	SARAH HARJEE, EVAN KRAAYENBRINK, HIBAH AOUN, SARAH LAMB, SAM SABOURIN, JACKIE RAMNAUTH, MARK MCDONOUGH -and- LINDA MCDONOUGH
	RESPONDENT	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF ONTARIO Cross-examination April 28 & May 5, 2022
6.	COURT FILE NUMBER	FDF-443-19
	COURT	COURT OF QUEEN'S BENCH OF NEW BRUNSWICK
	JUDICIAL CENTRE	FAMILY DIVISION JUDICIAL DISTRICT OF FREDERICTON
	APPLICANT	VICTORIA LYNN MITHAM
	RESPONDENT	BRADLEY SCOTT FOLLETT
7.	COURT FILE NUMBER	72/2022
	COURT	HIGH COURT OF SOUTH AFRICA
	JUDICIAL CENTRE	FREE STATE DIVISION, HELD AT BLOEMFONTEIN
	APPLICANT	SOLIDARITY obo MEMBERS, SOLIDARITY YOUTH Obo MEMBERS, JOANNA STANDER, SHANIQUE PIENAAR, ALICE FLORENCE MARINA STANDER - and - ANNELI BOTHA
	RESPONDENTS	CHAIRMAN OF THE COUNCIL OF THE UNIVERSITY OF THE FREE STATE– and – THE UNIVERSITY OF THE FREE STATE
8.	COURT FILE NUMBER	C.A.C.V.3903of202 C.A.C.V.3904of2021 C.A.C.V.3908of2021
	COURT	COURT OF APPEAL FOR SASKATCHEWAN ON APPEAL FROM THE QUEEN'S BENCH (FAMILY LAW DIVISION)
	JUDICIAL CENTRE	JUDICIAL CENTRE OF SASKATOON DIV. No. 625 of 2012

	APPLICANT	OLENA MYKOLAYIVNA SCHEMENAUER
	RESPONDENT	EVAN JOSEPH SCHEMENAUER
9.	COURT FILE NUMBER	FD 19-01-22922
	COURT	COURT OF QUEEN'S BENCH (Family Division)
	JUDICIAL CENTRE	WINNIPEG CENTRE
	APPLICANT	JORDAN SARAH CURÉ
	RESPONDENT	KENNETH PETER TYSON CURÉ
10.	COURT FILE NUMBER	E59176
	COURT	SUPREME COURT OF BRITISH COLUMBIA
	JUDICIAL CENTRE	NEW WESTMINISTER
	APPLICANT	VICTORIA LARA DRAPER AKA VICTORIA LARA DRAPER-SMITH
	RESPONDENT	MATTHEW LAWRENCE NEALE SMITH
11.	COURT FILE NUMBER	E17315
	COURT	SUPREME COURT OF BRITISH COLUMBIA
	JUDICIAL CENTRE	CHILLIWACK REGISTRY
	APPLICANT	DALE JAMES HOOGENDOORN
	RESPONDENT	KATIE NADINE HOOGENDOORN Testimony Feb. 17, 2022.
12.	COURT FILE NUMBER	FC-13-917-02
	COURT	SUPERIOR COURT OF JUSTICE FAMILY COURT BRANCH
	JUDICIAL CENTRE	OSHAWA REGISTRY
	APPLICANT	KAREN DIAZ (BOL)
	RESPONDENT	BRENT BOL
13.	COURT FILE NUMBER	2022/1456 P
	COURT	HIGH COURT OF IRELAND
	APPLICANTS	DAVID EGAN AND SHARON BROWNE AND EMMANUEL LAVERY
	RESPONDENTS	MINISTER FOR HEALTH, AN TAOISEACH, AND HSE
14.	ARBITRATION	
	EMPLOYER	HUMBER RIVER HOSPITAL
	UNION	NATIONAL ORGANIZED WORKERS UNION Grievances: NOWU Policy Service #170,2021 (All Bargaining Units) Covid Directive 6, NOWU Policy Service #01,2022 (All Bargaining Units) Covid Policy, 2022-NOWU-Clerical-55-HRH; Grievance of Gail Ackie Cross-examination Feb. 20, 22 & 29, 2023
15.	COURT FILE NUMBER	No. S2110229
	COURT	SUPREME COURT OF BRITISH COLUMBIA
	JUDICIAL CENTRE	NEW WESTMINISTER

	APPLICANTS	CANADIAN SOCIETY FOR THE ADVANCEMENT OF SCIENCE IN PUBLIC POLICY and KIPLING WARNER
	RESPONDENT	DR. BONNIE HENRY IN HER CAPACITY AS PROVINCIAL HEALTH OFFICER FOR THE PROVINCE OF BRITISH COLUMBIA
16.	COURT	ONTARIO
	APPLICANT	VALERIE ALAGNA
	RESPONDENT	HAMILTON HEALTH SCIENCES CORPORATION
17.	DISCIPLINARY HEARING	
	CASE	2021-AF-01136
	COLLEGE	COLLEGE OF NURSES OF ONTARIO
	DEFENDENT	SARAH A. CHOUJOUNIAN-ABULU Cross-examination April 13 & 14, May 19, June 9 & 30, July 8, 2023
18.	DISCIPLINARY HEARING	
	COLLEGE	BC COLLEGE OF NURSES AND MIDWIVES
	DEFENDENT	SEAN TAYLOR Cross-examination July 19 & 20, 2023
19.	DISCIPLINARY HEARING	
	CASE	CPSID 17223; IC2021-0481; IC2021-0535
	COLLEGE	COLLEGE OF PHYSICIANS AND SURGEONS OF BC
	DEFENDENT	DR. CHARLES HOFFE
20.	COURT FILE NUMBER	CV-22-0069-1880-0000
	COURT	ONTARIO SUPERIOR COURT OF JUSTICE
	APPLICANT	DR. BYRAM BRIDLE
	RESPONDENTS	UNIVERSITY OF GUELPH, JEFFREY WICHTEL, LAURIE ARNOTT, CHARLOTTE YATES, SCOTT WEESE, GLEN PYLE, ANDREW PEREGRINE, DOROTHEE BIENZLE, AMY GREER, DAVID FISMAN, NICK DULEY, JANE OR JOHN DOE JUNIOR SCIENTIST
21.	COURT	COURT OF KING'S BENCH ALBERTA
	JUDICIAL CENTRE	GRANDE PRAIRIE
	APPLICANT	ANNETTE LEWIS
	RESPONDENTS	ALBERTA HEALTH SERVICES AND REDACTED PARTIES
22.	DISCIPLINARY HEARING	
	CASE	24-20220001146; 30-21-3125
	PLANTIFF	GILLES MARION, syndic ad hoc COLLÈGE DES MÉDECINS DU QUÉBEC
	DEFENDENT	DR. MARC LACROIX
23.	COURT FILE NUMBER	SCBC Action E222370

COURT	SUPREME COURT OF BRITISH COLUMBIA
JUDICIAL CENTRE	VANCOUVER REGISTRY
APPLICANT	TRICIA MARIE BARR ALLARD
RESPONDENT	PATRICK JAMES ALLARD

24. DISCIPLINARY INVESTIGATION

CASE	IC 2022-0489
COLLEGE	COLLEGE OF PHYSICIANS AND SURGEONS OF BC
DEFENDENT	DR. SOFIA T. BAYFIELD

Action _____

FEDERAL COURT

BETWEEN

UNIVERSAL OSTRICH FARMS INC.

APPLICANT

AND:

CANADIAN FOOD INSPECTION AGENCY

RESONDENT

AFFIDAVIT

I, KATRINA JONES, Legal Assistant, of 1321 Johnston Street, White Rock, British Columbia, MAKE OATH AND SWEAR THAT:

1. I am a legal assistant to Michael D. Carter, the lawyer for the Applicant in this matter, and as such have personal knowledge of the facts and matters hereinafter deposed to, save and except where the same are stated to be based upon information or belief and where so stated I verily believe such statements to be true.

2. On January 30, 2025, I found the World Organisation for Animal Health (WOAH) objectives on the Government of Canada (GOC) website. Attached hereto and marked as **Exhibit "A"** to this Affidavit is a copy of the GOC website page, which speaks to WOAH's objectives.

3. On January 30, 2025 I found WOAH's Terrestrial Animal Health Code (2024) (the "WOAH Health Code") on the WOAH webpage. Attached hereto and marked as **Exhibit "B"** to this Affidavit is a copy of the specific sections of the WOAH Health Code that speaks to the high pathogenicity avian influenza viruses, its glossary, and WHOA's obligations.

4. On January 30, 2025 I found WOAH's Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (the "WOAH Manual") on the WOAH webpage. Attached hereto and marked as **Exhibit "C"** to this Affidavit is a copy of the specific

section of the WOAH Manual that addresses high pathogenicity avian influenza viruses.

5. On January 29, 2025, I found CFIA's information page regarding how it prevents, prepares and responds to bird flu outbreaks. Attached hereto and marked as **Exhibit "D"** to this Affidavit is a copy of the CFIA webpage that addresses its response and prevention of the bird flu.

6. On January 28, 2025, I found CFIA's information page regarding its Highly Pathogenic Avian Influenza Vaccination Task Force. Attached hereto and marked as **Exhibit "E"** to this Affidavit is a copy of the CFIA webpage that speaks to the Vaccination Task Force.

7. On January 30, 2025, I found CFIA's information page regarding avian influenza immunity and vaccination. Attached hereto and marked as **Exhibit "F"** to this Affidavit is a copy of the CFIA webpage that speaks to avian influenza immunity and vaccination.

8. On January 28, 2025, I found CFIA's Open and Transparent Agent Policy. Attached hereto and marked as **Exhibit "G"** to this Affidavit is a copy of the CFIA's Open and Transparent Agent Policy from its webpage.

9. On January 30, 2025, I found CFIA's Policy for Providing Guidance on Regulatory Requirements. Attached hereto and marked as **Exhibit "H"** to this Affidavit is a copy of the CFIA's Policy for Providing Guidance on Regulatory Requirements from its webpage.

10. On January 30, 2025, I found the CFIA's Field-ready lateral flow test for avian influenza, wherein the CFIA states that the National Centre for Foreign Animal Disease (NCFAD) is located in Winnipeg, which is a WOAH reference laboratory for the avian influenza. Attached hereto and marked as **Exhibit "I"** to this Affidavit is a copy of the CFIA's webpage.

11. On January 30, 2025, I found the CFIA's latest bird flu situation updates. Attached hereto and marked as **Exhibit "J"** to this Affidavit is a copy of the CFIA's webpage.

12. On January 29, 2025, I conducted an online search of the distance it would take to drive from Castlegar, British Columbia to Edgewood, BC V0G 1J0 on Google Maps. Attached hereto and marked as **Exhibit "K"** to this Affidavit is a copy of the Google Maps route.

13. On January 29, 2025, I conducted an online search of the distance it would take to drive from Vernon, British Columbia to Edgewood, BC V0G 1J0 on Google

Maps. Attached hereto and marked as **Exhibit "L"** to this Affidavit is a copy of the Google Maps route.

14. Attached hereto and marked as **Exhibit "M"** is a true copy a sales invoice received from Universal Ostrich Farms Inc.

SWORN (OR AFFIRMED) BEFORE ME at White Rock, British Columbia on January 30, 2025

.....

A commissioner for taking affidavits for British Columbia

MICHAEL D. CARTER
Barrister & Solicitor
1321 Johnston Road
White Rock, B.C. V4B 3Z3
(604) 536-5002

KATRINA JONES

World Organisation for Animal Health (WOAH)

The World Organisation for Animal Health (WOAH; founded as Office International des Épizooties (OIE)) is the science based standard setting organization at the international level for animal and veterinary public health. It also serves as the scientific reference body for international trade of animals and animal derived products under the Sanitary and Phyto-sanitary (SPS) Agreement of the World Trade Organization.

The WOAH (World Organization for Animal Health)'s objectives are:

- To ensure transparency in the global animal disease and zoonosis situation
- To collect, analyse and disseminate scientific veterinary information
- To provide expertise and encourage international solidarity in the control of animal diseases
- Within its mandate under the WTO (World Trade Organization) SPS (Sanitary and Phyto-sanitary) Agreement, to safeguard world trade by publishing health standards for international trade in animals and animal products
- To improve the legal framework and resources of National Veterinary Services
- To provide a better guarantee of the safety of food of animal origin and to promote animal welfare through a science-based approach

The duties of the WOAH (World Organisation for Animal Health) Delegate for Canada include, but are not limited to:

- Representing Canada at the World Assembly of Delegates and voting on international standards, recommendations, and resolutions
- Notifying the WOAH (World Organisation for Animal Health) of animal diseases present in Canada
- Bringing the resolutions of the World Assembly to the attention of the Canadian government, and ensuring that, as far as possible, the resolution of the World Assembly are applied in Canada
- Providing scientific input into the development of international standards, and
- Designating national focal points for support in the fields of animal health information, wildlife diseases, veterinary medicinal products, animal production food safety, animal welfare, communications and laboratories

This is Exhibit "A" referred to in the affidavit of Katrina Jones sworn before me at Whitehorse this 30 day of January 20 25

International Standards

International Sanitary Standards are drafted by the WOAH (World Organization for Animal Health) Specialist Commissions. Standards are created to protect countries from the introduction of diseases and pathogens, while ensuring they are fair and scientifically justified. These sanitary standards are continually revised and updated.

At the Specialist Commission level comments that are supported by sound scientific information will be taken into account and draft standards may be revised accordingly. All revised draft standards are submitted to the WOAH (World Organization for Animal Health) for ratification by the International Committee at the General Session. Ratified standards are then incorporated into the relevant WOAH (World Organization for Animal Health) publications.

- Manual of Diagnostic Test and Vaccines for Terrestrial Animals
- Manual of Diagnostic Tests for Aquatic Animals
- Terrestrial Animal Health Code
- Aquatic Animal Health Code

The WOAH (World Organization for Animal Health) oversees four specialist commissions that develop and revise the WOAH's international sanitary standards, by addressing scientific and technical issues raised by Member Countries.

- Terrestrial Animal Health Standards Commission ("Code Commission") - establishes standards governing the trade of terrestrial animals and animal products.
- Scientific Commission for Animal Diseases ("Scientific Commission")- assists in identifying the most appropriate strategies and measures for disease prevention and control. The Commission also reviews submissions regarding animal health status for Member Countries that wish to be included on the WOAH's list of countries 'free' of certain diseases.
- Biological Standards Commission ("Laboratories Commission")- establishes methods for diagnosing diseases of mammals, birds and bees. Furthermore, the Commission tests biological products, such as vaccines. It oversees the production of the Manual of Diagnostic Tests and Vaccines for Terrestrial Animals.
- Aquatic Animal Health Standards Commission ("Aquatic Commission")- compiles information on diseases of fish, molluscs and crustaceans, and on methods used to control these diseases.

In addition to the four Specialist Commissions, there are three working groups focusing on Wildlife Diseases, Animal Welfare and Food Safety. The purpose of the working groups is to collect, analyse and disseminate information relevant to their respective fields.

WOAH's Performance of Veterinary Services (PVS) Evaluation Report of Canada

The WOAH has evaluated Canada's veterinary services and has found Canada to be a top performing country and a leading example for meeting international veterinary service standards. The report is now available on the WOAH's website.

- WOAH's PVS evaluation report of Canada's veterinary services
- Notice to industry: WOAH releases PVS report on its evaluation of Canada's veterinary services
- CVO Statement: WOAH's PVS evaluation report of Canada (2018-08-02)
- Infographic: How Canada's veterinary services measure up in the world

Date modified:
2018-11-05

CHAPTER 10.4.

INFECTION WITH HIGH PATHOGENICITY AVIAN INFLUENZA VIRUSES

This is Exhibit "B" referred to in the affidavit of Katrina Jones sworn before me at Whitehorse this 30 day of January, 2025

Article 10.4.1.

General provisions

1) This chapter deals with the *listed disease*, *infection* with high pathogenicity avian influenza viruses.

2) For the purposes of the *Terrestrial Code*:

   a) High pathogenicity avian influenza means an *infection* of *poultry* by any influenza A virus that has been determined as high pathogenicity in accordance with the *Terrestrial Manual*.

   b) An occurrence of *infection* with a high pathogenicity avian influenza virus is defined by the isolation and identification of the virus or the detection of specific viral ribonucleic acid, in one or more samples from *poultry*.

   c) The *incubation period* at the *flock*-level for high pathogenicity avian influenza is 14 days.

3) Although the objective of this chapter is to mitigate animal and public health risks posed by *infection* with high pathogenicity avian influenza viruses, other influenza A viruses of avian host origin (i.e. low pathogenicity avian influenza viruses) may have the potential to exert a negative impact on animal and public health. A sudden and unexpected increase in virulence of low pathogenicity avian influenza viruses in *poultry* is notifiable as an *emerging disease* in accordance with Article 1.1.4. *Infection* of domestic and *captive wild* birds with low pathogenicity avian influenza viruses having proven natural transmission to humans associated with severe consequences, and *infection* of birds other than *poultry*, including *wild* birds, with influenza A viruses of high pathogenicity, are notifiable in accordance with Article 1.3.3.

4) A *notification* of *infection* of birds other than *poultry*, including *wild* birds, with influenza A viruses of high pathogenicity, or of *infection* of domestic or *captive wild* birds with low pathogenicity avian influenza viruses does not affect the high pathogenicity avian influenza status of the country or *zone*. A Member Country should not impose bans on the international trade of *poultry commodities* in response to such *notifications*, or to other information on the presence of any non-notifiable influenza A virus in birds.

5) This chapter includes *monitoring* considerations for low pathogenicity avian influenza viruses because some, especially H5 and H7 subtypes, have the potential to mutate into high pathogenicity avian influenza viruses.

6) The use of *vaccination* against avian influenza may be recommended under specific conditions. Any vaccine used should comply with the standards described in the *Terrestrial Manual*. *Vaccination* will not affect the high pathogenicity avian influenza status of a free country or *zone* if *surveillance* supports the absence of *infection*, in accordance with Article 10.4.28., in particular point 2. *Vaccination* can be used as an effective complementary control tool when a *stamping-out policy* alone is not sufficient. Whether to vaccinate or not should be decided by the *Veterinary Authority* on the basis of the avian influenza situation as well as the ability of the *Veterinary Services* to implement the *vaccination* strategy, as described in Chapter 4.18.

7) Standards for diagnostic tests and vaccines, including pathogenicity testing, are described in the *Terrestrial Manual*.

Article 10.4.2.

Safe commodities

When authorising importation or transit of the following *commodities*, *Veterinary Authorities* should not require any conditions related to high pathogenicity avian influenza, regardless of the high pathogenicity avian influenza status of the *exporting country* or *zone*:

1) heat-treated *poultry meat products* in a hermetically sealed container with an F_0 value of 3 or above;

2) extruded dry pet food and coated ingredients after extrusion;

3) rendered *protein meal*, blood meal, feather meal, and *poultry* oil;

4) washed and steam-dried feathers and down from *poultry* and other birds.

Other *commodities* of *poultry* and other birds can be traded safely if in accordance with the relevant articles of this chapter.

Article 10.4.3.

Country or zone free from high pathogenicity avian influenza

A country or *zone* may be considered free from high pathogenicity avian influenza when:

- *infection* with high pathogenicity avian influenza viruses is a *notifiable disease* in the entire country;
- an ongoing awareness programme is in place to encourage reporting of suspicions of high pathogenicity avian influenza;
- absence of *infection* with high pathogenicity avian influenza viruses, based on *surveillance*, in accordance with Chapter 1.4. and Articles 10.4.26. to 10.4.30., has been demonstrated in the country or *zone* for the past 12 months;
- an awareness programme is in place related to avian influenza viruses *risks* and the specific *biosecurity* and management measures to address them;
- *commodities* are imported in accordance with Articles 10.4.7. to 10.4.22.

Surveillance should be adapted to parts of the country or existing *zones* depending on historical or geographical factors, industry structure, population data and proximity to recent *outbreaks* or the use of *vaccination*.

Article 10.4.4.

Compartment free from high pathogenicity avian influenza

The establishment of a *compartment* free from high pathogenicity avian influenza should be in accordance with relevant requirements of this chapter and the principles described in Chapters 4.4. and 4.5.

Article 10.4.5.

Establishment of a containment zone within a country or zone free from high pathogenicity avian influenza

In the event of *outbreaks* of high pathogenicity avian influenza within a previously free country or *zone*, a *containment zone*, which includes all epidemiologically linked *outbreaks*, may be established for the purpose of minimising the impact on the rest of the country or *zone*.

In addition to the requirements for the establishment of a *containment zone* outlined in Article 4.4.7., the *surveillance* programme should take into account the density of *poultry* production, types of *poultry*, local management practices (including inter-premises movement patterns of *poultry*, people and equipment), relevant *biosecurity*, the presence and potential role of birds other than *poultry*, including *wild* birds, and the proximity of *poultry establishments* to permanent and seasonal water bodies.

The free status of the areas outside the *containment zone* is suspended while the *containment zone* is being established. It may be reinstated, irrespective of the provisions of Article 10.4.6., once the *containment zone* is established. It should be demonstrated that *commodities* for *international trade* have originated from outside the *containment zone* or comply with the relevant articles of this chapter.

Article 10.4.6.

Recovery of free status

If *infection* with high pathogenicity avian influenza virus has occurred in *poultry* in a previously free country or *zone*, the free status may be regained after a minimum period of 28 days (i.e. two *flock*-level *incubation periods*) after a *stamping-out policy* has been completed (i.e. after the *disinfection* of the last affected *establishment*), provided that *surveillance* in accordance with Articles 10.4.26. to 10.4.30., in particular point 3 of Article 10.4.28., has been carried out during that period and has demonstrated the absence of *infection*.

If a *stamping-out policy* is not implemented, Article 10.4.3. applies.

Article 10.4.7.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For live poultry (other than day-old poultry)

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that:

1) the *poultry* showed no clinical signs of avian influenza on the day of shipment;
2) the *poultry* originated from a country, *zone* or *compartment* free from high pathogenicity avian influenza;
3) the *poultry* originated from a *flock* that was monitored for avian influenza viruses and was found to be negative;
4) the *poultry* are transported in new or appropriately sanitised *containers*.

If the *poultry* have been vaccinated against avian influenza viruses, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.8.

Recommendations for the importation of live birds other than poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) on the day of shipment, the birds showed no clinical signs of avian influenza;
2) the birds had been kept in isolation facilities approved by the *Veterinary Services* since they were hatched or for at least 28 days (i.e. two *flock*-level *incubation periods*) prior to shipment and showed no clinical signs of avian influenza during the isolation period;
3) a statistically appropriate sample of the birds was subjected, with negative results, to a diagnostic test for avian influenza within 14 days prior to shipment;
4) the birds are transported in new or appropriately sanitised *containers*.

If the birds have been vaccinated against avian influenza, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.9.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For day-old live poultry

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that:

1) the day-old live *poultry* had been kept in a country, *zone* or *compartment* free from high pathogenicity avian influenza since they were hatched;

   and

   a) the day-old live *poultry* were derived from parent *flocks* that were monitored for avian influenza viruses and were found to be negative at the time of collection of the eggs from which the day-old *poultry* hatched; or
   b) the day-old live *poultry* that hatched from eggs that had had their surfaces sanitised in accordance with point 4 d) of Article 6.5.5.;

AND

2) the day-old live *poultry* were transported in new or appropriately sanitised *containers*.

If the day-old live *poultry* or the parent *flocks* have been vaccinated against avian influenza, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.10.

Recommendations for the importation of day-old live birds other than poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) on the day of shipment, the birds showed no clinical signs of avian influenza;
2) the birds were hatched and kept in isolation facilities approved by the *Veterinary Services*;
3) a statistically appropriate sample of the parent *flock* birds were subjected, with negative results, to a diagnostic test for avian influenza at the time of collection of the eggs;
4) the birds were transported in new or appropriately sanitised *containers*.

If the birds or parent *flocks* have been vaccinated against avian influenza, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.11.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For hatching eggs of poultry

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that:

1) the hatching eggs came from a country, *zone* or *compartment* free from high pathogenicity avian influenza;
2)
   a) the hatching eggs were derived from parent *flocks* that were monitored for avian influenza viruses and were found to be negative at the time of collection of the hatching eggs; or
   b) the hatching eggs have had their surfaces sanitised in accordance with point 4 d) of Article 6.5.5.;
3) the hatching eggs are transported in new or appropriately sanitised packaging materials and *containers*.

If the parent *flocks* have been vaccinated against avian influenza, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.12.

Recommendations for the importation of hatching eggs from birds other than poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) a statistically appropriate sample of the parent *flock* birds was subjected, with negative results, to a diagnostic test for avian influenza 14 days prior to and at the time of collection of the hatching eggs;
2) the hatching eggs have had their surfaces sanitised in accordance with point 4 d) of Article 6.5.5.;
3) the hatching eggs are transported in new or appropriately sanitised packaging materials and *containers*.

If the parent *flocks* have been vaccinated against avian influenza, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.13.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For poultry semen

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that the donor *poultry*:

1) showed no clinical signs of avian influenza on the day of semen collection;

2) were kept in a country, *zone* or *compartment* free from high pathogenicity avian influenza.

Article 10.4.14.

Recommendations for the importation of semen from birds other than poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that the donor birds:

1) were kept in isolation facilities approved by the *Veterinary Services* for at least 28 days (i.e. two *flock*-level *incubation periods*) prior to semen collection;
2) showed no clinical signs of avian influenza during the isolation period;
3) were subjected, with negative results, to a diagnostic test for avian influenza within 14 days prior to semen collection.

Article 10.4.15.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For eggs for human consumption

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that:

1) the eggs for human consumption were produced and packed in a country, *zone* or *compartment* free from high pathogenicity avian influenza;
2) the eggs for human consumption were transported in new or appropriately sanitised packaging materials and *containers*.

Article 10.4.16.

Recommendations for the importation of egg products from poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) the egg products are derived from eggs which meet the requirements of Article 10.4.15.; or
2) the egg products have been processed to ensure the inactivation of high pathogenicity avian influenza viruses, in accordance with Article 10.4.23.;

AND

3) the necessary precautions were taken to avoid contact of the egg products with any source of high pathogenicity avian influenza viruses.

Article 10.4.17.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For fresh meat of poultry

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that the entire consignment of *fresh meat* comes from *poultry*:

1) which originated from a country, *zone* or *compartment* free from high pathogenicity avian influenza;
2) which were slaughtered in an approved *slaughterhouse/abattoir* in a country, *zone* or *compartment* free from high pathogenicity avian influenza and were subjected to ante- and post-mortem inspections in accordance with Chapter 6.3., with favourable results.

Article 10.4.18.

Recommendations for the importation of meat products from poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) the *meat products* from *poultry* are derived from *fresh meat* which meets the requirements of Article 10.4.17.; or

2) the *meat products* from *poultry* have been processed to ensure the inactivation of high pathogenicity avian influenza viruses in accordance with Article 10.4.24.;

AND

3) the necessary precautions were taken to avoid contact of the *meat products* from *poultry* with any source of high pathogenicity avian influenza viruses.

Article 10.4.19.

Recommendations for the importation of poultry products not listed in Article 10.4.2. and intended for use in animal feeding, or for agricultural or industrial use

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) these *commodities* were obtained from *poultry* which originated in a country, *zone* or *compartment* free from high pathogenicity avian influenza and that the necessary precautions were taken to avoid contamination during processing with any source of high pathogenicity avian influenza viruses;

OR

2) these *commodities* have been processed to ensure the inactivation of high pathogenicity avian influenza viruses using:

   a) moist heat treatment for 30 minutes at 56°C; or

   b) heat treatment where the internal temperature throughout the product reached at least 74°C; or

   c) any equivalent treatment that has been demonstrated to inactivate avian influenza viruses;

AND

3) the necessary precautions were taken to avoid contact of the *commodity* with any source of high pathogenicity avian influenza viruses.

Article 10.4.20.

Recommendations for the importation of feathers and down from poultry not listed in Article 10.4.2.

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that:

1) these *commodities* originated from *poultry* as described in Article 10.4.17. and were processed in a country, *zone* or *compartment* free from high pathogenicity avian influenza; or

2) these *commodities* have been processed to ensure the inactivation of high pathogenicity avian influenza viruses using one of the following:

   a) fumigation with formalin (10% formaldehyde) for 8 hours;

   b) irradiation with a dose of 20 kGy;

   c) any equivalent treatment which has been demonstrated to inactivate avian influenza viruses;

AND

3) the necessary precautions were taken to avoid contact of the *commodity* with any source of high pathogenicity avian influenza viruses.

Article 10.4.21.

Recommendations for the importation of feathers and down of birds other than poultry not listed in Article 10.4.2.

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) these *commodities* have been processed to ensure the inactivation of high pathogenicity avian influenza viruses using one of the following:
   a) fumigation with formalin (10% formaldehyde) for 8 hours;
   b) irradiation with a dose of 20 kGy;
   c) any equivalent treatment which has been demonstrated to inactivate avian influenza viruses;
2) the necessary precautions were taken to avoid contact of the *commodity* with any source of high pathogenicity avian influenza viruses.

Article 10.4.22.

Recommendations for the importation of collection specimens, skins and trophies of birds other than poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) these *commodities* have been processed to ensure the inactivation of high pathogenicity avian influenza viruses in accordance with Article 10.4.25.;

AND

2) the necessary precautions were taken to avoid contact of the *commodity* with any source of high pathogenicity avian influenza viruses.

Article 10.4.23.

Procedures for the inactivation of high pathogenicity avian influenza viruses in egg products from poultry

The following time/temperature combinations are suitable for the inactivation of high pathogenicity avian influenza viruses present in egg products:

	Core temperature (°C)	Time
Whole egg	60	188 seconds
Whole egg blends	60	188 seconds
Whole egg blends	61.1	94 seconds
Liquid egg white	55.6	870 seconds
Liquid egg white	56.7	232 seconds
Plain or pure egg yolk	60	288 seconds
10% salted yolk	62.2	138 seconds
Dried egg white	67	20 hours
Dried egg white	54.4	50.4 hours
Dried egg white	51.7	73.2 hours

These time/temperature combinations are indicative of a range that achieves a 7-$\log_{10}$ reduction of avian influenza virus infectivity. These are examples for a variety of egg products but, when supported by scientific evidence, variations of these time/temperature combinations may be used, and they may be used for other egg products, if they achieve equivalent inactivation of the virus.

Article 10.4.24.

Procedures for the inactivation of high pathogenicity avian influenza viruses in meat products from poultry

The following time/temperature combinations are suitable for the inactivation of high pathogenicity avian influenza viruses in *meat products*.

	Core temperature (°C)	Time
Meat products from poultry	60.0	507 seconds
	65.0	42 seconds
	70.0	3.5 seconds
	73.9	0.51 second

These time/temperature combinations are indicative of a range that achieves a 7-$\log_{10}$ reduction of avian influenza virus infectivity. When supported by scientific evidence, variations of these time/temperature combinations may be used if they achieve equivalent inactivation of the virus.

Article 10.4.25.

Procedures for the inactivation of high pathogenicity avian influenza viruses in collection specimens and in skins and trophies

For the inactivation of high pathogenicity avian influenza viruses in collection specimens and in skins and trophies, one of the following procedures should be used:

1) boiling in water for an appropriate time to ensure that any material other than bone, claws or beaks is removed; or
2) soaking, with agitation, in a 4% (w/v) solution of washing soda (sodium carbonate-Na_2CO_3) maintained at pH 11.5 or above for at least 48 hours; or
3) soaking, with agitation, in a formic acid solution (100 kg salt [NaCl] and 12 kg formic acid per 1,000 litres water) maintained below pH 3.0 for at least 48 hours; wetting and dressing agents may be added; or
4) in the case of raw hides, treatment for at least 28 days with salt (NaCl) containing 2% washing soda (sodium carbonate-Na_2CO_3); or
5) treatment with 1% formalin for a minimum of six days; or
6) any equivalent treatment which has been demonstrated to inactivate the virus.

Article 10.4.26.

Principles of surveillance for avian influenza

The following are complementary to Chapter 1.4. and should be applied by Member Countries seeking to determine their high pathogenicity avian influenza status.

These principles are also necessary to support *vaccination* programmes, to monitor low pathogenicity avian influenza viruses, especially H5 and H7, in *poultry* and to detect high pathogenicity avian influenza in *wild* birds.

The impact and epidemiology of avian influenza differ widely among different regions of the world and therefore it is impossible to provide detailed recommendations for all situations. Variables such as the frequency of contacts between *poultry* and *wild* birds, different *biosecurity* levels and production systems, and the commingling of different susceptible species including domestic waterfowl, may require different *surveillance* strategies to address each situation. Furthermore, domestic waterfowl typically do not show clinical signs and have longer infective periods than gallinaceous *poultry*. It is therefore incumbent upon the Member Country to provide scientific data that explain the epidemiology of avian influenza in the region of concern and also to demonstrate how all the risk factors have been taken into account. Member Countries have flexibility to provide a science-based approach to demonstrate absence of *infection* with high pathogenicity avian influenza viruses at an appropriate level of confidence, as described in Chapter 1.4.

There is an increased recognition of the value of the application of sequencing technologies and phylogenetic analyses to determine routes of introduction, transmission pathways and epidemiological patterns of *infection*. When avian influenza viruses are detected, Member Countries should apply these technologies, when possible, to enhance the evidence used to develop specific *surveillance* strategies and control activities.

A *monitoring* system for low pathogenicity avian influenza viruses in *poultry* should be in place for the following reasons:

1) H5 and H7 low pathogenicity avian influenza viruses have the potential to mutate into high pathogenicity avian influenza viruses, but it is not possible to predict which viruses will mutate or when these mutations will occur.
2) The detection of sudden and unexpected increases in virulence of low pathogenicity avian influenza viruses in *poultry* is notifiable as an *emerging disease* in accordance with Article 1.1.4.
3) The detection, in domestic or *captive wild* birds, of low pathogenicity avian influenza viruses that have been proven to be transmitted naturally to humans with severe consequences is notifiable in accordance with Article 1.1.3.

Article 10.4.27.

Surveillance for early warning of high pathogenicity avian influenza

1) An ongoing *surveillance* programme for avian influenza should be in place and be designed to detect the presence of *infection* with high pathogenicity avian influenza viruses in the country or *zone* in a timely manner.
2) The high pathogenicity avian influenza *surveillance* programme should include the following.
   a) An *early warning system* for reporting suspected *cases*, in accordance with Article 1.4.5. throughout the production, marketing and processing chain. Farmers and workers who have day-to-day contact with *poultry*, as well as diagnosticians, should report promptly any suspicion of avian influenza to the *Veterinary Services*. All suspected *cases* of high pathogenicity avian influenza should be investigated immediately and samples should be collected and submitted to a *laboratory* for appropriate tests.
   b) Implementation, as relevant, of regular and frequent clinical inspection, or serological and virological testing of high-risk groups of *animals*, such as those adjacent to a country or *zone* infected with high pathogenicity avian influenza, places where birds and *poultry* of different origins are mixed, such as live bird markets, and *poultry* in close proximity to waterfowl or other potential sources of influenza A viruses. This activity is particularly applicable to domestic waterfowl, where detection of high pathogenicity avian influenza via clinical suspicion can be of low sensitivity.
   c) Immediate investigation of the presence of antibodies against influenza A viruses that have been detected in *poultry* and are not a consequence of *vaccination*. In the case of single or isolated serological positive results, *infection* with high pathogenicity avian influenza viruses may be ruled out on the basis of a thorough epidemiological and *laboratory* investigation that does not demonstrate further evidence of such an *infection*.

Article 10.4.28.

Surveillance for demonstrating freedom from infection with high pathogenicity avian influenza

1) A Member Country declaring freedom of the entire country, a *zone* or a *compartment* from high pathogenicity avian influenza in *poultry* should provide evidence of an effective *surveillance* programme.

   Transparency in the application of different methodologies is essential to ensure consistency in decision-making, ease of understanding, fairness and rationality. The assumptions made, the uncertainties, and the effect of these on the interpretation of the results, should be documented.

   The design of the *surveillance* programme will depend on the epidemiological circumstances and it should be planned and implemented in accordance with this chapter and Article 1.4.6.This requires the availability of demographic data on the *poultry* population and the support of a *laboratory* able to undertake identification of *infection* with avian influenza viruses through virus detection and antibody tests.

   The *surveillance* programme should demonstrate absence of *infection* with high pathogenicity avian influenza viruses during the preceding 12 months in susceptible *poultry* populations (vaccinated and non-vaccinated).

   The design of the sampling strategy should include an epidemiologically appropriate design prevalence. The design prevalence and desired level of confidence in the results will determine the sample size. The Member Country should justify the choice of design prevalence and confidence level used on the basis of the stated objectives of the *surveillance* and the epidemiological situation.

   The sampling strategy may be risk-based if scientific evidence is available, and provided, for the quantification of risk factors. Specific risks could include those linked to the types of production, possible direct or indirect contact

with *wild* birds, multi-age *flocks*, local trade patterns including live bird markets, use of possibly contaminated surface water, the presence of more than one species at the *establishment* and poor *biosecurity* in place.

Data from different *surveillance* activities can be included to increase the sensitivity of the *surveillance* system. If this is to be done, data from structured (e.g. surveys and active *surveillance*) and non-structured (e.g. passive *surveillance*) sources should be combined and the sensitivity of each activity should be quantified in order to be able to quantify the sensitivity of the overall *surveillance* system.

The *surveillance* programme should include *surveillance* for high pathogenicity avian influenza viruses in birds other than *poultry*, including *wild* birds, and *monitoring* of low pathogenicity avian influenza viruses in *poultry*, in order to ensure that *biosecurity* and control measures are fit for purpose.

Documentation of freedom from *infection* with high pathogenicity avian influenza should provide details of the *poultry* population, the occurrence of suspected *cases* and how they were investigated and dealt with. This should include the results of *laboratory* testing and the *biosecurity* and control measures to which the animals concerned were subjected during the investigation.

2. Additional requirements for countries, zones or compartments that practise vaccination

Vaccination to prevent the transmission of high pathogenicity avian influenza virus may be part of a disease control programme. The level of *flock* immunity required to prevent transmission depends on the *flock* size, composition (e.g. species) and density of the susceptible *poultry* population. Based on the epidemiology of avian influenza in the country, *zone* or *compartment*, a decision may be reached to vaccinate only certain species or other *poultry subpopulations*.

In all vaccinated *flocks* tests should be performed to ensure the absence of virus circulation. The tests should be repeated at a frequency that is proportionate to the *risk* in the country, *zone* or *compartment*. The use of sentinel *poultry* may provide further confidence in the absence of virus circulation.

Member Countries seeking the demonstration of freedom from high pathogenicity avian influenza in vaccinated population should refer to the chapter on avian influenza (*infection* with avian influenza viruses) in the *Terrestrial Manual*.

Evidence to show the effectiveness of the *vaccination* programme should also be provided.

3. Additional requirements for recovery of free status

In addition to the conditions described in the point above, a Member Country declaring that it has regained country, *zone* or *compartment* freedom after an *outbreak* of high pathogenicity avian influenza in *poultry* should show evidence of an active *surveillance* programme, depending on the epidemiological circumstances of the *outbreak*, to demonstrate the absence of the *infection*. This will require *surveillance* incorporating virus detection and antibody tests. The Member Country should report the results of an active *surveillance* programme in which the susceptible *poultry* population undergoes regular clinical examination and active *surveillance* planned and implemented according to the general conditions and methods described in these recommendations. The *surveillance* samples should be representative of *poultry populations* at risk. The use of sentinel birds may facilitate the interpretation of *surveillance* results.

Populations under this *surveillance* programme should include:

a) *establishments* in the proximity of the *outbreaks*;

b) *establishments* epidemiologically linked to the *outbreaks*;

c) *poultry* used to re-populate affected *establishments*;

d) any *establishments* where preventive depopulation has been carried out.

Article 10.4.29.

Surveillance of wild bird populations

Passive *surveillance*, i.e. sampling of birds found dead, is an appropriate method of *surveillance* in *wild* birds because *infection* with high pathogenicity avian influenza can be associated with mortality in some species. Mortality events, or clusters of birds found dead should be reported to the *Veterinary Services* and investigated, including through the collection and submission of samples to a *laboratory* for appropriate tests.

Active *surveillance*, i.e. sampling of live *wild* birds, may be necessary for detection of some strains of high pathogenicity avian influenza viruses that produce *infection* without mortality in *wild* birds. Furthermore, it increases knowledge of the ecology and evolution of avian influenza viruses.

Surveillance in *wild* birds should be targeted towards times of year, species and locations in which *infection* is more likely.

Surveillance in *wild* birds should be enhanced by raising awareness, and by active searching and *monitoring* for dead or moribund *wild* birds when high pathogenicity avian influenza has been detected in the region. The movements of migratory water birds, in particular ducks, geese and swans, should be taken into account as a potential pathway for introduction of virus to uninfected areas.

Article 10.4.30.

Monitoring of low pathogenicity avian influenza in poultry populations

Outbreaks of low pathogenicity avian influenza viruses can be managed at the *establishment* level; however, spread to other *poultry establishments* increases the risk of virus mutation, particularly if it is not detected and managed. Therefore, a *monitoring* system should be in place.

Monitoring the presence and types of low pathogenicity avian influenza viruses can be achieved through a combination of clinical investigation when *infection* is suspected because of changes in production parameters, such as reductions in egg production or *feed* and water intake, and active serological and virological *surveillance*, which can be supported by the information obtained by the *surveillance* system for high pathogenicity avian influenza.

Serological and virological *monitoring* should aim at detecting clusters of infected *flocks* to identify spread between *establishments*. Epidemiological follow-up (tracing forward and back) of serologically positive *flocks* should be carried out to determine whether there is clustering of infected *flocks* regardless of whether the seropositive birds are still present at the *establishment* or whether active virus *infection* has been detected. Hence, *monitoring* of low pathogenicity avian influenza will also enhance early detection of high pathogenicity avian influenza.

NB: FIRST ADOPTED IN 1998; MOST RECENT UPDATE ADOPTED IN 2024.

GLOSSARY

For the purposes of the *Terrestrial Code*:

ANIMAL

means a mammal, reptile, bird or bee.

ANIMAL FOR BREEDING OR REARING

means a domesticated or confined *animal* which is not intended for *slaughter* within a short time.

ANIMAL FOR SLAUGHTER

means an *animal* intended for *slaughter* within a short time, under the control of the relevant *Competent Authority*.

ANIMAL HANDLER

means a person with a knowledge of the behaviour and needs of *animals* who, with appropriate experience and a professional and positive response to an *animal*'s needs, can achieve effective management and good *welfare*. Competence should be gained through formal training or practical experience.

ANIMAL HEALTH MANAGEMENT

means a system designed to optimise the physical and behavioural health and welfare of *animals*. It includes the prevention, treatment and control of diseases and conditions affecting the individual *animal* and *herd* or *flock*, including the recording of illness, injuries, mortalities and medical treatments where appropriate.

ANIMAL HEALTH STATUS

means the status of a country, *zone* or *compartment* with respect to an animal disease in accordance with the criteria listed in the relevant disease-specific chapter or Chapter 1.4. of the *Terrestrial Code*.

ANIMAL IDENTIFICATION

means the combination of the identification and *registration* of an *animal* individually, with a unique identifier, or collectively by its *epidemiological unit* or group, with a unique group identifier.

ANIMAL IDENTIFICATION SYSTEM

means the inclusion and linking of components such as identification of *establishments* or owners, the persons responsible for the *animals*, movements and other records with *animal identification*.

ANIMAL PRODUCT

means any part of an *animal*, or a raw or manufactured product containing any material derived from *animals*, excluding *germinal products*, *biological products* and *pathological material*.

ANIMAL TRACEABILITY

means the ability to follow an *animal* or group of *animals* during all stages of its life.

ANIMAL WELFARE

means the physical and mental state of an *animal* in relation to the conditions in which it lives and dies.

ANTIMICROBIAL AGENT

means a naturally occurring, semi-synthetic or synthetic substance that exhibits antimicrobial activity (kill or inhibit the growth of micro-organisms) at concentrations attainable *in vivo*. Anthelmintics and substances classed as disinfectants or antiseptics are excluded from this definition.

APIARY

means a *beehive* or group of *beehives* whose management allows them to be considered as a single *epidemiological unit*.

APPROVED

means officially approved, accredited or registered by the *Veterinary Authority*.

BEEHIVE

means a structure for the keeping of honey bee colonies that is being used for that purpose, including frameless hives, fixed frame hives and all designs of moveable frame hives (including nucleus hives), but not including packages or cages used to confine bees for the purposes of transport or isolation.

BIOLOGICAL PRODUCT

means a product of animal or microorganism origin, used in the diagnosis of diseases, for treatment, control and prevention of diseases, or in the collection and processing of *germinal products*.

BIOSECURITY

means a set of management and physical measures designed to reduce the *risk* of introduction, establishment and spread of animal diseases, *infections* or *infestations* to, from and within an animal population.

BIOSECURITY PLAN

means a plan that identifies potential pathways for the introduction and spread of disease in a *zone* or *compartment*, and describes the measures which are being or will be applied to mitigate the disease *risks*, if applicable, in accordance with the recommendations in the *Terrestrial Code*.

BORDER POST

means any airport, or any port, railway station or road check-point open to *international trade* of *commodities*, where import veterinary inspections can be performed.

CAPTIVE WILD [ANIMAL]

means an *animal* that has a phenotype not significantly affected by human selection but that is captive or otherwise lives under or requires human supervision or control.

CASE

means an individual *animal* infected by a pathogenic agent, with or without clinical signs.

CASINGS

means intestines and bladders that, after cleaning, have been processed by tissue scraping, defatting and washing, and have been treated with salt.

COLLECTION CENTRE

means a facility approved by the *Veterinary Authority* for the collection of oocytes or embryos and used exclusively for donor animals which meet the conditions of the *Terrestrial Code*.

COMMODITY

means a live *animal*, an *animal product*, *germinal products*, a *biological product* or *pathological material*.

COMPARTMENT

means an animal *subpopulation* contained in one or more *establishments*, separated from other susceptible *populations* by a common *biosecurity* management system, and with a specific *animal health status* with respect to one or more *infections* or *infestations* for which the necessary *surveillance*, *biosecurity* and control measures have been applied for the purposes of *international trade* or disease prevention and control in a country or *zone*.

COMPETENT AUTHORITY

means a Governmental Authority of a Member Country having the responsibility in the whole or part of the territory for the implementation of certain standards of the *Terrestrial Code*.

CONTAINER

means a non-self-propelled receptacle or other rigid structure for holding *animals* during a *journey* by one or several means of transport.

CONTAINMENT ZONE

means an *infected zone* defined within a previously free country or *zone*, which includes all suspected or confirmed *cases* that are epidemiologically linked and where movement control, *biosecurity* and *sanitary measures* are applied to prevent the spread of, and to eradicate, the *infection* or *infestation*.

DAY-OLD BIRDS

means birds aged not more than 72 hours after hatching.

DISINFECTION

means the application, after thorough cleansing, of procedures intended to destroy the infectious or parasitic agents of animal diseases, including zoonoses; this applies to premises, *vehicles* and different objects which may have been directly or indirectly contaminated.

DISINFESTATION

means the application of procedures intended to eliminate *infestation*.

DISTRESS

means the state of an animal, that has been unable to adapt to stressors, and that manifests as abnormal physiological or behavioural responses. It can be acute or chronic and may result in pathological conditions.

EARLY WARNING SYSTEM

means a system for the timely detection, reporting and communication of occurrence, incursion or emergence of diseases, *infections* or *infestations* in a country, *zone* or *compartment*.

EMERGING DISEASE

means a new occurrence in an *animal* of a disease, *infection* or *infestation*, causing a significant impact on animal or public health resulting from:

a) a change of a known pathogenic agent or its spread to a new geographic area or species; or

b) a previously unrecognised pathogenic agent or disease diagnosed for the first time.

EPIDEMIOLOGICAL UNIT

means a group of *animals* with the same likelihood of exposure to a pathogenic agent. In certain circumstances, the epidemiological unit may be a single *animal*.

ERADICATION

means the elimination of a pathogenic agent from a country or *zone*.

ESTABLISHMENT

means the premises in which *animals* are kept.

EUTHANASIA

means the *killing* of an *animal* using a method that causes a rapid and irreversible loss of consciousness with minimum *pain* and *distress*.

EXPORTING COUNTRY

means a country from which *commodities* are sent to another country.

FEED

means any material (single or multiple), whether processed, semi-processed or raw, which is intended to be fed directly to terrestrial *animals* (except bees).

FEED INGREDIENT

means a component part or constituent of any combination or mixture making up a *feed*, whether or not it has a nutritional value in the *animal*'s diet, including feed additives. Ingredients are of plant (including aquatic plants) or terrestrial or aquatic animal origin, or other organic or inorganic substances.

FERAL [ANIMAL]

means an *animal* of a domesticated species that lives without requiring human supervision or control.

FLOCK

means a number of *animals* of one kind kept together under human control or a congregation of gregarious *wild animals*. A *flock* is usually regarded as an *epidemiological unit*.

FREE COMPARTMENT

means a *compartment* in which the absence of the animal pathogenic agent causing the disease under consideration has been demonstrated by all requirements specified in the *Terrestrial Code* for free status being met.

FREE-ROAMING DOG

means any *owned dog* or unowned dog that is without direct human supervision or control, including *feral* dogs.

FREE ZONE

means a *zone* in which the absence of a specific *infection* or *infestation* in an animal *population* has been demonstrated in accordance with the relevant requirements of the *Terrestrial Code*.

FRESH MEAT

means *meat* that has not been subjected to any treatment irreversibly modifying its organoleptic and physicochemical characteristics. This includes frozen *meat*, chilled *meat*, minced *meat* and mechanically recovered *meat*.

GERMINAL PRODUCTS

means animal semen, oocytes, embryos or *hatching eggs*.

GOOD MANUFACTURING PRACTICE

means a production and testing practice recognised by the *Competent Authority* to ensure the quality of a product.

HATCHING EGGS

means fertilised bird eggs, suitable for incubation and hatching.

HAZARD

means a biological, chemical or physical agent in, or a condition of, an *animal* or animal product with the potential to cause an adverse health effect.

HEADQUARTERS

means the Permanent Secretariat of the World Organisation for Animal Health located at:

12, rue de Prony, 75017 Paris, FRANCE
Telephone: 33-(0)1 44 15 18 88
Fax: 33-(0)1 42 67 09 87
Electronic mail: woah@woah.org
WWW: http://www.woah.org

HERD

means a number of *animals* of one kind kept together under human control or a congregation of gregarious *wild animals*. A *herd* is usually regarded as an *epidemiological unit*.

IMPORTING COUNTRY

means a country that is the final destination to which *commodities* are sent.

INCIDENCE

means the number of new *cases* or *outbreaks* of a disease that occur in a population at risk in a particular geographical area within a defined time interval.

INCUBATION PERIOD

means the longest period that elapses between the introduction of the pathogenic agent into the *animal* and the occurrence of the first clinical signs of the disease.

INFECTED ZONE

means a *zone* either in which an *infection* or *infestation* has been confirmed, or one that is defined as such in the relevant chapters of the *Terrestrial Code*.

INFECTION

means the entry and development or multiplication of a pathogenic agent in the body of humans or *animals*.

INFECTIVE PERIOD

means the longest period during which an affected *animal* can be a source of *infection*.

INFESTATION

means the external invasion or colonisation of *animals* or their immediate surroundings by arthropods, which may cause clinical signs or are potential *vectors* of pathogenic agents.

INTERNATIONAL TRADE

means importation, exportation and transit of *commodities*.

INTERNATIONAL VETERINARY CERTIFICATE

means a certificate, issued in accordance with Chapter 5.2., describing the animal health and public health requirements that are fulfilled by the exported *commodities*.

JOURNEY

An *animal* transport journey commences when the first *animal* is loaded onto a *vehicle/vessel* or into a *container* and ends when the last *animal* is unloaded, and includes any stationary resting/holding periods. The same *animals* do not commence a new journey until after a suitable period for rest and recuperation, with adequate *feed* and water.

KILLING

means any procedure that causes the death of an *animal*.

LABORATORY

means a properly equipped institution staffed by technically competent personnel under the control of a specialist in veterinary diagnostic methods, who is responsible for the validity of the results. The *Veterinary Authority* approves and monitors such laboratories with regard to the diagnostic tests required for *international trade*.

LAIRAGE

means pens, yards and other holding areas used for accommodating *animals* in order to give them necessary attention (such as water, *feed*, rest) before they are moved on or used for specific purposes including *slaughter*.

LISTED DISEASE

means a disease, *infection* or *infestation* listed in Chapter 1.3. after adoption by the World Assembly of Delegates.

LOADING/UNLOADING

Loading means the procedure of moving *animals* onto a *vehicle/vessel* or into a *container* for transport purposes, while unloading means the procedure of moving *animals* off a *vehicle/vessel* or out of a *container*.

MARKET

means a place where *animals* are assembled for the purposes of trade or sale.

MEAT

means all edible parts of an *animal*.

MEAT PRODUCTS

means *meat* that has been subjected to a treatment irreversibly modifying its organoleptic and physicochemical characteristics.

MILK

means the normal mammary secretion of milking *animals* obtained from one or more milkings without either addition to it or extraction from it.

MILK PRODUCT

means the product obtained by any processing of *milk*.

MONITORING

means the intermittent performance and analysis of routine measurements and observations, aimed at detecting changes in the environment or health status of a *population*.

NOTIFIABLE DISEASE

means a disease listed by the *Veterinary Authority*, and that, as soon as detected or suspected, should be brought to the attention of this *Authority*, in accordance with national regulations.

NOTIFICATION

means the procedure by which:

a) the *Veterinary Authority* informs the *Headquarters*,

b) the *Headquarters* inform the *Veterinary Authority*,

of the occurrence of disease, *infection* or *infestation* in accordance with Chapter 1.1.

OFFICIAL CONTROL PROGRAMME

means a programme which is approved, and managed or supervised by the *Veterinary Authority* of a Member Country for the purposes of controlling a *vector*, pathogenic agent or disease by specific measures applied throughout that Member Country, or within a *zone* or *compartment* of that Member Country.

OFFICIAL VETERINARIAN

means a *veterinarian* authorised by the *Veterinary Authority* of the country to perform certain designated official tasks associated with animal health or public health and inspections of *commodities* and, when appropriate, to certify in accordance with Chapters 5.1. and 5.2.

OFFICIAL VETERINARY CONTROL

means the operations whereby the *Veterinary Services*, knowing the location of the *animals* and after taking appropriate actions to identify their owner or responsible keeper, are able to apply appropriate animal health measures, as required. This does not exclude other responsibilities of the *Veterinary Services* e.g. food safety.

OUTBREAK

means the occurrence of one or more *cases* in an *epidemiological unit*.

OWNED DOG

means a dog for which a person claims responsibility.

PAIN

means an unpleasant sensory and emotional experience associated with actual or potential tissue damage. It may elicit protective actions, result in learned avoidance and *distress* and may modify species-specific traits of behaviour, including social behaviour.

PATHOLOGICAL MATERIAL

means samples obtained from live or dead *animals*, containing or suspected of containing infectious or parasitic agents, to be sent to a *laboratory*.

PLACE OF SHIPMENT

means the place where the *commodities* are loaded into the *vehicle* or handed to the agency that will transport them to another country.

POPULATION

means a group of *units* sharing a common defined characteristic.

POULTRY

means all birds reared or kept in captivity for the production of any commercial animal products or for breeding for this purpose, fighting cocks used for any purpose, and all birds used for restocking supplies of game or for breeding for this purpose, until they are released from captivity.

Birds that are kept in a single household, the products of which are used within the same household exclusively, are not considered *poultry*, provided that they have no direct or indirect contact with *poultry* or *poultry* facilities.

Birds that are kept in captivity for other reasons, including those that are kept for shows, racing, exhibitions, zoological collections and competitions, and for breeding or selling for these purposes, as well as pet birds, are not considered *poultry*, provided that they have no direct or indirect contact with *poultry* or *poultry* facilities.

PRE-JOURNEY PERIOD

means the period during which *animals* are identified, and often assembled for the purposes of *loading* them.

PREVALENCE

means the total number of *cases* or *outbreaks* of a disease that are present in a population at risk, in a particular geographical area, at one specified time or during a given period.

PROTEIN MEAL

means any final or intermediate solid protein-containing product, obtained when animal tissues are rendered, excluding peptides of a molecular mass less than 10,000 daltons and amino-acids.

PROTECTION ZONE

means a *zone* where specific *biosecurity* and *sanitary measures* are implemented to prevent the entry of a pathogenic agent into a free country or *zone* from a neighbouring country or *zone* of a different *animal health status*.

QUALITATIVE RISK ASSESSMENT

means an assessment where the outputs on the likelihood of the outcome or the magnitude of the consequences are expressed in qualitative terms such as 'high', 'medium', 'low' or 'negligible'.

QUANTITATIVE RISK ASSESSMENT

means an assessment where the outputs of the *risk assessment* are expressed numerically.

QUARANTINE STATION

means an establishment under the control of the *Veterinary Authority* where *animals* are maintained in isolation with no direct or indirect contact with other *animals*, to ensure that there is no transmission of specified pathogenic agents outside the establishment while the *animals* are undergoing observation for a specified length of time and, if appropriate, testing or treatment.

REGISTRATION

is the action by which information on *animals* (such as identification, animal health, movement, certification, epidemiology, *establishments*) is collected, recorded, securely stored and made appropriately accessible and able to be utilised by the *Competent Authority*.

RESPONSIBLE DOG OWNERSHIP

means the situation whereby a person accepts and commits to perform various duties in accordance with the legislation in place and focused on the satisfaction of the behavioural, environmental and physical needs of a dog and to the prevention of risks (aggression, disease transmission or injuries) that the dog may pose to the community, other *animals* or the environment.

RESTING POINT

means a place where the *journey* is interrupted to rest, *feed* or water the *animals*; the *animals* may remain in the *vehicle*/*vessel* or *container*, or be unloaded for these purposes.

RESTRAINT

means the application to an *animal* of any procedure designed to restrict its movements.

RISK

means the likelihood of the occurrence and the likely magnitude of the biological and economic consequences of an adverse event or effect to animal or human health.

RISK ANALYSIS

means the process composed of *hazard* identification, *risk assessment*, *risk management* and *risk communication*.

RISK ASSESSMENT

means the evaluation of the likelihood and the biological and economic consequences of entry, establishment and spread of a *hazard*.

RISK COMMUNICATION

is the interactive transmission and exchange of information and opinions throughout the *risk analysis* process concerning *risk*, *risk*-related factors and *risk* perceptions among *risk* assessors, *risk* managers, *risk* communicators, the general public and other interested parties.

RISK MANAGEMENT

means the process of identifying, selecting and implementing measures that can be applied to reduce the level of *risk*.

SAFE COMMODITY

means a *commodity* that can be traded without the need for *risk* mitigation measures specifically directed against a particular *listed disease*, *infection* or *infestation* and regardless of the status of the country or *zone* of origin for that disease, *infection* or *infestation*.

SANITARY MEASURE

means a measure, such as those described in various chapters of the *Terrestrial Code*, designed to protect animal or human health or life within the whole territory or a *zone* of a Member Country from *risks* arising from the entry, establishment or spread of a *hazard*.

SEMEN COLLECTION CENTRE

means an *approved* facility that meets the conditions set out in the *Terrestrial Code* for the collection, processing and storage of semen.

SLAUGHTER

means the *killing* of an *animal* primarily intended for human consumption.

SLAUGHTERHOUSE/ABATTOIR

means premises, including facilities for moving or lairaging *animals*, used for the *slaughter* of *animals* to produce animal products and approved by the relevant *Competent Authority*.

SPACE ALLOWANCE

means the measure of the floor area and height allocated per individual or body weight of *animals*.

SPECIFIC SURVEILLANCE

means the *surveillance* targeted to a specific disease or *infection*.

STAMPING-OUT POLICY

means a policy designed to eliminate an *outbreak* by carrying out under the authority of the *Veterinary Authority* the following:

a) the *killing* of the *animals* which are affected and those suspected of being affected in the *herd* or *flock* and, where appropriate, those in other *herds* or *flocks* which have been exposed to *infection* by direct animal to animal contact, or by indirect contact with the causal pathogenic agent; *animals* should be killed in accordance with Chapter 7.6.;

b) the disposal of carcasses and, where relevant, animal products by rendering, burning or burial, or by any other method described in Chapter 4.13.;

c) the cleansing and *disinfection* of *establishments* through procedures defined in Chapter 4.14.

STOCKING DENSITY

means the number or body weight of *animals* per unit area on a *vehicle/vessel* or *container*.

STUNNING

means any procedure that causes loss of consciousness for the purpose of *killing* without avoidable *distress*, fear and *pain*.

SUBPOPULATION

means a distinct part of a *population* identifiable in accordance with specific common animal health characteristics.

SURVEILLANCE

means the systematic ongoing collection, collation, and analysis of information related to animal health and the timely dissemination of information so that action can be taken.

TERRESTRIAL CODE

means the WOAH *Terrestrial Animal Health Code*.

TERRESTRIAL MANUAL

means the WOAH *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals*.

TRANSIT COUNTRY

means a country through which *commodities* destined for an *importing country* are transported or in which a stopover is made at a *border post*.

UNIT

means an individually identifiable element used to describe, for example, the members of a *population* or the elements selected when sampling; examples of *units* include individual *animals*, *herds*, *flocks* and *apiaries*.

VACCINATION

means the administration of a vaccine, in accordance with the manufacturer's instructions and the *Terrestrial Manual*, when relevant, with the intention of inducing immunity in an *animal* or group of *animals* against one or more pathogenic agents.

VECTOR

means an insect or any living carrier that transports an infectious agent from an infected individual to a susceptible individual or its food or immediate surroundings. The organism may or may not pass through a development cycle within the *vector*.

VEHICLE/VESSEL

means any means of conveyance including train, truck, aircraft or ship that is used for carrying *animals*.

VETERINARIAN

means a person with appropriate education, registered or licensed by the relevant *veterinary statutory body* of a country to practice veterinary medicine/science in that country.

VETERINARY AUTHORITY

means the Governmental Authority of a Member Country having the primary responsibility in the whole territory for coordinating the implementation of the standards of the *Terrestrial Code*.

VETERINARY LEGISLATION

means laws, regulations and all associated legal instruments that pertain to the veterinary domain.

VETERINARY MEDICINAL PRODUCT

means any product with approved claims to having a prophylactic, therapeutic or diagnostic effect or to alter physiological functions when administered or applied to an *animal*.

VETERINARY PARAPROFESSIONAL

means a person who, for the purposes of the *Terrestrial Code*, is authorised by the *veterinary statutory body* to carry out certain designated tasks (dependent upon the category of *veterinary paraprofessional*) in a territory, and delegated to them under the responsibility and direction of a *veterinarian*. The tasks for each category of *veterinary paraprofessional* should be defined by the *veterinary statutory body* depending on qualifications and training, and in accordance with need.

VETERINARY SERVICES

means the combination of governmental and non-governmental individuals and organisations that perform activities to implement the standards of the *Terrestrial Code*.

VETERINARY STATUTORY BODY

means an autonomous regulatory body for *veterinarians* and *veterinary paraprofessionals*.

WILD [ANIMAL]

means an *animal* that has a phenotype unaffected by human selection and lives independently without requiring human supervision or control.

WILDLIFE

means *feral animals*, *captive wild animals* and *wild animals*.

ZONE

means a part of a country defined by the *Veterinary Authority*, containing an animal *population* or *subpopulation* with a specific *animal health status* with respect to an *infection* or *infestation* for the purposes of *international trade* or disease prevention or control.

NB: FIRST ADOPTED IN 1968; MOST RECENT UPDATE ADOPTED IN 2024.

SECTION 5.

TRADE MEASURES, IMPORT/EXPORT PROCEDURES AND VETERINARY CERTIFICATION

CHAPTER 5.1.

GENERAL OBLIGATIONS RELATED TO CERTIFICATION

Article 5.1.1.

Safety of *international trade* in *animals* and animal products depends on a combination of factors which should be taken into account to ensure unimpeded trade, without incurring unacceptable *risks* to human and animal health.

Because of differences between countries in their animal health situations, various options are offered by the *Terrestrial Code*. The animal health situation in the *exporting country*, in the *transit country* or *countries* and in the *importing country* should be considered before determining the requirements for trade. To maximise harmonisation of the sanitary aspects of *international trade*, *Veterinary Authorities* of Member Countries should base their import requirements on the standards of WOAH.

These requirements should be included in the model certificates approved by WOAH which are included from Chapters 5.10. to 5.12.

Certificates should be exact and concise, and should clearly convey the requirements of the *importing country*. For this purpose, prior consultation between *Veterinary Authorities* of *importing* and *exporting countries* may be necessary. It enables the setting out of the exact requirements so that the signing *veterinarian* can, if necessary, be given a note of guidance explaining the understanding between the *Veterinary Authorities* involved.

The certification requirements should not include conditions for diseases that are not transmitted by the *commodity* concerned. The certificate should be signed in accordance with Chapter 5.2.

When officials of a *Veterinary Authority* wish to visit another country for matters of professional interest to the *Veterinary Authority* of the other country, the latter should be informed.

Article 5.1.2.

Responsibilities of the importing country

1) The import requirements included in the *international veterinary certificate* should assure that *commodities* introduced into the *importing country* comply with the standards of WOAH. *Importing countries* should align their requirements with the recommendations in the relevant standards of WOAH. If there are no such recommendations or if the country chooses a level of protection requiring measures more stringent than the standards of WOAH, these should be based on an import *risk analysis* conducted in accordance with Chapter 2.1.
2) The *international veterinary certificate* should not include requirements for the exclusion of pathogenic agents or animal diseases which are present in the *importing country* and are not subject to any *official control programme*. The measures imposed on imports to manage the *risks* posed by a specific pathogenic agent or disease should not be more stringent than those applied as part of the *official control programme* operating within the *importing country*.

3) The *international veterinary certificate* should not include measures against pathogenic agents or diseases which are not WOAH listed, unless the *importing country* has demonstrated through import *risk analysis*, carried out in accordance with Section 2., that the pathogenic agent or disease poses a significant *risk* to the *importing country*.

4) The transmission by the *Veterinary Authority* of certificates or the communication of import requirements to persons other than the *Veterinary Authority* of another country, necessitates that copies of these documents are also sent to the *Veterinary Authority*. This important procedure avoids delays and difficulties which may arise between traders and *Veterinary Authorities* when the authenticity of the certificates or permits is not established.

   This procedure is under the responsibility of *Veterinary Authorities*. However, it can be undertaken by private sector *veterinarians* at the place of origin of the *commodities* when this practice is the subject of appropriate approval and authentication by the *Veterinary Authority*.

5) Situations may arise which result in changes to the consignee, identification of the means of transportation, or *border post* after a certificate is issued. Because these do not change the animal or public health status of the consignment, they should not prevent the acceptance of the certificate.

Article 5.1.3.

Responsibilities of the exporting country

1) An *exporting country* should, on request, supply the following to *importing countries*:
   a) information on the animal health situation and national animal health information systems to determine whether that country is free or has *zones* or *compartments* free from *listed diseases*, including the regulations and procedures in force to maintain its free status;
   b) regular and prompt information on the occurrence of *notifiable diseases*;
   c) details of the country's ability to apply measures to control and prevent the relevant *listed diseases*;
   d) information on the structure of the *Veterinary Services* and the authority which they exercise in accordance with Chapters 3.2. and 3.3.;
   e) technical information, particularly on biological tests and vaccines applied in all or part of the national territory.
2) *Veterinary Authorities* of *exporting countries* should:
   a) have official procedures for authorisation of certifying *veterinarians*, defining their functions and duties as well as conditions of oversight and accountability, including possible suspension and termination of the authorisation;
   b) ensure that the relevant instructions and training are provided to certifying *veterinarians*;
   c) monitor the activities of the certifying *veterinarians* to verify their integrity and impartiality.
3) The *Veterinary Authority* of the *exporting country* is ultimately accountable for veterinary certification used in *international trade*.

Article 5.1.4.

Responsibilities in case of an incident related to importation

1) *International trade* involves a continuing ethical responsibility. Therefore, if within the recognised *incubation periods* of the various diseases subsequent to an export taking place, the *Veterinary Authority* becomes aware of the appearance or reappearance of a disease which has been specifically included in the *international veterinary certificate*, there is an obligation for this *Authority* to notify the *importing country*, so that the imported *commodities* may be inspected or tested and appropriate action be taken to limit the spread of the disease should it have been inadvertently introduced.

2) If a disease condition appears in imported *commodities* within a time period after importation consistent with the recognised *incubation period* of the disease, the *Veterinary Authority* of the *exporting country* should be informed so as to enable an investigation to be made, since this may be the first available information on the occurrence of the disease in a previously free *herd* or *flock*. The *Veterinary Authority* of the *importing country* should be informed of the result of the investigation since the source of *infection* may not be in the *exporting country*.

3) In case of suspicion, on reasonable grounds, that an official certificate may be fraudulent, the *Veterinary Authorities* of the *importing country* and *exporting country* should conduct an investigation. Consideration should also be given to notifying any third country that may have been implicated. All associated consignments should be kept under official control, pending the outcome of the investigation. The *Veterinary Authorities* of all countries involved should fully cooperate with the investigation. If the certificate is found to be fraudulent, every effort should be made to identify those responsible so that appropriate action can be taken in accordance with the relevant legislation.

NB: FIRST ADOPTED IN 1982; MOST RECENT UPDATE ADOPTED IN 2024.

CHAPTER 3.3.4.

AVIAN INFLUENZA (INCLUDING INFECTION WITH HIGH PATHOGENICITY AVIAN INFLUENZA VIRUSES)

This is Exhibit "C" referred to in the affidavit of Katrina Jones sworn before me at Whitehorse this 30 day of January 20 25

SUMMARY

Influenza A is caused by specified viruses that are members of the family Orthomyxoviridae *and placed in the genus* Alphainfluenzavirus (Influenzavirus *A or influenza A virus). There are seven influenza genera but only influenza A viruses are known to infect birds. Diagnosis is by isolation of the virus or by detection and characterisation of fragments of its genome. This is because infections in birds can give rise to a wide variety of clinical signs that may vary according to the host, strain of virus, the host's immune status, presence of any secondary exacerbating organisms and environmental conditions.*

Detection of the agent: *Suspensions in antibiotic solution of oropharyngeal and cloacal swabs (or faeces) taken from live birds, or of faeces and pooled samples of organs from dead birds, are inoculated into the allantoic cavity of 9- to 11-day-old embryonated chicken eggs. The eggs are incubated at 37°C (range 35–39°C) for 2–7 days. The allantoic fluid of any eggs containing dead or dying embryos during the incubation and all eggs at the end of the incubation period are tested for the presence of haemagglutinating activity. The presence of influenza A virus can be confirmed by an immunodiffusion test between concentrated virus and an antiserum to the nucleoprotein and/or matrix antigens, both of which are common to all influenza A viruses, or by real-time reverse-transcription polymerase chain reaction (real-time RT-PCR) on the allantoic fluids. Isolation in embryos has largely been replaced for initial diagnosis by direct detection in samples, of one or more segments of the influenza A genome using real-time RT-PCR or other validated molecular techniques.*

For serological subtyping of the virus, a reference laboratory should conduct haemagglutination and neuraminidase inhibition tests against a battery of polyclonal or monospecific antisera to each of the 16 haemagglutinin (H1–16) and 9 neuraminidase (N1–9) subtypes of influenza A virus. Alternatively, the genome of specific H and N subtypes is identified using RNA detection technologies with subtype specific primers and probes (e.g. real-time RT-PCR) or sequencing and phylogenetic analysis.

As the general term 'highly pathogenic avian influenza' and the historical term 'fowl plague' refer to infection with high pathogenicity strains of influenza A virus, it is necessary to assess the pathogenicity of Influenza A virus isolates for domestic poultry. All naturally occurring high pathogenicity avian influenza (HPAI) strains isolated to date have been either of the H5 or H7 subtype, with a subset of H5 or H7 isolates being of low pathogenicity. The methods used for the determination of strain virulence for birds have evolved over recent years with a greater understanding of the molecular basis of pathogenicity. Regardless of their pathogenicity for chickens, H5 or H7 viruses with a HA0 cleavage site amino acid sequence similar to any of those that have been observed in high pathogenicity viruses are considered to be influenza A viruses with high pathogenicity. H5 and H7 isolates that are not highly pathogenic for chickens and do not have an HA0 cleavage site amino acid sequence similar to any of those that have been observed in highly pathogenic viruses are considered to have low pathogenicity. However in some circumstances it is necessary to verify high or low pathogenicity of a virus isolate using the intravenous inoculation of a minimum of eight susceptible 4- to 8-week-old chickens with infectious virus; strains are considered to be of high pathogenicity if they cause more than 75% mortality within 10 days, or inoculation of 10 susceptible 4- to 8-week-old chickens resulting in an intravenous pathogenicity index (IVPI) of greater than 1.2. Characterisation of suspected highly pathogenic strains of the virus should be conducted in a virus-secure biocontainment laboratory. Low pathogenicity avian influenza (LPAI) in poultry may be accompanied

by a sudden and unexpected increase in virulence (emerging disease) or have proven natural transmission to humans associated with severe consequences. In these disease scenarios there should be formal monitoring in relevant poultry populations by national authorities. The occurrence of H5 and H7 low pathogenicity avian influenza viruses should be monitored as some have the potential to mutate into high pathogenicity avian influenza viruses.

Serological tests: *As all influenza A viruses have antigenically similar nucleoprotein and matrix antigens, these are preferred targets of influenza A group serological methods. Enzyme-linked immunosorbent assays (ELISA) are widely used to detect antibodies to these antigens in either host species-dependent (indirect) or species-independent (competitive) test formats. Haemagglutination inhibition tests have also been employed in routine diagnostic serology, but it is possible that this technique may miss some particular infections because the haemagglutinin is subtype specific.*

Requirements for vaccines: *The first use of vaccination in an avian influenza eradication programme was against LPAI. The programmes used inactivated oil-emulsion vaccines with the same haemagglutinin and neuraminidase subtypes as the circulating field virus, and infected flocks were identified by detection of virus or antibodies against the virus in non-vaccinated sentinel birds. During the 1990s the prophylactic use of inactivated oil-emulsion vaccines was employed in Mexico and Pakistan to control widespread outbreaks of HPAI and H5/H7 LPAI. During the 1999–2001 outbreak of H7 LPAI in Italy, an inactivated vaccine was used with the same (i.e. homologous) haemagglutinin subtype to the field virus, but with a different (i.e. heterologous) neuraminidase. This allowed the serological differentiation of non-infected vaccinated birds from vaccinated birds infected with the field virus and ultimately resulted in eradication of the field virus. Prophylactic use of H5 and H7 vaccines has been practised in parts of Italy, aimed at preventing H5/H7 LPAI infections, and several countries in Asia, Africa and the Middle East as an aid in controlling HPAI, in China (People's Rep. of) for H7N9, and in Mexico for H7N3 HPAI virus infections. HPAI viruses should not be used as the seed virus for production of vaccine.*

If LPAI and HPAI viruses are used in challenge studies, an appropriate level of containment should be used as determined by risk assessment.

A. INTRODUCTION

Influenza in birds is caused by infection with viruses of the family *Orthomyxoviridae* placed in the genus *Alphainfluenzavirus* (*influenzavirus A* or influenza A virus) (International Committee on Taxonomy of Viruses (ICTV), 2019). Influenza A viruses are the only orthomyxoviruses known to naturally affect birds (Swayne & Sims, 2020). Many species of birds have been shown to be susceptible to infection with influenza A viruses; aquatic birds form a major reservoir of these viruses, and the overwhelming majority of isolates have been of low pathogenicity (low virulence) for chickens and turkeys. Influenza A viruses have antigenically related nucleoprotein and matrix proteins, but are classified into subtypes on the basis of their haemagglutinin (H) and neuraminidase (N) antigens (World Health Organization Expert Committee, 1980). At present, 16 H subtypes (H1–H16) and 9 N subtypes (N1–N9) are recognised with proposed new subtypes (H17, H18) for influenza A viruses from bats in Guatemala (ICTV 2019; Swayne *et al.*, 2020; Tong *et al.*, 2013). To date, naturally occurring high pathogenicity influenza A viruses that produce acute clinical disease in chickens, turkeys and other birds of economic importance have been associated only with the H5 and H7 subtypes. Low pathogenicity H5 and H7 occur widely in poultry and aquatic wild birds, although intercontinental spread of HPAI has received greater attention in recent years. There is the risk of a H5 or H7 virus of low pathogenicity (H5/H7 low pathogenicity avian influenza [LPAI]) becoming highly pathogenic by mutation. Some avian influenza virus strains have caused sporadic zoonotic infections principally of H5, H7 and H9 subtypes and these three subtypes have been highlighted as potential pandemic risks should additional mutations occur that support sustained human-to-human transmission (Cox *et al.*, 2017).

Throughout this chapter of the *Terrestrial Manual*, the following terms will be used: 1) HPAI as an infection by an avian influenza virus that meets the definition of high pathogenicity, 2) LPAI as an infection with any H1–H16 avian influenza virus that is not of high pathogenicity, and 3) influenza A as an infection with any HPAI or LPAI virus.

Depending on the species, age and type of bird, specific characteristics of the viral strain involved, and on environmental factors, the highly pathogenic disease, in fully susceptible birds, may vary from one of sudden death with no overt clinical signs, to a more characteristic disease with variable clinical presentations including respiratory signs, such as ocular and nasal discharges, coughing, snicking and dyspnoea, swelling of the sinuses and/or head,

apathy, reduced vocalisation, marked reduction in feed and water intake, cyanosis of the unfeathered skin, wattles and comb, incoordination and nervous signs and diarrhoea (Swayne *et al.*, 2020). In laying birds, additional clinical features include a marked drop in egg production, usually accompanied by an increase in numbers of poor quality eggs. Typically, high morbidity is accompanied by high and rapidly escalating unexplained mortality. However, none of these signs can be considered pathognomonic. In certain host species such as Pekin ducks (*Anas platyrhynchos domesticus*) some HPAI viruses do not necessarily produce significant clinical disease. In addition, LPAI viruses which normally cause only a mild or no clinical disease, may in certain circumstances produce a spectrum of clinical signs, the severity of which may approach that of HPAI, particularly if exacerbating infections and/or adverse environmental conditions are present. Confirmatory diagnosis of the disease, therefore, depends on the isolation or detection of the causal virus and the demonstration that it fulfils one of the defined criteria described in Section B.1.1.1. Testing sera from suspect birds using antibody detection methods may supplement diagnosis, but these methods are not suitable for a definitive identification. Diagnosis for official control purposes is established on the basis of agreed official criteria for pathogenicity according to *in-vivo* tests or to molecular determinants (i.e. the presence of a cleavage site of the haemagglutinin precursor protein HA0 consistent with HPAI virus) and haemagglutinin subtyping. These definitions evolve as scientific knowledge of the disease increases.

HPAI should be subject to official control by national authorities. In addition LPAI, particularly H5 and H7 subtypes, may be subject to national or state/provincial control. The viruses that cause influenza A have the potential to spread from the laboratory if adequate levels of biosecurity and biosafety are not in place. Avian influenza viruses should be handled with appropriate measures as described in Chapter 1.1.4 *Biosafety and biosecurity: Standard for managing biological risk in the veterinary laboratory and animal facilities*. Biocontainment measures should be determined by risk analysis as described in Chapter 1.1.4. The measures required may vary among the subtypes and pathotypes of influenza A viruses, with higher level containment being indicated for some LPAI and HPAI viruses, and may require additional procedural, equipment and facility enhancements under specific conditions such as high virus concentrations, housing infected animals or conducting procedures with aerosol generating activities. Countries lacking access to such a specialised national or regional laboratory should send specimens to a WOAH Reference Laboratory.

B. DIAGNOSTIC TECHNIQUES

Table 1. Test methods available for the diagnosis of avian influenza and their purpose

Method	Purpose					
	Population freedom from infection	Individual animal freedom from infection prior to movement	Contribute to eradication policies	Confirmation of clinical cases	Prevalence of infection – surveillance	Immune status in individual animals or populations post-vaccination
	Detection of the agent[a]					
Virus isolation	+	+++	+	+++	+	–
Antigen detection	+	+	+	+	+	–
Real-time RT-PCR	++	+++	++	+++	++	–

Method	Purpose					
	Population freedom from infection	Individual animal freedom from infection prior to movement	Contribute to eradication policies	Confirmation of clinical cases	Prevalence of infection – surveillance	Immune status in individual animals or populations post-vaccination
	Detection of immune response					
AGID	+ (Influenza A)	+ (Influenza A)	++ (Influenza A)	+ (convalescent)	++ (Influenza A)	++ (Influenza A)
HI	+++ (H5 or H7)	++ (H5 or H7)	+++ (H5 or H7)	++ (convalescent)	+++ (H5 or H7)	+++ (H5 or H7)
ELISA	+	+	++	+ (convalescent)	++	++

Key: +++ = recommended for this purpose; ++ recommended but has limitations;
+ = suitable in very limited circumstances; – = not appropriate for this purpose.
RT-PCR = reverse-transcription polymerase chain reaction; AGID = agar gel immunodiffusion;
HI = haemagglutination inhibition test; ELISA = enzyme-linked immunosorbent assay.
[a]A combination of agent identification methods applied on the same clinical sample is recommended.

1. Detection of the agent

Identification of influenza A viruses as the cause of infections and disease in poultry and other birds requires a thorough diagnostic investigation to differentiate from similar diseases caused by other viral agents especially avian paramyxovirus type 1 (APMV-1). Individual influenza A and APMV-1 virus isolates vary greatly in virulence, causing various syndromes evident as subclinical infections, drops in egg production, respiratory disease, and severe and high mortality disease. The latter clinical syndrome can be caused by either HPAI or Newcastle disease viruses. Therefore, it is judicious to have a single sampling procedure and simultaneously conduct specific differentiating diagnostic tests for both influenza A and APMV-1 viruses on field samples to obtain an accurate aetiological diagnosis of a single agent or, on occasion, confirmation of dual infection.

1.1. Samples for virus isolation

Virus isolation is the reference method but is laborious and time intensive, used primarily for diagnosis of a first clinical case in an outbreak and to obtain virus isolates for further laboratory analysis.

For investigations of severe disease and high mortality in poultry flocks, it is usual to attempt virus isolation from recently dead birds or moribund birds that have been killed humanely. Samples taken from dead birds should include intestinal contents (faeces) or cloacal swabs and oropharyngeal or tracheal swabs. Samples from trachea, lungs, air sacs, intestine, spleen, caecal tonsils, kidney, brain, liver and heart should also be collected and processed either separately or as a pool. When pooling samples the brain should be collected and processed first (to avoid cross contamination with other tissue types) and kept separate as presence of virus in the brain may be an indicator of HPAI or NDV. Further pools should be made consistent with known virus tropisms between HPAI and LPAI, i.e. grouped at the level of respiratory, systemic and gastrointestinal.

Samples from live birds should include both oropharyngeal or tracheal and cloacal swabs, the latter should be visibly coated with faecal material. To avoid harming them, swabbing of small delicate birds should be done with the use of especially small swabs that are usually commercially available and intended for use in human paediatrics or the collection of fresh faeces may serve as an adequate alternative (caution that some influenza A viruses and type 1 avian paramyxoviruses in birds can have a strong respiratory tropism). Similar swab samples can be pooled from the same anatomical site (i.e. cloacal swabs with cloacal swabs, oropharyngeal swabs with oropharyngeal swabs), and most commonly pooling of 5 or occasionally more, if appropriately validated not to reduce sensitivity of detection, but specific swab types should be used (Spackman *et al.*, 2013). Further the type of swabs used may affect test sensitivity or validity with thin wire or plastic shafted swabs preferred.

The samples should be placed in isotonic phosphate-buffered saline (PBS), pH 7.0–7.4 with antibiotics or a solution containing protein and antibiotics. The antibiotics can be varied according to local conditions, but could be, for example, penicillin (2000 units/ml), streptomycin (2 mg/ml), gentamycin (50 µg/ml) and mycostatin (1000 units/ml) for tissues and oropharyngeal or tracheal swabs, but at five-fold higher concentrations for faeces and cloacal swabs. It is important to re-adjust the pH of the solution to pH 7.0–7.4 following the addition of the antibiotics. It is recommended that a solution for transport of the swabs should contain protein to stabilise the virus (e.g. brain–heart infusion, up to 5% [v/v] cattle serum, 0.5% [w/v] bovine albumen or similar commercially available transport media). If control of *Chlamydophila* is desired, 0.05–0.1 mg/ml oxytetracycline should be included. Faeces and finely minced tissues should be prepared as 10–20% (w/v) suspensions in the antibiotic solution. Suspensions should be processed as soon as possible after incubation for 1–2 hours at room temperature. When immediate processing is impractical, samples may be stored at 4°C for up to 4 days. For prolonged storage, diagnostic samples and isolates should be kept at –80°C but for transport on dry ice (≤–50°C) is widely used. Repeated freezing and thawing should be avoided.

1.2. Virus isolation

The preferred method of growing influenza A viruses is by the inoculation of specific pathogen free (SPF) embryonated chicken eggs, or specific antibody negative (SAN) eggs. The supernatant fluids of faeces, swabs or tissue suspensions obtained through clarification by centrifugation at 1000 *g* for about 10 minutes at a temperature not exceeding 25°C. Clarified preparations can be inoculated using a number of routes including the amniotic sac, chorioallantoic sac or membrane (one of which is recommended for primary isolation) and in all cases allantoic sacs of three to five embryonated SPF or SAN chicken eggs of 9–11 days' incubation. The eggs are incubated at 37°C (range 35–39°C) for 2–7 days. Eggs containing dead or dying embryos as they arise, and all eggs remaining at the end of the incubation period, should first be chilled to 4°C for 4 hours or overnight. After checking that the embryos have died, the amnio-allantoic fluids should be recovered and tested with a screening test (such as haemagglutination [HA] test), influenza A type-specific test (such as agar gel immunodiffusion test [AGID] or solid-phase antigen-capture enzyme-linked immunosorbent assays [ELISA]) or influenza A subtype-specific test (such as haemagglutination inhibition [HI] and neuraminidase [N] inhibition [NI] tests) or a molecular test to detect influenza A specific nucleic acid signatures (such as real-time reverse transcription polymerase chain reaction [RT-PCR]) as described later (see Section B.1.2.2). Detection of HA activity, in bacteria-free amnio-allantoic fluids verified by microbiological assay, indicates a high probability of the presence of an influenza A virus or of an avian orthoavulavirus (formerly avian paramyxovirus). Fluids that give a negative reaction should be passaged into at least one further batch of eggs, and up to three passages.

Routine checks for bacterial contamination should be conducted by streaking samples in Luria Broth agar plates and reading these at 24 and 48 hours of incubation against a light source. BHI agar and blood agar plates may also be used. For larger numbers of sample initial culture could be in tryptose phosphate broth. Contaminated samples can be treated by incubation with increased antibiotic concentrations for 2–4 hours (gentamicin, penicillin g, and amphotericin b solutions at final concentrations to a maximum of 1 mg/ml, 10,000 U/ml, and 20 µg/ml, respectively). Samples heavily contaminated by bacteria that cannot be removed by centrifugation or controlled by antibiotics can be filtrated through 0.45 and 0.2 micron sterile filters. Filtration should be used only when other methods fail because aggregation may significantly reduce virus titre.

1.3. Virus identification

The presence of influenza A virus can be confirmed in AGID tests by demonstrating the presence of the nucleoprotein or matrix antigens, both of which are common to all influenza A viruses (see Section B.2.2). The antigens may be prepared by concentrating the virus from infective allantoic fluid or extracting the infected chorioallantoic membranes; these are tested against known positive antisera. Virus may be concentrated from infective allantoic fluid by ultracentrifugation, or by precipitation under acid conditions. The latter method consists of the addition of 1.0 M HCl to infective allantoic fluid until it is approximately pH 4.0. The mixture is placed in an ice bath for 1 hour and then clarified by centrifugation at 1000 *g* at 4°C. The supernatant fluid is discarded. The virus concentrates are resuspended in glycin/sarcosyl buffer: this consists of 1% (w/v) sodium lauroyl sarcosinate buffered to pH 9.0 with 0.5 M glycine. These concentrates contain both nucleoprotein and matrix polypeptides.

Preparations of nucleoprotein-rich antigen can also be obtained from chorioallantoic membranes for use in the AGID test (Beard, 1970). This method involves removal of the chorioallantoic membranes from infected eggs that have allantoic fluids with HA activity. The membranes are then homogenised or ground to a paste. This is subjected to three freeze–thaw cycles, followed by centrifugation at 1000 *g* for 10 minutes. The pellet is discarded and the supernatant is used as an antigen following treatment with 0.1% formalin or 1% betapropiolactone.

Use of the AGID test to demonstrate nucleoprotein or matrix antigens is a satisfactory way to indicate the presence of influenza A virus in amnioallantoic fluid, but lacks sensitivity compared to other methods including molecular (see Section 1.2.2) but various experimental and commercial rapid, solid-phase antigen-capture ELISAs (AC-ELISAs) are an effective alternative (Swayne *et al.*, 2020). Most AC-ELISAs have been approved and marketed to detect human influenza A virus in clinical specimens. Some have demonstrated effectiveness for detection of influenza A, but many of these commercial tests have had low sensitivity (Slomka *et al.*, 2012). Those validated for veterinary use are preferred.

Any HA activity of sterile fluids harvested from the inoculated eggs is most likely to be caused by an influenza A virus or an avian paramyxovirus, but a few strains of avian reovirus, as well as nonsterile fluid containing HA of bacterial origin can cause the agglutination of RBCs. There are currently 21 recognised serotypes of avian paramyxoviruses (ICTV, 2019). Most laboratories will have antiserum specific to Newcastle disease virus (avian paramyxovirus type 1, APMV1), and in view of its widespread occurrence and almost universal use as a live vaccine in poultry, it is best to evaluate its presence by haemagglutination inhibition (HI) tests (see Chapter 3.3.10 *Newcastle disease*).

Alternatively, the presence of influenza virus can be confirmed by the use of conventional RT-PCR or real-time RT-PCR using nucleoprotein-specific or matrix-specific conserved primers (Nagy *et al.*, 2020; Spackman *et al.*, 2002). Also, the presence of subtype H5 or H7 influenza virus can be confirmed by using H5- or H7-specific primers (Slomka *et al.*, 2007; Spackman *et al.*, 2002).

Antigenic subtyping can be accomplished by monospecific antisera prepared against purified or recombinant H and N subtype-specific proteins, used in HI and NI tests, or polyclonal antisera raised against a range of intact influenza viruses and used in HI and NI tests. For laboratories conducting the HI test to H subtype it is strongly recommended that two sera for each H subtype is used but with a heterologous N and should ideally use antisera to contemporary viruses relevant to the region in which the virus is detected. Subtyping can also be accomplished using H and N subtype specific primers in RT-PCR and real-time RT-PCR tests; or using sequence analysis of H and N genes. Subtype identification by these techniques is becoming increasingly common but is beyond the scope of many diagnostic laboratories not specialising in influenza viruses. Assistance is available from the WOAH Reference Laboratories and Collaborating Centres (see WOAH website for up-to-date list).

1.4. Assessment of pathogenicity

The term HPAI relates to the assessment of pathogenicity in chickens and implies the involvement of high pathogenicity strains of virus. It is used to describe a disease of fully susceptible chickens with clinical signs that may include one or more of the following: ocular and nasal discharges, coughing, snicking and dyspnoea, swelling of the sinuses and/or head, listlessness, reduced vocalisation, marked reduction in feed and water intake, cyanosis of the unfeathered skin, wattles and comb, incoordination, nervous signs and diarrhoea. In laying birds, additional clinical features include a marked drop in egg production usually accompanied by an increase in numbers of poor quality eggs. Typically, high morbidity is accompanied by high and rapidly escalating unexplained mortality. However, none of these signs can be considered pathognomonic and high mortality may occur in their absence. In addition, LPAI viruses that normally cause only mild or no clinical disease, may cause a much more severe disease if exacerbating infections or adverse environmental factors are present and, in certain circumstances, the spectrum of clinical signs may mimic HPAI.

The historical term 'fowl plague' has been abandoned in favour of the more accurate term HPAI. Because all naturally occurring HPAI viruses to date have been H5 and H7 subtypes and genomic studies have determined HPAI viruses arise by mutation of H5/H7 LPAI viruses, all H5/H7 LPAI viruses may potentially become HPAI but predicting which LPAI strains will mutate to HPAI is not possible. Pathogenicity shifts have been associated with changes to the proteolytic cleavage site of the haemagglutinin including: 1) substitutions of non-basic with basic amino acids (arginine or lysine); 2) insertions of multiple basic

amino acids from codons duplicated from the haemagglutinin cleavage site; 3) short inserts of basic and non-basic amino acids from unknown source; 4) recombination with inserts from other influenza A virus gene segments or avian host cellular genome (e.g. 28S rRNA) that lengthen the proteolytic cleavage site; and 5) loss of the shielding glycosylation site at residue 13 in combination with multiple basic amino acids at the cleavage site1. Amino acid sequencing of the cleavage sites of H5 and H7 subtype influenza A isolates of low pathogenicity for birds may identify viruses that have the capacity, following simple mutation, to have high pathogenicity for poultry.

The following criteria have been adopted by the WOAH for determining pathogenicity of an influenza A virus:

a) One of the two following methods to determine pathogenicity in chickens is used. A high pathogenicity influenza A virus is:

   i) any influenza A virus that is lethal[2] for six, seven or eight of eight 4- to 8-week-old susceptible chickens within 10 days following intravenous inoculation with 0.2 ml of a 1/10 dilution of a bacteria-free, infective allantoic fluid

   or

   ii) any influenza A virus that has an intravenous pathogenicity index (IVPI) greater than 1.2. The following is the IVPI procedure:

   - Fresh infective allantoicfluid, confirmed free from APMV-1 and other extraneous agents, with a HA titre >1/16 (>24 or >log2 4 when expressed as the reciprocal) is diluted 1/10 in sterile isotonic saline.
   - 0.1 ml of the diluted virus is injected intravenously into each of ten 4- to 8-week-old SAN susceptible chickens; if possible, SPF chickens should be used.
   - Birds are examined at 24-hour intervals for 10 days. At each observation, each bird is scored 0 if normal, 1 if sick, 2 if severely sick, 3 if dead. (The judgement of sick and severely sick birds is a subjective clinical assessment. Normally, 'sick' birds would show one of the following signs and 'severely sick' more than one of the following signs: respiratory involvement, depression, diarrhoea, cyanosis of the exposed skin or wattles, oedema of the face and/or head, nervous signs. Dead individuals must be scored as 3 at each of the remaining daily observations after death[3].)
   - The IVPI is the mean score per bird per observation over the 10-day period. An index of 3.00 means that all birds died within 24 hours, and an index of 0.00 means that no bird showed any clinical sign during the 10-day observation period.

b) For all H5 and H7 viruses of low pathogenicity in chickens, the amino acid sequence of the connecting peptide of the haemagglutinin molecule (HA0) (i.e. the cleavage site) must be determined. The presence of several basic amino acids, inserts of cellular or viral nucleic acids or loss of specific glycosylation sites in the HA0 cleavage site is the genotypic standard for HPAI strains; therefore, if the isolate being tested has an HA0 cleavage site motif identical to previous HPAI viruses, it should be designated as HPAI irrespective of a low or high pathogenicity determined by pathotyping in chickens (see the table that lists all the reported haemagglutinin proteolytic cleavage sites of HA0 protein for H5 and H7 LPAI and HPAI viruses based on deduced amino acid sequence, which can be found on the OFFLU site (see footnote 2). Furthermore any isolate with a new motif must be tested *in vivo* by IVPI. In case of difficulties in the interpretation of the cleavage site motif, WOAH and/or FAO reference laboratories should be consulted.

   The WOAH classification system to identify influenza A viruses for which disease notification and control measures should be taken is defined in the *Terrestrial Code*.

   A variety of strategies and techniques have been used successfully to sequence the nucleotides at that portion of the HA gene coding for the cleavage site region of the haemagglutinin of H5 and

1 https://www.offlu.org/
2 When birds are too sick to eat or drink, they should be killed humanely.
3 When birds are too sick to eat or drink, they should be killed humanely and scored as dead at the next observation.

H7 subtypes of avian influenza virus, enabling the amino acids there to be deduced. This can be done by RNA extraction from the sample and direct sequencing of the haemagglutinin proteolytic cleavage site. Various stages in the procedure can be facilitated using commercially available kits and automated sequencers.

Determination of the cleavage site by sequencing or other methods has become the method of choice for initial assessment of the pathogenicity of these viruses and has been incorporated into agreed definitions. This has reduced the number of *in-vivo* tests, although the initial Sanger sequencing result of a HA cleavage site for an H5 or H7 LPAI virus should be confirmed by either inoculation of birds or deep sequencing using high throughput sequencing with a minimum of 1000 reads to to exclude the presence of any HPAI virus.

Although all the truly HPAI viruses isolated to date have been of H5 or H7 subtypes, at least three isolates, all of H10 subtype (H10N1, H10N4 and H10N5), have been reported that would have fulfilled both the WOAH and EU *in-vivo* definitions for HPAI viruses (Bonfante *et al.*, 2014; Wood *et al.*, 1996) as they killed 6/10, 7/10 and 8/10 chickens with IVPI values >1.2 when the birds were inoculated intravenously. However, these viruses did not induce death or signs of disease when inoculated intranasally and did not have a haemagglutinin cleavage site sequence compatible with HPAI virus. Similarly, other intravenously inoculated influenza A viruses are nephrotropic and birds that die have high titres of virus in their kidneys indicating a renal pathogenic mechanism (Slemons & Swayne, 1990), but such laboratory-induced pathobiology is not comparable to multi-organ infection and systemic disease caused by HPAI viruses. An H4N2 virus isolated from quail had a multibasic cleavage site sequence (PEKRRTR/GLF) but with an IVPI value of 0.0 (Wong et al., 2014) suggesting the multibasic cleavage site in viruses other than H5 and H7 alone may not be sufficient for declaration of HPAI virus and the in-vivo test should be carried out. Conversely, four viruses (A/chicken/Pennsylvania/1/83 [H5N2] and A/goose/Guangdong/2/96 [H5N1], A/turkey/England/87-92BFC/91 [H5N1] or A/chicken/Texas/298313/04 [H5N2]) have been described that have HA0 cleavage sites containing multiple basic amino acids, but which show low pathogenicity (IVPI <1.2) when inoculated intravenously into 6-week-old chickens (Londt *et al.*, 2007).No single explanation including the presence of a glycosylation site masking the HA0 cleavage site was reported emphasising both intra-haemagglutinin and multigenic influences in rare circumstances upon phenotypic expression of high pathogenicity. The presence of high pathogenicity haemagglutinin cleavage site in H5 and H7 influenza A viruses necessitates declaration of high pathogenicity to facilitate immediate control of the disease, otherwise a delay to complete *in-vivo* testing may result in continued onward transmission and spread between premises with severe consequence for future eradication once confirmed as a HPAI virus.

A table is available on the OFFLU website that lists all the reported haemagglutinin proteolytic cleavage site of HA0 protein for H5 and H7 LPAI and HPAI viruses based on deduced amino acid sequence. This table will be updated as new viruses are characterised; it can be found on the OFFLU site (see footnote 2).

1.5. Antigen capture and molecular techniques

At present, conventional virus isolation and characterisation techniques for the diagnosis of influenza A viruses remain a key method, for initial diagnosis of influenza A infection in a primary disease event and to provide virus for more detailed analyses including *in-vivo* testing and gene sequencing. Further they may be invaluable in confirming or disproving the presence of infectious virus when other test results Including conventional and real-time RT-PCR are all weakly positive. However, conventional methods tend to be costly, labour intensive and slow. There have been enormous developments and improvements in molecular and other diagnostic techniques, many of which are now routinely applied as a first choice for the diagnosis of influenza A infections.

1.5.1. Antigen detection

There are several commercially available AC-ELISA kits that can detect the presence of influenza A viruses in poultry (Swayne *et al.*, 2020). Most of the kits are enzyme immunoassays or are based on immunochromatography (lateral flow devices) and use a monoclonal antibody against the nucleoprotein; they should be able to detect any influenza A virus. The main advantage of these tests is that they can demonstrate the presence of influenza A within 15 minutes. The disadvantages are that they may lack sensitivity, they may not have been validated for different

species of birds, H and N subtype identification is not achieved and the kits are expensive. The tests should only be interpreted on a flock basis and not as an individual bird test. Oropharyngeal or tracheal samples from clinically affected or dead birds provide the best sensitivity. Nevertheless, the lack of sensitivity is a major drawback to the use of available antigen detection tests. Test sensitivities may vary between cloacal and tracheal swabs, whilst the tests can perform less well with samples from waterfowl or wild birds compared with chickens. Improved but moderate sensitivity in so named lateral flow devices was reported when using samples of feather follicles from birds infected with HPAI (Slomka *et al.*, 2012). Because of low sensitivity, antigen detection is mainly used for field screening of high mortality clinical cases for suspected influenza A virus infections followed by confirmation of results using a more sensitive laboratory-based test.

1.5.2. Direct RNA detection

As demonstrated by the current definitions of HPAI, molecular techniques are used preferentially for diagnosis for some time now. Furthermore, there have recently been developments towards their application to the detection and characterisation of influenza A viruses directly from clinical specimens of infected birds. It is imperative that when using highly sensitive molecular detection methods that allow rapid direct detection of viral RNA for confirmatory laboratory diagnosis of influenza A infections, stringent protocols are in place to prevent the risk of cross-contamination between clinical samples. In addition, RNA detection test methodologies should be validated to the WOAH standard (see Chapter 1.1.6 *Validation of diagnostic assays for infectious diseases of terrestrial animals*) using clinical material to demonstrate the tests as being 'fit for purpose' for application in a field diagnostic setting, which may include the use of internal test standards. The control reactions enable greater confidence in the integrity of the molecular reactions, clinical samples and results.

Furthermore, these evaluations enable the appropriate setting of test thresholds for interpretation between positive and negative samples. The increased sensitivity of real-time RT-PCR leads to the detection of viral RNA in samples in the absence of infectious virus and care should be taken when interpreting outputs with small detection limits that may not be indicative of active infection. This problem can be overcome, through the testing of multiple samples from the same cohort of infected birds, especially relevant when testing samples from domestic poultry for disease investigation.

In settings with more limited facilities, RT-PCR techniques on clinical samples can, with the correctly defined primers, result in rapid detection and subtype identification (at least of H5, H7 and H9 subtypes, and more recently developed assays are also available for other subtypes), including a cDNA product that can be used for nucleotide sequencing However, these approaches have now been largely replaced by the preferred molecular detection tests for influenza A virus by real-time RT-PCR, a modification to the RT-PCR that reduces the time for both identification of virus subtype and sequencing. For example, Spackman *et al.* (2002) used a single-step real-time RT-PCR primer/fluorogenic hydrolysis probe system to allow detection of influenza A viruses and determination of subtype H5 or H7. The test performed well relative to virus isolation and offered a cheaper and much more rapid alternative, with diagnosis on clinical samples in less than 3 hours. In additional studies, the real-time RT-PCR was shown to have sensitivity and specificity equivalent to virus isolation in numerous settings but updates to primer/probe design can be beneficial over time to accommodate genetic evolution in gene regions targeted by assays (Laconi *et al.*, 2020). These tests provide high sensitivity and specificity similar to those of virus isolation when used on tracheal and oropharyngeal swabs of chickens and turkeys, but may lack sensitivity for detection of influenza A virus in faecal swabs, faeces and tissues in some bird species, because of the presence of PCR inhibitors resulting in false-negative results (Das *et al.*, 2006). Incorporation of a positive internal control into the test will verify a proper test run. In addition, improvements in RNA extraction methods have been developed to eliminate most PCR inhibitors from test samples.

Real-time RT-PCR, usually based around the hydrolysis probe method for generation of the target-specific fluorescence signal, has become the method of choice in many laboratories for at least partial diagnosis directly from clinical specimens. The method offers rapid results, with sensitivity and specificity comparable to virus isolation. These are ideal qualities for influenza A outbreak management, where the period of time in which an unequivocal diagnosis can be obtained is crucial for decision making by the relevant Veterinary Authority. In addition, real-time

RT-PCR systems can be designed to operate in a 96-well format and combined with high-throughput robotic RNA extraction from specimens (Aguero *et al.*, 2007).

The approach to diagnosis using real-time RT-PCR adopted in most laboratories has been based on initial generic detection of influenza A virus in clinical samples, primarily by initially targeting the matrix (M) gene, which is highly conserved for all influenza A viruses, followed by specific real-time RT-PCR testing for H5 and H7 subtype viruses. Numerous assays have been reported for highly sensitive detection of M (or NP) gene fulfilling the criteria for a suitable screening test. For subtype identification, primers used in real-time RT-PCR are targeted at the HA2 region, as this is relatively well conserved within the haemagglutinin genes of the H5 and H7 subtypes (Spackman *et al.*, 2008; Spackman & Suarez, 2008). It has therefore served as the target region for these subtypes. Spackman *et al.* (2002) demonstrated specific detection of these subtypes, but cautioned that their H5 and H7 primer/probe sequences had been designed for the detection of North American H5 and H7 isolates and might not be suitable for all H5 and H7 isolates. This proved to be the case. Slomka *et al.* (2007) described modification of the H5 oligonucleotide sequences used by Spackman *et al.* (2002) to enable the detection of the Eurasian 'Goose/Guangdong lineage' (Gs/GD) H5N1 subtype and other Eurasian H5 subtypes that have been isolated within the past 15 years in both poultry and wild birds. As the group of 'Gs/GD' viruses diversified and spread across several continents it has become important that diagnostics in all settings have proven fit for purpose detection of this H5 lineage of viruses divided into multiple clades (World Health Organization/World Organisation for Animal Health/Food and Agriculture Organization & H5N1 Evolution Working Group, 2014). Newer rapid methods have been developed that enable simultaneous detection and subtyping speeding the time to achieve rapid identification of an influenza A virus using arrays (Hoffmann *et al.*, 2016) or microchip (Kwon *et al.*, 2019) technologies. The validated Eurasian real-time RT-PCR have proven valuable in the investigation of many H5Nx HPAI clinical samples and other subtypes submitted to International Reference Laboratories from Europe, Africa, Asia and North America since 2005 (Liu *et al.*, 2018; Slomka *et al.*, 2007). Each set of primers and probes needs to be validated against a diverse set of viruses to make the test applicable in a diverse range of avian species, and in viruses from broad geographic areas and time periods. In addition, real-time RT-PCR methods are now widely used for the rapid and accurate determination of the neuraminidase subtype (James *et al.*, 2018)

One of the problems with rapidly emerging new tests is that methods and protocols may be developed and reported without the test being properly validated. This has been addressed for some of the real-time RT-PCR protocols. In the European Union, National Reference Laboratories have collaborated to define and validate protocols that can be recommended for use within Europe (Hoffmann *et al.*, 2016; Nagy *et al.*, 2020; Slomka *et al.* 2007). Importantly this should include routine analysis of detected viruses (coordinated through WOAH Reference Laboratories) in standard assays to ensure reliable specific detection of contemporary viruses affecting poultry and other populations. In addition, given the high variability in the influenza A genome it is imperative that assays used in routine diagnosis and surveillance have ongoing demonstration of their fitness for detection of contemporary viruses validated for use in the region where they are applied. There should be an appropriate match for local strains taking account of significant regional and intercontinental variability amongst particular endemic viruses. Laconi *et al.* (2020) in reviewing five validated well used real-time RT-PCR methods concluded that continuous monitoring of assay performance using both in silico and *in-vitro* methodology was important as the emergence of new strains containing mutations within primer and probe binding areas might significantly affect the positive outcome of a test. Increasingly with improvements in assay design and using novel biochemical approaches screening assays relevant to all influenza A viruses from all hosts (animal and human) have been developed (Nagy *et al.*, 2020) with high relevance to an avian–'other' host interface.

Real-time RT-PCR protocols have been described that amplify regions across the cleavage site of the HA0 gene. This may result in useful tests for specific viruses. For example, Hoffman *et al.* (2007) have described a real-time RT-PCR test specific to the Eurasian HPAI H5N1 Qinghai-like clade 2.2 viruses that represents a rapid means of determining the pathotype for this subgroup of H5N1 HPAI viruses without sequencing. In situations where large numbers of positive samples/cases are detected during disease events, specific targeted real-time RT-PCR assays have been developed for the simultaneous sensitive detection and pathotyping of viruses. This can prove to be very useful, particularly when applying to early warning systems such as

surveillance of wild bird populations for local presence of HPAI (Graaf *et al.*, 2017; Naguib *et al.*, 2017).

Modifications to the straightforward RT-PCR method of detection of viral RNA have been designed to reduce the effect of inhibitory substances in the sample taken, the possibility of contaminating nucleic acids and the time taken to produce a result. The loop-mediated isothermal amplification (LAMP) system for H5 and H7 detection appears to show high sensitivity and reliable specificity (Ahn *et al.*, 2019; Bao *et al.*, 2014), but may have limited application because of susceptibility to viral mutations affecting the target regions, reducing virus detection (Postel *et al.*, 2010).

Increasing innovation and technological improvements have made it possible that molecular based and improved antigen detection technologies have developed sufficiently to permit rapid flock side tests for the detection of presence of influenza A virus specific subtypes and pathogenicity markers (Inui *et al.*, 2019). Furthermore, innovations in test design have enabled for example the development of point of care chip based ultrafast PCR approaches (Kwon *et al.*, 2018) with increasing application anticipated in the future.

1.5.3. Gene sequencing

Currently real-time RT-PCR is the preferred method of virus surveillance because the test provides rapid sensitive diagnostics for influenza H5, H7 and H9 and is available in high throughputs. However, greater use of sequencing technologies particularly as unit costs reduce with improvement in technology, offer powerful opportunities to simultaneously detect and sequence from clinical samples in a laboratory or field setting, for example applying nanopore technology (King *et al.*, 2020).

Increasingly gene sequencing is being applied not only to detailed characterisation of viruses for use in molecular epidemiology but also in virus subtyping and defining markers for host range including zoonotic risk. Sanger sequencing methodology has been widely used for decades and enables the rapid determination of typically a single (H) target gene in 24-36 hours to define virus pathogenicity (see Section B.1.1.1) and still has widespread utility. However, as genomic data can be rapidly determined using next generation sequencing technology it enables a broader analysis using a range of bioinformatics tools (Zhang *et al.*, 2017). For example, with the advent of greater access to sequencing methodology either through specialised laboratories or commercial providers it is now possible to determine the genomic sequences of influenza A viruses from birds to provide a level of characterisation important in rapid pathogen identification and outbreak intervention. Conventionally nucleotide sequences have been used in outbreak epidemiology to infer virus origin and precise relationships between different viruses associated within the same event (by phylogeny) to support outbreak management. Virus gene sequences of haemagglutinin and neuraminidase can rapidly be compared to known sequences of all subtypes in gene databases and used to reveal closest match thereby identifying the virus subtype and phylogenetic relationships. This often avoids the need to culture the virus for rapid identification although reliability and quality of data reduces with increasing cycle threshold values in samples from real-time RT-PCR testing.

Increasingly such analyses are now being applied at the whole genome level to reveal virus genotypes and provide greater analytical specificity to the analyses. Such approaches are especially valuable to track since virus evolution which can be more precisely mapped including change through genetic reassortment, a key mechanism associated with virus diversity and fitness for birds. This approach is especially valuable for early or first incursions in a new event as it enables greater precision in determining virus origin and the mechanisms leading to the emergence of virus. This has become increasingly important in characterising the rapid evolution and wide diversity of Gs/GD lineage viruses associated with transcontinental spread. Translation of nucleotide sequences of all genomic segments into amino acid sequences enables data mining for other virus characteristics or traits such as tropism, host range markers including zoonotic and predicted antiviral drug susceptibility which are invaluable for informing outbreak management.

2. Serological tests

2.1. Enzyme-linked immunoassay (ELISA)

Commercial ELISA kits that detect antibodies against the nucleoprotein are available. Kits with an indirect and competitive/blocking format have been developed and validated, and are now being used to detect influenza A virus-specific antibodies. Several avian influenza competitive ELISA (AIV C-ELISA) or blocking ELISA (AIV B-ELISA) have been developed and validated as a more sensitive alternative to the AGID test for the detection of influenza A group reactive antibodies in sera from chickens and other bird species (SCAHLS, 2009). This AIV ELISA platform, as either a "competitive" or "blocking" format, detects antibodies to influenza A viruses by allowing these antibodies to compete for antigen binding sites with a monoclonal antibody against an epitope on the nucleoprotein that is conserved in all influenza A viruses.

The kits should be validated for the specific species of interest and for the specific purpose(s) for which they are to be used. Several different test and antigen preparation methods are used. Such tests have usually been evaluated and validated by the manufacturer, and it is therefore important that the instructions specified for their use be followed carefully. Please see the WOAH Register for kits certified by the WOAH[4]. ELISA kits are of moderate cost and are amenable to high throughput screening for influenza A virus infections and have strong utility for application to large-scale serosurveillance programmes and compare favourably to HI (Arnold *et al.*, 2018). However, all positive results must be followed by HI test for subtyping to H5 and H7. Some subtype-specific ELISA kits are available, e.g. for antibodies to H5, H7, H9 and some N subtypes i.e. N1 but generally are of lower sensitivity than influenza A ELISA.

2.2. Agar gel immunodiffusion

All influenza A viruses have antigenically similar nucleoprotein and antigenically similar matrix antigens. Owing to this fact AGID tests are able to detect the presence or absence of antibodies to any influenza A virus. Concentrated virus preparations, as described above, contain both matrix and nucleoprotein antigens; the matrix antigen diffuses more rapidly than the nucleoprotein antigen. AGID tests have been widely and routinely used to detect specific antibodies in chicken and turkey flocks as an indication of infection, but AGID tests are less reliable at detecting antibodies following infection with influenza A viruses in other avian species. These have generally employed nucleoprotein-enriched preparations made from the chorioallantoic membranes of embryonated chicken eggs (Beard, 1970) that have been infected at 10 days of age, homogenised, freeze–thawed three times, and centrifuged at 1000 ***g***. The supernatant fluids are inactivated by the addition of 0.1% formalin or 1% betapropiolactone, recentrifuged and used as antigen. Not all avian species may produce precipitating antibodies following infection with influenza viruses, for example ducks. The AGID is a low-cost serological screening test of reduced sensitivity for detection of generic influenza A infections, but must be followed by HI tests for subtyping influenza A positives as to H5 and H7.

Tests are usually carried out using gels of 1% (w/v) agarose or purified type II agar and 8% (w/v) NaCl in 0.01 M phosphate buffer, pH 7.2, poured to a thickness of 2–3 mm in Petri dishes or on microscope slides, and incubated in a humidified chamber. Using a template and cutter, wells of approximately 5 mm in diameter are cut into the agar at a distance of about 3 mm from each other. A pattern of wells must place each suspect serum adjacent to a known positive serum and antigen. Each well should have reagent added to fill the well, corresponding to the top of the meniscus with the top of the gel, but do not over fill. Approximately 25–30 µl of each reagent should be required per well, but this depends on thickness of the gel, with thicker gels requiring an additional volume of reagent.

Wells should be examined for precipitin lines at 24 hours, and weak positive samples or samples for which specific lines have not formed should be incubated longer and examined again at 48 hours. The time to formation of visible precipitin line is dependent on the concentrations of the antibody and the antigen. The precipitin lines are best observed against a dark background that is illuminated from behind. A specific, positive result is recorded when the precipitin line between the known positive control wells is

4 https://www.woah.org/en/what-we-offer/veterinary-products/#ui-id-5/

continuous with the line between the antigen and the test well. Crossed lines are interpreted to be caused by the test serum lacking identity with the antibodies in the positive control well.

Whilst the AGID is relatively inexpensive and suitable for resource limited settings it is being increasingly replaced by other platforms such as ELISA for flock level serological investigations including pre export/import screening of birds for historical exposure to influenza A.

2.3. Haemagglutination and haemagglutination inhibition tests

Variations in the procedures for HA and HI tests are practised in different laboratories. The following recommended examples apply to the use of V-bottomed microwell plastic plates in which the final volume for both types of test is 0.075 ml. U- bottomed plates can be used but care in reading is required as the clarity is less defined. The reagents required for these tests are isotonic PBS (0.01 M), pH 7.0–7.4, and red blood cells (RBCs) taken from a minimum of three SPF or SAN chickens and pooled into an equal volume of Alsever's solution. Cells should be washed three times in PBS before use as a 1% (packed cell v/v) suspension. Positive and negative control antigens and antisera should be run with each test, as appropriate.

2.3.1. Haemagglutination test

i) Dispense 0.025 ml of PBS into each well of a plastic V-bottomed microtitre plate.

ii) Place 0.025 ml of virus suspension (i.e. infective allantoic fluid) in the first well. For accurate determination of the HA content, this should be done from a close range of an initial series of dilutions, i.e. 1/3, 1/4, 1/5, 1/6, etc.

iii) Make twofold dilutions of 0.025 ml volumes of the virus suspension across the plate.

iv) Dispense a further 0.025 ml of PBS to each well.

v) Dispense 0.025 ml of 1% (v/v) chicken RBCs to each well.

vi) Mix by tapping the plate gently and then allow the RBCs to settle for about 40 minutes at room temperature, i.e. about 20°C, or for 60 minutes at 4°C, if ambient temperatures are high, by which time control RBCs should have formed a distinct button.

vii) HA is determined by tilting the plate and observing the presence or absence of tear-shaped streaming of the RBCs. The titration should be read to the highest dilution giving complete HA (no streaming); this represents 1 HA unit (HAU) and can be calculated accurately from the initial range of dilutions.

2.3.2. Haemagglutination inhibition test

i) Dispense 0.025 ml of PBS into each well of a plastic V-bottomed microtitre plate.

ii) Place 0.025 ml of serum into the first well of the plate.

iii) Make twofold dilutions of 0.025 ml volumes of the serum across the plate.

iv) Add 4 HAU of virus/antigen in 0.025 ml to each well and leave for a minimum of 30 minutes at room temperature (i.e. about 20°C) or 60 minutes at 4°C.

v) Add 0.025 ml of 1% (v/v) chicken RBCs to each well and mix gently, allow the RBCs to settle for about 40 minutes at room temperature, i.e. about 20°C, or for 60 minutes at 4°C if ambient temperatures are high, by which time control RBCs should have formed a distinct button.

vi) The HI titre is the highest dilution of serum causing complete inhibition of 4 HAU of antigen. The agglutination is assessed by tilting the plates. Only those wells in which the RBCs stream at the same rate as the control wells (containing 0.025 ml RBCs and 0.05 ml PBS only) should be considered to show inhibition.

vii) The validity of results should be assessed against a negative control serum, which should not give a titre >1/4 ($>2^2$ or $>\log_2 2$ when expressed as the reciprocal), and a positive control serum for which the titre should be within one dilution of the known titre.

The HI test is primarily used to determine if antibodies indicating influenza A virus infections are subtyped as H5 and H7 or other H subtypes (H1-4, H6, H8-16). HI titres may be regarded as being positive if there is inhibition at a serum dilution of 1/16 (2^4 or $\log_2$ 4 when expressed as the reciprocal) or more against 4 HAU of antigen. Some laboratories prefer to use 8 HAU in HI tests. While this is permissible, it affects the interpretation of results so that a positive titre is 1/8 (2^3 or $\log_2$ 3) or more. The meaning of a minimum positive titre should not be misinterpreted; it does not imply, for example, that immunised birds with that titre will be protected against challenge or that birds with lower titres will be susceptible to challenge. Appropriate virus/antigen control, positive control serum and RBC control well should be included with each batch of HI tests.

Chicken sera rarely give nonspecific positive agglutination reactions in this test and any pretreatment of the sera is unnecessary. Sera from species other than chickens may sometimes cause agglutination of chicken RBCs resulting in nonspecific agglutination. Therefore, each serum should first be tested for this idiosyncrasy and, if present, it should be inhibited by adsorption of the serum with chicken RBCs. This is done by adding 0.025 ml of packed chicken RBCs to each 0.5 ml of antisera, mixing gently and leaving for at least 30 minutes; the RBCs are then pelleted by centrifugation at 800 *g* for 2–5 minutes and the adsorbed sera are decanted. Alternatively, RBCs of the avian species under investigation could be used. Nonspecific inhibition of agglutination can be caused by steric inhibition when the tested serum contains antibodies against the same N subtype as the H antigen used in the HI test. The steric inhibition reaction can result in RBC buttoning in the bottom of the plate or streaming at the same rate as the control. If using whole virus antigen in HI test for subtyping, it is important to ensure that two antigens for each haemagglutinin subtype are used with heterologous neuraminidase i.e. H5N1 and H5N6 to eliminate the possibility of interference in the assay with anti N antibodies that can lead to false typing results. Alternatively the H antigen used can be recombinant or purified H protein that lacks N protein. The HI test is based on antigenic binding between the H antigen and antisera and thus other factors may cause nonspecific binding of the H antigen and sera leading to a nonspecific inhibition reaction. At this time there are no documented cross reactions or nonspecific inhibition reactions between the different haemagglutinin subtypes of influenza A.

2.4. Neuraminidase inhibition test

The neuraminidase-inhibition test has been used to identify the influenza A neuraminidase type of isolates as well as to characterise the antibody in infected birds. The procedure requires specialised expertise and reagents; consequently, this testing is usually done in a WOAH Reference Laboratory. The DIVA (differentiating infected from vaccinated animals) strategy used previously in Italy also relies on a serological test to detect specific anti-N antibodies; the test procedure has been described (Capua *et al.*, 2003).

C. REQUIREMENTS FOR VACCINES

1. Background

Vaccination alone is not the solution to the control of HPAI if eradication is the desired result. Without the application of monitoring systems, strict biosecurity and depopulation in the face of infection, HPAI will become endemic in vaccinated poultry populations. Long-term circulation of the virus in a vaccinated population may result in both antigenic and genetic changes as has occurred with H5Nx (Gs/GD lineage), H7N3, H7N9 and H9N2 influenza A viruses in Mexico, and various Middle Eastern and Asian countries (Swayne & Sims, 2020). Currently used vaccines and the use of vaccination have been reviewed (FAO, 2016; Swayne & Sims, 2020). The haemagglutinin is the primary influenza A viral protein that elicits a protective immune response used in officially approved poultry vaccines and such immunity is haemagglutinin subtype specific.

To date, the majority of influenza A vaccines used in poultry have been inactivated whole virus vaccines prepared from infective allantoic fluid of embryonated chicken eggs, inactivated by beta-propiolactone or formalin and emulsified with mineral oil adjuvants. Because of the potential for reassortment leading to increased virulence, live conventional influenza vaccines against any subtype are not recommended. However, biotechnology holds great potential to generate live avian influenza virus vaccines with altered gene segments which reduce the risk of reassortment, limit replication and abrogate negative aspects of live influenza A virus vaccines (Song *et al.*, 2007). The existence of a large number of haemagglutinin subtypes (i.e. H1–16), together with the known variation of different strains within a subtype, pose serious problems when selecting strains to produce inactivated influenza A

vaccines. In addition, some isolates do not grow to a sufficiently high titre to produce adequately potent vaccines without costly pre-concentration. While some vaccination strategies use autogenous vaccines, i.e. vaccines prepared from isolates specifically involved in an epizootic, others rely on vaccines prepared from biologically characterised, fully approved seed strain viruses possessing the same haemagglutinin subtype as the field virus and capable of yielding high concentrations of antigen. Historically, inactivated vaccines for LPAI and HPAI control have used LPAI viruses with a matching haemagglutinin subtype from outbreaks as seed strains, but with development of resistance in the field associated with prolonged vaccine use, the majority of inactivated vaccine seed strains are now reverse genetic derived virus with antigenically close matching haemagglutinin, and sometimes neuraminidase, to circulating field viruses. Use of HPAI viruses as inactivated vaccine seed strains is strongly discouraged because of biosafety concerns.

Since the 1970s in the USA, inactivated influenza A vaccines have been used primarily in turkeys against LPAI viruses under emergency vaccination programs, but since the 2000s, most vaccines have been against H1 and H3 swine influenza A viruses used under a routine preventative vaccination program in breeder turkeys (Swayne *et al.*, 2020). Since the early 1990s, vaccination against H9N2 LPAI virus has been used extensively in Asia and the Middle East using billions of inactivated vaccine doses (Swayne & Sims, 2020). Vaccination against HPAI was first used in Mexico during the H5N2 outbreaks of 1994–1995 (Villarreal, 2007), and in Pakistan (Naeem, 1998) during the H7N3 outbreaks of 1995. Beginning with H5N1 goose/Guangdong (Gs/GD) lineage HPAI outbreaks in Hong Kong in 2002 (Sims, 2003), a vaccination policy was adopted using H5N2 LPAI vaccine seed strains and subsequently replaced with H5Nx reverse genetic vaccine seed strains, as the field virus spread throughout and outside of China Between 2002 and 2010, 113 billion doses of vaccine was used to control HPAI with 95% being inactivated and 5% recombinant vaccines, and a similar usage rate continues (Swayne *et al.*, 2011; Swayne & Sims, 2020). As the H5Nx Gs/GD lineage HPAI spread across the global, additional countries have implemented emergency and/or preventative vaccination programs for HPAI control. Similarly, preventive vaccination against H5N1 HPAI has been permitted for outdoor poultry and zoo birds in several European Union countries in in the 2000s.

Live recombinant virus-vectored vaccines with H5 influenza A virus haemagglutinin gene inserts have been approved and used in a few countries since 1997, mostly in chickens, and include recombinant fowl poxvirus (rFPV), recombinant Newcastle disease virus (rNDV) and recombinant herpesvirus turkey vaccines (rHVT). Since 2015, non-replicating, haemagglutinin based H5 RNA particle, H5 expressed baculovirus and H5 DNA vaccines have been approved for poultry but have had limited use (Swayne & Sims, 2020).

1.1. Rationale and intended use of the product

Experimental work has shown, for HPAI and LPAI, that potent and properly administered vaccines increase resistance to, or prevent infection, protect against clinical signs and mortality, prevent drops in egg production, reduce virus shedding from respiratory and intestinal tracts, protect from diverse field viruses within the same haemagglutinin subtype, protect from low and high challenge exposure, and reduce excretion and thus prevent contact transmission of challenge virus (Capua *et al.*, 2004; Swayne & Sims, 2020). Although, in experimental vaccination studies, a challenge virus is still able to infect and replicate in clinically healthy vaccinated SPF birds when exposed to high doses, the quantities shed may be insufficient for onward transmission of the virus (Van der Goot et al., 2005). Most of the work evaluating vaccines has been done in chickens and turkeys and some care must be taken in extrapolating the results obtained to other species. Most national HPAI and LPAI control regulations reserve the right to use vaccines in emergencies.

2. Outline of production and minimum requirements for conventional vaccines

The information below is based primarily on the experiences in the USA and the guidance and policy for regulatory approval of influenza A vaccines in that country (United States Department of Agriculture, 1995 [updated 2006]). The basic principles for producing vaccines, particularly inactivated vaccines, are common to several viruses e.g. Newcastle disease (chapter 3.3.10).

Guidelines for the production of veterinary vaccines are given in Chapter 1.1.8 *Principles of veterinary vaccine production*. The guidelines given here and in chapter 1.1.8 are intended to be general in nature and may be supplemented by national and regional requirements.

The vaccine production facility should operate under the appropriate biosecurity procedures and practices. If HPAI virus is to be used in challenge studies, the facility used for such studies should meet the competent veterinary authority within the country minimum requirements for Containment Group 3 pathogens as outlined in chapter 1.1.4.

2.1. Characteristics of the seed

2.1.1. Biological characteristics

For any subtype, only well characterised influenza A virus of proven low pathogenicity, preferably obtained from an international or national repository, should be used to establish a master seed for inactivated vaccines. HPAI viruses should not be used as seed virus for vaccine. For HPAI, reverse genetic produced vaccine seed strains based on haemagglutinin gene of the HPAI virus are preferred, but should have the cleavage site sequence altered to that of a H5/H7 LPAI virus.

A master seed is established from which a working seed is obtained. The master seed and working seed are produced in SPF or SAN embryonated eggs. The establishment of a master culture may only involve producing a large volume of infective allantoic fluid (minimum 100 ml), which can be stored as lyophilised aliquots (0.5 ml).

2.1.2. Quality criteria (sterility, purity, freedom from extraneous agents)

The established master seed should be controlled/examined for sterility, safety, potency and absence of specified extraneous agents.

2.2. Method of manufacture

2.2.1. Procedure

For vaccine production, a working seed, from which batches of vaccine are produced, is first established in SPF or SAN embryonated eggs by expansion of an aliquot of master seed to a sufficient volume to allow vaccine production for 12–18 months. It is best to store the working seed in liquid form at below –60°C as lyophilised virus does not always multiply to high titre on subsequent first passage.

The routine procedure is to dilute the working seed in sterile isotonic buffer (e.g. PBS, pH 7.2), so that about 10^3–10^4 EID_{50} in 0.1 ml are inoculated into each allantoic cavity of 9- to 11-day-old embryonated SPF or SAN chicken eggs. These are then incubated at 37°C. Eggs containing embryos that die within 24 hours should be discarded. The incubation time will depend on the virus strain being used and will be predetermined to ensure maximum yield with the minimum number of embryo deaths.

The infected eggs should be chilled at 4°C before being harvested. The tops of the eggs are removed and the allantoic fluids collected by suction. The inclusion of any yolk material and albumin should be avoided. All fluids should be stored immediately at 4°C and tested for bacterial contamination.

In the manufacture of inactivated vaccines, the harvested allantoic fluid is treated with either formaldehyde (a typical final concentration is 1/1000, i.e. 0.1% formalin) or beta-propiolactone (BPL) (a typical final concentration is 1/1000–1/4000, i.e. 0.1–0.025% of 99% pure BPL). The time required must be sufficient to ensure freedom from live virus. Most inactivated vaccines are formulated with non-concentrated inactivated allantoic fluid (active ingredient). However, active ingredients may be concentrated for easier storage of antigen. The active ingredient is usually emulsified with mineral or vegetable oil and surfactants. The exact formulations are generally commercial secrets.

2.2.2. Requirements for substrates and media

The inactivated influenza A vaccines prepared from conventional virus are produced in 9- to 11-day-old embryonated SPF or SAN chicken eggs. The method of production is basically the same as for propagating the virus aseptically; all procedures are performed under sterile conditions.

2.2.3. In-process controls

For inactivated vaccines, completion of the inactivation process should be tested in embryonated eggs, taking at least 10 aliquots of 0.2 ml from each batch and passaging each aliquot at least twice through SPF or SAN embryos. Viral infectivity must not remain.

2.2.4. Final product batch tests

Most countries have published specifications for the control of production and testing of vaccines, which include the definition of the obligatory tests on vaccines during and after manufacture.

i) Sterility and purity

Tests for sterility and freedom from contamination of biological materials intended for veterinary use may be found in chapter 1.1.9.

ii) Safety

For inactivated vaccines, a double dose is administered by the recommended route to ten 3-week-old birds, and these are observed for 2 weeks for absence of clinical signs of disease or local lesions.

iii) Batch potency

Potency of influenza A vaccine is generally evaluated by testing the ability of the vaccine to induce a significant HI titre in SPF or SAN birds. Conventional potency testing involving the use of three diluted doses and challenge with HPAI virus (e.g. chapter 3.3.10) may also be used for vaccines prepared to give protection against LPAI subtypes. For inactivated vaccines against HPAI or LPAI virus, potency tests may rely on the measurement of immune response or challenge and assessment of morbidity, mortality (HPAI only) and quantitative reduction in challenge virus replication in respiratory (oropharyngeal or tracheal) and intestinal (cloaca) tracts. Assessment of haemagglutinin antigen content could allow for *in-vitro* extrapolation to potency for subsequent vaccine batches.

iv) Preservatives

A preservative may be used for vaccine in multidose containers.

2.3. Requirements for regulatory approval

2.3.1. Safety requirements

i) Target and non-target animal safety

Most inactivated influenza A vaccines are approved for use in chickens and turkeys. Field trials in the target species should be conducted to determine tolerance and safety of the vaccine at full dose. Recently the use of inactivated influenza A vaccines has been expanded to ducks, geese, other poultry and zoo birds. Any extra-label use of the vaccines should be done cautiously and under the supervision of a veterinarian experienced in disease control through vaccination in the test species. Care must be taken to avoid self-injection with oil emulsion vaccines.

ii) Reversion-to-virulence for attenuated/live vaccines

Only inactivated influenza A virus vaccines are recommended. Live conventional influenza vaccines against any subtype are not recommended because of the risk for reassortment of gene segments of vaccine virus with field virus, potentially creating more pathogenic field viruses.

iii) Environmental consideration

None

2.3.2. Efficacy requirements

i) For animal production

For regulatory purposes, influenza A vaccines should pass an efficacy challenge test using a statistically relevant number of SPF or SAN chickens per group. The challenge should occur at a minimum of three weeks post-vaccination, using a challenge HPAI virus dose that

causes 90% or greater mortality in the sham population. A standardised challenge dose of 10^6 mean chicken embryo infectious doses is most widely used. Protection from mortality in the vaccine group should be a minimum of 80%. For LPAI, mortality is not a feature of challenge models, therefore a statistically significant reduction in virus shedding titre and/or the number of birds shedding virus from oropharynx or cloaca should be observed between sham and test vaccine groups. Other metrics of protection can be used to determine efficacy such as prevention of drops in egg production.

In establishing minimum antigen requirements, 50 PD_{50} or 3 µg of haemagglutinin per dose have been recommended (Swayne & Sims, 2020). Minimum HI serological titres in field birds should be 1/32 to protect from mortality or greater than 1/128 to provide reduction in challenge virus replication and shedding for antigenically close related vaccine and challenge viruses.

ii) For control and eradication

Efficacy should be the same as for animal production.

2.3.3. Stability

When stored under the recommended conditions, the final vaccine product should maintain its potency for at least 1 year. Inactivated vaccines must not be frozen.

3. Vaccines based on biotechnology

3.1. Vaccines available and their advantages

Recombinant live vaccines for influenza A viruses have been produced by inserting the gene coding for the influenza A virus haemagglutinin into a non-influenza live virus vector and using this recombinant virus to immunise poultry against influenza A (Swayne & Sims, 2020). Recombinant live vector vaccines have several advantages over inactivated influenza A vaccines: 1) they induce mucosal, humoral and cellular immunity; 2) they can be mass administered *in ovo* or to 1-day-old birds in the biosecure hatchery to induce early protection; and 3) they enable easy serological differentiation of infected from non-infected vaccinated birds because they do not induce the production of antibodies against the nucleoprotein or matrix antigens that are common to all influenza A viruses; i.e. differentiation of infected from vaccinated (DIVA) animals. Therefore, only field-infected birds will exhibit antibodies in the AGID test or ELISAs directed towards the detection of influenza group A (nucleoprotein and/or matrix) antibodies. However, recombinant live vaccines have limitations in that they may have reduced replication and thus induce no or only partial protective immunity in birds that have had field exposure to or vaccine induced immunity against the vector virus or the H gene insert (Bertran et *al.*, 2018; Swayne & Sims, 2020). If used in day-old or young birds, the effect of maternal antibodies to the vector virus on vaccine efficacy may vary with the vector type; i.e. most severe inhibition in decreasing order for Newcastle disease virus, fowl poxvirus and HVT vectors. In addition, because the vectors are live viruses that may have a restricted host range, the use of such vaccines must be restricted to species in which efficacy has been demonstrated.

A rFPV-H5 vaccine, with H gene insert for A/turkey/Ireland/1378/1983 (H5N8), was developed in the early 1980s and authorised beginning in 1998 for use against H5N2 LPAI of Mexico (Swayne & Sims, 2020). This vaccine has principally been used in Mexico with expansion into several other countries within Central America and Vietnam with over 9 billion doses used between 1998 and 2016. This rFPV-H5 has had the H gene insert updated to A/chicken/Mexico/P-14/2016 (H5N2) (Bertran et *al.*, 2020). An rFPV-H7 with haemagglutinin insert from A/chicken/Guanajuato/07437-15/2015 (H7N3) has been developed and approved with deployment to Mexico in 2018 against H7N3 HPAI, and a rFPV-H5 with H and N gene inserts from A/goose/Guangdong/1996 (H5N1, clade 0) was used in China against the H5N1 HPAI during 2005 (Chen & Bu, 2009; Criado et *al.*, 2019; Swayne & Sims, 2020). rFPV can be effective when given to 1-day-old chicks with varying levels of maternal immunity (Arriola et *al.*, 1999). However, when very high levels of inhibitory immunity is anticipated because of previous infection or vaccination, the efficacy of the recombinant live vaccine in such day-old chicks should be confirmed and may require a prime-boost application of recombinant vaccine followed at a minimum 10 days later by inactivated influenza A vaccine boost to give optimal immunity (Richard-Mazet et *al.*, 2014; Swayne & Sims, 2020).

Newcastle disease virus can also be used as a vector for expressing influenza haemagglutinin genes. A recombinant Newcastle disease vaccine virus (rNDV) expressing a H5 HA gene (rNDV-H5) was shown to protect SPF chickens against challenge with both virulent Newcastle disease virus and a HPAI H5N2 virus (Veits *et al.*, 2006). A similar recombinant virus based on Newcastle disease virus vaccine strain La Sota and expressing H gene of A/goose/Guangdong/1996 (clade 0)(H5N1) was produced in China (the People's Rep. of) (Ge *et al.*, 2007) and reported to be efficacious in protection studies with either virus. This rNDV-H5 (clade 0) vaccine has been used widely with subsequent updating of HA insert twice with clade 2.3.4 and 2.3.2 clade haemagglutinin inserts (Swayne & Sims, 2020). An rNDV-H5 with H gene insert from A/chicken/Mexico/435/2005 (H5N2) has been developed, approved and deployed in Mexico against H5N2 LPAI (Swayne & Sims, 2020). An rNDV-H5 vaccine with H gene insert from A/chicken/Iowa/04-20/2015 (H5N2) (Gs/GD lineage, clade 2.3.4.4) insert was effective in protecting chickens against challenge with homologous H5N2 HPAI virus in chickens lacking immunity to the Newcastle disease virus vector or the H gene insert, but rNDV-H5 vaccine was ineffective as a primary or booster vaccine in poultry with maternal immunity or well-immunised against Newcastle disease or the H5 haemagglutinin protein (Bertran *et al.*, 2018). rNDV-H5 vaccines are effective as a primary vaccine if used in Newcastle disease or H5 antibody negative chickens, or as a priming vaccine followed by a boost with an inactivated influenza A vaccine in Newcastle disease or H5 antibody positive chickens. The major advantage of rNDV-H5 is the ability for low cost mass application by spray in the hatchery or field (Swayne & Sims, 2020).

Since 2010, a rHVT-H5 with haemagglutinin insert of A/swan/Hungary/4999/2006 (Gs/GD lineage, clade 2.2) has been approved and used in Egypt and Bangladesh against H5Nx Gs/GD lineage HPAI and in Mexico against H5N2 LPAI (Rauw *et al.*, 2011; Swayne & Sims, 2020). This rHVT-H5 vaccine has produced broad protection across diverse H5 HPAI viruses (Rauw *et al.*, 2011). Furthermore, maternally derived antibodies to rHVT vector or H5 haemagglutinin protein have had minimal negative impact on the effectiveness of the vaccine in broiler chickens after a single vaccination at 1 day of age (Bertran *et al.*, 2018). The rHVT-H5 is limited to application only *in ovo* or at 1 day of age to chickens in the hatchery, as application later on the farm is not feasible because of the ubiquitous infection by Marek's disease viruses or use of Marek's disease vaccines.

Because of the induction of broader immunity across mucosal, humoral and cellular areas, recombinant live vectored vaccines have had a longer use life in the field before appearance of field viruses that are resistant to the vaccine strains as compared to inactivated whole virus vaccines which produce primarily a strong humoral immunity. A recombinant duck enteritis virus in domestic ducks has been developed and shown efficacy but is pending regulatory approval and deployment in China (People's Rep. of) (Liu *et al.*, 2011).

Non-replicating haemagglutinin-based RNA particle and DNA vaccines with H gene from A/Gyrfalcon/Washington/40188-6/2014 (H5N8) (Gs/GD lineage, clade 2.3.4.4) have been approved for poultry use in the USA (Swayne & Sims, 2020). The H5 RNA particle vaccine is part of the USA emergency vaccine bank, along with rHVT-H5 and an inactivated H5N2 vaccines. The H5 RNA particle vaccine has been demonstrated to be an effective booster vaccine to replace rg inactivated H5Nx vaccine (Bertran *et al.*, 2017). A baculovirus with H gene insert from A/duck/China/E319-2/2003 (Gs/GD lineage, clade 2.3.3) has been approved for poultry use in Bangladesh, Egypt and Mexico (Swayne & Sims, 2020). Since this category of vaccine only contain the specific influenza A haemagglutinin protein, they are easily amenable to serological DIVA testing using assays designed for identifying antibodies to the nucleoprotein/matrix protein. However, field reports of protection with vectored and conventional influenza A vaccines suggest that protection by single dose of the vectored vaccines for long lived poultry is not feasible, with long-term field protection requiring a booster with inactivated influenza A vaccine or non-replicating, haemagglutinin-based vaccine (Swayne & Sims, 2020).

In addition to these approved vaccines, various experimental haemagglutinin-based H5 and H7 influenza A vaccines have been described using *in-vivo* or *in-vitro* expression systems including recombinant adenoviruses, salmonella, vaccinia, avian leucosis virus, various eukaryotic systems (plants or cell cultures) and infectious laryngotracheitis virus (Swayne & Sims, 2020).

3.2. Special requirements for biotechnological vaccines, if any

Live recombinant vectored vaccines with influenza A haemagglutinin gene inserts should have an environmental impact assessment completed to determine the risk of the vaccine to be virulent in non-target avian species and will not increase in virulence in the target avian species.

4. Surveillance methods for detecting infection in vaccinated flocks and vaccinated birds

A strategy that allows differentiation of infected from vaccinated animals (DIVA), has been put forward as a possible solution to the eventual eradication of HPAI and H5/H7 LPAI without involving mass culling of birds and the resulting economic damage, especially in developing countries (FAO, 2004). This strategy has the benefits of vaccination (less virus in the environment), but the ability to identify infected flocks would still allow the implementation of additional control measures, including stamping out of infected flocks. DIVA strategies use one of two broad detection schemes within the vaccinated population: 1) detection of influenza A virus ('virus DIVA'), or 2) detection of antibodies against influenza A field virus infection ('serological DIVA'). At the flock level, a simple method consists of regularly monitoring sentinel birds left unvaccinated in each vaccinated flock, but this approach does have some management problems, particularly with regards to identifying the sentinels in large flocks. As an alternative or adjunct system, testing for field exposure may be performed on the vaccinated birds either by detection of field virus or antibodies against the virus. To detect the field virus, oropharyngeal or cloacal swabs from baseline daily mortality or sick birds can be tested, individually or as pools, by molecular methods, such as real-time RT-PCR or AC-ELISA of the vaccinated populations (Swayne & Kapczynski, 2008).

To use serological DIVA schemes, vaccination systems that enable the detection of field exposure in vaccinated populations should be used. Several systems have been used. First, use of a vaccine containing a virus of the same haemagglutinin subtype but a different neuraminidase (N) from the field virus. Antibodies to the N of the field virus act as natural markers of infection. This system was used in Italy following the re-emergence of a H7N1 LPAI virus in 2000, and used an H7N3 inactivated vaccine with the detection of N3 antibodies indicating a vaccinated flock, N1 antibodies indicating infection, and both N1 and N3 antibodies indicating an infected, vaccinated flock (Capua *et al.*, 2003). Problems with this system would arise if a field virus emerges that has a different N antigen to the existing field virus or if subtypes with different N antigens are already circulating in the field as is present in many low and middle income countries with H5Nx (Gs/GD lineage), H9N2 and other NA subtypes in live poultry markets (Swayne & Sims, 2020). A second serological DIVA option is the use of vaccines that contain only HA, e.g. replicating or non-replicating recombinant vaccines, which allows validated, classical AGID and nucleoprotein (NP)- or matrix protein-based ELISAs to be used to detect antibodies indicative of infection in vaccinated birds. Finally, for inactivated vaccines, a test that detects antibodies to the nonstructural viral or M2e proteins have been described (Avellaneda *et al.*, 2010; Lambrecht *et al.*, 2007). These systems are yet to be validated in the field.

5. Continued evaluation and updating of vaccine seed strains to protect against emergent variant field virus strains

Historically, H5 LPAI inactivated vaccine seed strains and recombinant fowl poxviruses with H5 gene inserts have shown broad cross protection in chickens against challenge by diverse H5 HPAI viruses from Eurasia and North America (Swayne & Kapczynski, 2008). In 1995, Mexico implemented influenza A vaccine use for poultry as one tool in the HPAI control strategy, with eradication of HPAI strain by June 1995, but as H5N2 LPAI viruses continued to circulate, H5N2 vaccination was maintained (Villarreal, 2007). Within a few years, multiple lineages of antigenically variant H5N2 LPAI field viruses emerged that escaped from immunity induced by the original 1994 inactivated vaccine seed strain (Lee *et al.*, 2004). Similarly, emergent H5Nx HPAI Gs/GD lineage field viruses have arisen in China (the People's Rep. of), Indonesia, Egypt and various other Asian and Middle Eastern countries since 2005 that escaped from immunity induced by classical H5 inactivated LPAI vaccine seed strains and even rg generated H5 vaccine seed strains used in commercial vaccines (Grund *et al.*, 2011; Liu *et al.*, 2020; Swayne & Sims, 2020). Similarly, H9N2 LPAI field viruses resistant to inactivated vaccine seed strains have arisen in multiple countries in Asian and Middle East after prolonged usage of a single inactivated vaccine seed strain. It is not clear whether the emergence of these antigenic variants is related to use of vaccines or improper use of vaccines, but the emergence of resistance necessitated the change in vaccine seed strains to antigenically match the circulating field strains (Cattoli *et al.*, 2011; Lee *et al.*, 2016). China as the largest user of avian influenza vaccines has updated it's inactivated H5Nx (Gs/GD lineage) and H7N9 seed strains eight times and once, respectively, with the life span of a seed strain ranging from 3 to 7 years (Liu *et al.*, 2020; Swayne & Sims, 2020). Mexico has updated its H5N2 inactivated seed strains twice and its rFPV-H5 once over a 20-year period of H5 vaccine use (Swayne & Sims, 2020). Initially H9N2 inactivated vaccine usage in South Korea, was associated with decreased field virus diversity, as vaccinal immunity completely inhibited antigenically closely related field virus replication (Lee et al., 2016). However, over time, field

virus diversity increases as antigenic variants arise in the field and expand their populations. The live recombinant vectored vaccines have been updated less frequently, suggesting a broader immunity, requiring less frequent insert updates as compared inactivated vaccine seed strains.

All influenza A vaccination programmes should have an epidemiologically relevant surveillance programme that includes all relevant geographical regions and production sectors. The resulting isolates, along with viruses obtained from outbreaks, should be assessed for genetic and antigenic variation as part of an ongoing program for assessing vaccine effectiveness in the field. Initially, the viruses should be sequenced and analysed for critical amino acid changes within the five major antigenic epitopes of the HA. A representative subset of antigenic variants should be tested for cross-reactivity in a HI test using a panel of standard antisera produced against diverse influenza A viruses from the same HA subtype and the data analysed for quantitative changes by antigenic cartography (Fouchier & Smith, 2010). Based on this cartographic data, a few of the predominant circulating influenza A viruses and selected antigenic variants should be used in challenge efficacy studies (Swayne *et al.*, 2015). Vaccines that are not protective should be discontinued and replaced with vaccines containing updated inactivated vaccine seed strains or HA inserts within other vaccine platforms. Based on the timeline for emergence of antigenic variants for H5N1 viruses in China (People's Rep. of), vaccines should be assessed at a minimum every 2–3 years for efficacy against predominant circulating field viruses of the country or region. Alternatively, vaccine seed strains should be updated when a vaccine-escape mutant accounts for more than 30% of the relevant AIV subtype (Liu *et al.*, 2020). Based on this scientific information, the competent veterinary authority within the country should establish, in consultation with leading veterinary vaccine scientists and international organisations, naturally isolated or reverse genetics LPAI vaccine seed strains for conventional inactivated vaccines, and H5 and H7 haemagglutinin gene insert cassettes for recombinant vaccines. In some situations, more than one seed strain may be necessary to cover all production sectors within a country. Only high quality and potent vaccines should be approved for use in control programmes. Proper administration of high quality, potent vaccines is critical in inducing protective immunity in poultry populations.

REFERENCES

AGUERO M., SAN MIGUEL E., SÁNCHEZ A., GÓMEZ-TEJEDOR C. & JIMÉNEZ-CLAVERO M.A. (2007). A fully automated procedure for the high-throughput detection of avian influenza virus by real-time reverse transcription–polymerase chain reaction. *Avian Dis.*, **51**, 235–241. doi: 10.1637/7634-042806R1.1.

AHN S.J., BAEK Y.H., LLOREN K.K.S., CHOI W.S., JEONG J.H., ANTIGUA K.J.C., KWON H.I., PARK S.J., KIM E.H., KIM Y.I., SI Y.J., HONG S.B., SHIN K.S., CHUN S., CHOI Y.K. & SONG M.S. (2019). Rapid and simple colorimetric detection of multiple influenza viruses infecting humans using a reverse transcriptional loop-mediated isothermal amplification (RT-LAMP) diagnostic platform. *BMC Infect. Dis.*, **19**, 676. doi.org/10.1186/s12879-019-4277-8

ARNOLD M.E., SLOMKA M.J., BREED A.C., HJULSAGER C.K., PRITZ-VERSCHUREN S., VENEMA-KEMPER S., BOUWSTRA R.J., TREBBIEN R., ZOHARI S., CEERAZ V., LARSEN L.E. & BROWN I.H. (2018). Evaluation of ELISA and haemagglutination inhibition as screening tests in serosurveillance for H5/H7 avian influenza in commercial chicken flocks. *Epidemiol. Infect.*, **146**,1–8. https://doi.org/10.1017/S0950268817002898

ARRIOLA J.M., FARR W., URIBE G. & ZURITA J. (1999). Experiencias de campo en el uso de vacunos contra influenza aviar. *In:* Proceedings Curso de Enfermedades Respiratorias de las Aves, Asociacion Nacional de Especialistas en Cienvias Avicelase, 3–13.

AVELLANEDA G., MUNDT E., LEE C.W., JADHAO S. & SUAREZ D.L. (2010). Differentiation of infected and Vaccinated animals (DIVA) using the NS1 protein of avian influenza virus. *Avian Dis.*,**54** (Suppl. 1), 278–286. doi: 10.1637/8644-020409-Reg.1.

BAO H., ZHAO Y., WANG Y., XU X., SHI J., ZENG X., WANG X. & CHEN H. (2014). Development of a reverse transcription loop-mediated isothermal amplification method for the rapid detection of subtype H7N9 avian influenza virus (2014) *BioMed Res. Int.*, Art. no. 525064. doi: 10.1155/2014/525064

BEARD C.W. (1970). Demonstration of type-specific influenza antibody in mammalian and avian sera by immunodiffusion. *Bull. WHO*, **42**, 779–785.

BERTRAN K., BALZLI C., LEE D.H., CRIADO M., KILLMASTER L., KAPCZYNSKI D.H. & SWAYNE D.E. (2018). Maternal antibody inhibition of recombinant Newcastle disease virus vectored vaccine in a primary or booster avian influenza vaccination program of broiler chickens. *Vaccine*, **36**, 6361–6372, 2018. doi: 10.1016/j.vaccine.2018.09.015.

BERTRAN K., BALZLI C., LEE D.H., SUAREZ D.L., KAPCZYNSKI D.R. & SWAYNE D.E. (2017). Protection of White Leghorn chickens by U.S. emergency H5 vaccines against clade 2.3.4.4 H5N2 high pathogenicity avian influenza virus. *Vaccine*, **35**, 6336–6344. doi: 10.1016/j.vaccine.2017.05.051.

BERTRAN K., CRIADO M.F., LEE D.H., KILLMASTER L., SÁ E SILVA M., WIDENER J., PRITCHARD N. & SWAYNE D.E. (2020). Protection of White Leghorn chickens by recombinant fowlpox vector vaccine with updated H5 insert against Mexican H5N2 high and low pathogenicity avian influenza viruses. *Vaccine*, **39**, 1526–1534. doi:10.1016/j.vaccine.2019.11.072

BONFANTE F., FUSARO A., ZANARDELLO C., PATRONO L.V., DE NARDI R., MANIERO S. & TERREGINO C. (2014). Lethal Nephrotropism of an H10N1 Avian Influenza Virus Stands Out as an Atypical Pathotype *Vet. Microbiol.*, **173**, 189–200.

CAPUA I., TERREGINO C., CATTOLI G., MUTINELLI F. & RODRIGUEZ J.F. (2003). Development of a DIVA (Differentiating Infected from Vaccinated Animals) strategy using a vaccine containing a heterologous neuraminidase for the control of avian influenza. *Avian Pathol.*, **32**, 47–55. doi:10.1080/0307945021000070714

CAPUA I., TERREGINO C., CATTOLI G. & TOFFAN A. (2004). Increased resistance of vaccinated turkeys to experimental infection with an H7N3 low-pathogenicity avian influenza virus. *Avian Pathol.*, **33**, 47–55. doi: 10.1080/0307945031000165207 7

CATTOLI G., FUSARO A., MONNE I., COVEN F., JOANNIS T., EL-HAMID H.S., HUSSEIN A.A., CORNELIUS C., AMARIN N.M., MANCIN M., HOLMES E.C. & CAPUA I. (2011). Evidence for differing evolutionary dynamics of A/H5N1 viruses among countries applying or not applying avian influenza vaccination inp oultry. *Vaccine*, **29**, 9368–9375. doi: 10.1016/j.vaccine.2011.09.127

CHEN H. & BU Z. (2009). Development and application of avian influenza vaccines in China. *Curr. Top. Microbiol. Immunol.*, **333**, 153–162. doi: 10.1007/978-3-540-92165-3_7

COX N.J., TROCK S.C. & UYEKI T.M. (2017). Public health implications of animal influenza viruses. *In:* Animal Influenza, Second Edition, Swayne D.E., Ed. Wiley-Blackwell, Ames, Iowa, USA, pp 92–132.

CRIADO M., BERTRAN K., LEE D.H., KILLMASTER L., STEPHENS C.B., SPACKMAN E., ATKINS E., SA E SILVA M., MEBATSION T., SMITH R., HUGHES T., WIDENER J., PRITCHARD N. & SWAYNE D.E. (2019) Addition of N-glycosylation sites on the globular head of the hemagglutinin induced escape of a 2015 Mexican H7N3 highly pathogenic avian influenza virus from vaccine-induced immunity. *Vaccine*, **37**, 2232–2243. doi: 10.1016/j.vaccine.2019.03.009

DAS A., SPACKMAN E., SENNE D., PEDERSEN J. & SUAREZ D.L. (2006). Development of an internal positive control for rapid diagnosis of avian influenza virus infections by real-time reverse transcription-PCR with lyophilized reagents. *J. Clin. Microbiol.*, **44**, 3065–3073.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO) (2004). FAO, OIE & WHO Technical consultation on the Control of Avian Influenza. Animal health special report. FAO, Rome, Italy.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (2016). Rational use of vaccination for prevention and control of H5 highly pathogenic avian influenza. *Focus on*, **10**, 1–12. FAO, Rome, Italy.

FOUCHIER R.A.M. & SMITH D.J. (2010). Use of antigenic cartography in vaccine seed strain selection. *Avian Dis.*, **54**, 220–223.

GE J., DENG G., WEN Z., TIAN G., WANG Y., SHI J., WANG X., LI Y., HU S., JIANG Y., YANG C., YU K., BU Z. & CHEN H. (2007). Newcastle disease virus-based live attenuated vaccine completely protects chickens and mice from lethal challenge of homologous and heterologous H5N1 avian influenza viruses. *J. Virol.*, **81**, 150–158.

GRAAF A., BEER M. & HARDER T. (2017). Real-time reverse transcription PCR-based sequencing-independent pathotyping of Eurasian avian influenza A viruses of subtype H7. *Virol. J.*, **14**, 137. doi: 10.1186/s12985-017-0808-3

GRUND C., ABDELWHAB E.S., ARAFA A.S., ZILLER M., HASSAN M.K., ALY M.M., HAFEZ H.M., HARDER T.C. & BEER M. (2011). Highly pathogenic avian influenza virus H5N1 from Egypt escapes vaccine-induced immunity but confers clinical protection against a heterologous clade 2.2.1 Egyptian isolate. *Vaccine*, **29**, 5567–5573. doi: 10.1016/j.vaccine.2011.01.006.

HOFFMANN B., HOFFMANN D., HENRITZI D., BEER M. & HARDER T.C. (2016). Riems influenza a typing array (RITA): An RT-qPCR-based low density array for subtyping avian and mammalian influenza a viruses. *Sci. Rep.*, **6**, 27211.

INUI K., NGUYEN T., TSENG H.J., TSAI C.M., TSAI Y.L., CHUNG S., PADUNGTOD P., ZHU H., GUAN Y., KALPRAVIDH W. & CLAES F. (2019). A field-deployable insulated isothermal RT-PCR assay for identification of influenza A (H7N9) shows good performance in the laboratory. *Influenza Other Respir. Viruses*, **13**, 610–617.

INTERNATIONAL COMMITTEE ON TAXONOMY OF VIRUSES. (2019). Orthomyxoviridae. Virus Taxonomy: 2019 Release. https://talk.ictvonline.org/ictv-reports/ictv_9th_report/negative-sense-rna-viruses-2011/w/negrna_viruses/209/orthomyxoviridae. Accessed 9 June 2020.

JAMES J., SLOMKA M., REID S., THOMAS S., MAHMOOD S., BYRNE A., COOPER J., RUSSELL C., MOLLETT B., AGYEMAN-DUA E., ESSEN S., BROWN I. & BROOKES S. (2018). Development and application of real-time PCR assays for specific detection of contemporary avian influenza virus subtypes N5, N6, N7, N8 and N9; *Avian Dis.*, **63**, 209–218. https://doi.org/10.1637/11900-051518-Reg.1

KING J., SCHULZE C., ENGELHARDT A., HLINAK A., LENNERMANN S.-L., RIGBERS K., SKUBALLA J., STAUBACH C., METTENLEITER T.C., HARDER T., BEER M. & POHLMANN A. (2020). Novel HPAIV H5N8 reassortant (Clade 2.3.4.4b) detected in Germany. *Viruses*, **12**, Art. no. 281, https://www.scopus.com/inward/record.uri?eid=2-s2.0-85081231134&doi=10.3390%2fv12030281&partnerID=40&md5=4e8bd3edb9a711a33c6ec7abe68a5f49 doi: 10.3390/v12030281

KWON S.H., LEE S., JANG J., SEO Y. & LIM H.Y (2018). A point-of-care diagnostic system to influenza viruses using chip-based ultra-fast PCR. *J. Med. Virol.*, **90**, 1019–1026.

KWON N., AHN J.J., KIM J.H., KIM S., LEE J.H., KWON J.H., SONG C.S. &HWANG S.Y. (2019). Rapid Subtyping and Pathotyping of Avian Influenza Virus using Chip-based RT-PCR. *Biochip J.*, **13**, 333–340.

LACONI A., FORTIN A., BEDENDO G., SHIBATA A., SAKODA Y., AWUNI J.A., GO-MARO E., ARAFA A., MAKEN ALI A.S., TERREGINO C. & MONNE I. (2020). Detection of avian influenza virus: a comparative study of the in silico and *in vitro* performances of current RT-qPCR assays. *Sci. Rep.*, **10**, Art. No. 8441. doi: 10.1038/s41598-020-64003-6.

LAMBRECHT B., STEENSELS M., VAN BORM S., MEULEMANS G. & VAN DEN BERG T. (2007). Development of an M2e-specific enzyme-linked immunosorbent assay for differentiating infected from vaccinated animals. *Avian Dis.*, **51** (Suppl. 1), 221–226. doi: 10.1637/7589-040206R.1.

LEE C.W., SENNE D.A. & SUAREZ D.L. (2004). Effect of vaccine use in the evolution of Mexican lineage H5N2 avian influenza virus. *J. Virol.*, **78**, 8372–8381. doi: 10.1128/JVI.78.15.8372-8381.2004.

LEE D.H., FUSARO A., SONG C.S., SUAREZ D.L. & SWAYNE D.E. (2016). Poultry vaccination directed evolution of H9N2 low pathogenicity avian influenza viruses in Korea. *Virology*, **488**, 225–231. DOI: 10.1016/j.virol.2015.11.023.

LIU J., CHEN P., JIANG Y., WU L., ZENG X., TIAN G., GE J., KAWAOKA Y., BU Z. & CHEN H. (2011). A duck enteritis virus-vectored bivalent live vaccine provides fast and complete protection against H5N1 avian influenza virus infection in ducks. *J. Virol.*, **85**, 10989–10998. DOI: 10.1128/JVI.05420-11

LIU J., YAO L., ZHAI F., CHEN Y., LEI J., BI Z., HU J., XIAO Q., SONG S., YAN L. & ZHOU J. (2018). Development and application of a triplex real-time PCR assay for the simultaneous detection of avian influenza virus subtype H5, H7 and H9. *J. Virol. Methods*, **252**, 49–56.

LIU S., ZHUANG Q., WANG S., JIANG W., JIN J., PENG C., LOU G., LI J., YU J., YU X., LI H., SUN S., YUAN L. & CHEN J (2020). Control of avian influenza in China: Strategies and lessons. *Transbound. Emerg. Dis.*, **67**, 1–9. doi: 10.1111/tbed.13515

LONDT B.Z., BANKS J. & ALEXANDER D.J. (2007). Highly pathogenic avian influenza viruses with low virulence for chickens in *in vivo* tests. *Avian Pathol.*, **36**, 347–350.

NAEEM K. (1998). The avian influenza H7N3 outbreak in South Central Asia. Proceedings of the Fourth International Symposium on Avian Influenza, Athens, Georgia, USA. Swayne D.E. & Slemons R.D., eds. U.S. Animal Health Association, 31–35.

NAGUIB M.M., GRAAF A., FORTIN A., LUTTERMANN C., WERNERY U., AMARIN N., HUSSEIN H.A., SULTAN H., AL ADHADH B., HASSAN M.K., BEER M., MONNE I. & HARDER T.C. (2017). Novel real-time PCR-based patho- and phylotyping of potentially zoonotic avian influenza a subtype H5 viruses at risk of incursion into Europe in 2017. *Euro Surveill.*, **22**, 30435. doi: 10.2807/1560-7917.ES.2017.22.1.30435.

NAGY A., ČERNÍKOVÁ L., KUNTEOVÁ K., DIRBÁKOVÁ Z., THOMAS S.S., SLOMKA M.J., DÁN Á., VARGA T., MÁTÉ M., JIŘINCOVÁ H. & BROWN I.H. (2020). A universal RT-qPCR assay for "One Health" detection of influenza A viruses. *bioRxiv* https://doi.org/10.1101/2020.06.29.171306.

POSTEL A., LETZEL T., FRISCHMANN S., GRUND C., BEER M. & HARDER T (2010). Evaluation of two commercial loop-mediated isothermal amplification assays for detection of avian influenza H5 and H7 hemagglutinin genes. *J. Vet. Diagn. Invest.*, **22**, 61–66.

RAUW F., PALYA V., VAN B.S., WELBY S., TATAR-KIS T., GARDIN Y., DORSEY K.M., ALY M.M., HASSAN M.K., SOLIMAN M.A., LAMBRECHT B. & VAN DEN BERG T. (2011). Further evidence of antigenic drift and protective efficacy afforded by a recombinant HVT-H5 vaccine against challenge with two antigenically divergent Egyptian clade 2.2.1 HPAI H5N1 strains. *Vaccine*, **29**, 2590–2600. doi: 10.1016/j.vaccine.2011.01.048

RICHARD-MAZET A., GOUTEBROZE S., LE GROS F.X., SWAYNE D.E. & BUBLOT M. (2014). Immunogenicity and efficacy of fowlpox-vectored and inactivated avian influenza vaccines alone or in a prime-boost schedule in chickens with maternal antibodies. *Vet. Res.*, **45**:e107. doi: 10.1186/s13567-014-0107-6.

SCAHLS (SUB-COMMITTEE ON ANIMAL HEALTH LABORATORY STANDARDS [AUSTRALIA/NEW ZEALAND]) (2009). SCAHLS Approved Tests. Avian Influenza b-ELISA. http://www.scahls.org.au/new_tests/scahls_approved_tests

SIMS L.D. (2003). Avian influenza in Hong Kong 1997-2002. *Avian Dis.*, **47**, 832–838. doi: 10.1637/0005-2086-47.s3.832

SLEMONS R.D. & D.E. SWAYNE (1990). Replication of a waterfowl-origin influenza virus in the kidney and intestine of chickens. *Avian Dis.*, **34**, 277–284.

SLOMKA M.J., PAVLIDIS T., BANKS J., SHELL W., MCNALLY A., ESSEN S. & BROWN I.H. (2007). Validated H5 Eurasian real-time reverse transcriptase–polymerase chain reaction and its application in H5N1 outbreaks in 2005–2006. *Avian Dis.*, **51**, 373–377.

SLOMKA M.J., TO T., TONG H., COWARD V., MAWHINNEY I., BANKS J. & BROWN I.H. (2012). Evaluation of lateral flow devices for identification of infected poultry by testing swab and feather specimens during H5N1 highly pathogenic avian influenza outbreaks in Vietnam. *Influenza Other Respir. Viruses*, **6**, 318–327.

SONG H., NIETO G.R. & PEREZ D.R. (2007). A New Generation of Modified Live-Attenuated Avian Influenza Viruses Using a Two-Strategy Combination as Potential Vaccine Candidates. *J. Virol.*, **17**, 9238–9248. doi: 10.1128/JVI.00893-07.

SPACKMAN E., IP HS, SUAREZ D.L., SLEMONS R.D. & STALLKNECHT D.E. (2008). Analytical validation of a real-time reverse transcription polymerase chain reaction test for Pan-American lineage H7 subtype Avian influenza viruses. *J. Vet. Diagn. Invest.*, **20**, 612–616.

SPACKMAN E., PEDERSEN J.C., MCKINLEY E.T. & GELB J. (2013). Optimal specimen collection and transport methods for the detection of avian influenza virus and Newcastle disease virus. *BMC Vet. Res.*, **9**, 35.

SPACKMAN E., SENNE D.A., MYERS T.J., BULAGA L.L., GARBER L.P., PERDUE M.L., LOHMAN K., DAUM L.T. & SUAREZ D.L. (2002). Development of a real-time reverse transcriptase PCR assay for type A influenza virus and the avian H5 and H7 hemagglutinin subtypes. *J. Clin. Microbiol.*, **40**, 3256–3260.

SPACKMAN E. & SUAREZ D.L. (2008). Detection and identification of the H5 hemagglutinin subtype by real-time RT-PCR. *Methods Mol. Biol.*, **436**, 27–33.

SWAYNE D.E. & KAPCZYNSKI D. (2008). Vaccines, vaccination, and immunology for avian influenza viruses in poultry. *In:* Avian Influenza. Swayne D.E. ed., Wiley-Blackwell, Ames, Iowa, USA, 407–451.

SWAYNE D.E., PAVADE G., HAMILTON K., VALLAT B. & MIYAGISHIMA K. (2011). Assessment of national strategies for control of high pathogenicity avian influenza and low pathogenicity notifiable avian influenza in poultry, with emphasis on vaccines and vaccination. *Rev. sci. tech. Off. Int. Epiz.*, **30**, 839–870. doi: 10.20506/rst.30.3.2081

SWAYNE D.E. & SIMS L. (2020). Avian influenza. *In:* Veterinary Vaccines: Principles and Applications, Metwally S, El Idrissi M., Viljoen G., eds. Wiley, Chichester, United Kingdom, 229–251.

SWAYNE D.E., SUAREZ D.L. & SIMS L.D. (2020). Influenza. *In:* Diseases of Poultry, Fourteenth Edition. Swayne D.E., Boulianne, M., Logue, C., McDougald L.R., Nair, V., & Suarez D.L., eds. Wiley Publishing, Ames, Iowa, USA, 210–256.

SWAYNE D.E., SUAREZ D.L., SPACKMAN E., JADHAO S., DAUPHIN G., KIM M., MCGRANE J., WEAVER J, DANIELS P., WONG F., SELLECK P., WIYONO A., INDRIANI R., YUPIANA Y., SIREGAR E.S., PRAJITNO T., FOUCHIER R. & SMITH D. (2015). Antibody titer has positive predictive value for vaccine protection against challenge with natural antigenic drift variants of H5N1 high pathogenicity avian influenza viruses from Indonesia. *J. Virol.*, **89**, 3746–3762. doi: 10.1128/JVI.00025-15.

TONG S., ZHU X., LI Y., SHI M., ZHANG J., BOURGEOIS M., YANG H., CHEN X., RECUENCO S., GOMEZ J., CHEN L. M., JOHNSON A., TAO Y., DREYFUS C., YU W., MCBRIDE R., CARNEY P.J.,GILBERT A.T., CHANG J., GUO Z., DAVIS C.T., PAULSON J.C., STEVENS J., RUPPRECHT C.E.,HOLMES E.C.,WILSON I.A. & DONIS R.O. (2013). New world bats harbor diverse influenza A viruses. *PLoS Pathog.*, **9**, e1003657. doi: 10.1371/journal.ppat.1003657

VAN DER GOOT J.A., KOCH G., DE JONG M.C. & VAN BOVEN M. (2005). Quantification of the effect of vaccination on transmission of avian influenza (H7N7) in chickens. *Proc. Natl Acad. Sci. USA*, **102**, 18141–18146. doi:10.1073/pnas.0505098102.

VEITS J., WIESNER D., FUCHS W., HOFFMANN B., GRNZOW H., STARICK E., MUNDT E., SCHIRRMEIER H., MEBATSION, T., METTENLEITER T.C. & ROMER-OBERDORFER A. (2006). Newcastle disease virus expressing H5 hemagglutinin gene protects chickens against Newcastle disease and avian influenza. *Proc. Natl. Acad. Sci. USA*, **103**, 8197–8202. DOI: 10.1016/j.vaccine.2007.09.048

VILLARREAL C. (2007). Experiences in control of avian influenza in the Americas. *Dev. Biol.*, **130**, 53–60.

WONG S.S., YOON S.W., ZANIN M., SONG M.S., OSHANSKY C., ZARAKET H., SONNBERG S., RUBRUM A., SEILER P., FERGUSON A., KRAUSS S., CARDONA C., WEBBY R.J. & CROSSLEY B. (2014). Characterization of an H4N2 influenza virus from quails with a multibasic motif in the hemagglutinin cleavage site. *Virology*, **468–470**, 72–80. doi: 10.1016/j.virol.2014.07.048

WOOD G.W., BANKS J., STRONG I., PARSONS G. & ALEXANDER D.J. (1996). An avian influenza virus of H10 subtype that is highly pathogenic for chickens but lacks multiple basic amino acids at the haemagglutinin cleavage site. *Avian Pathol.*, **25**, 799–806.

WORLD HEALTH ORGANIZATION/WORLD ORGANISATION FOR ANIMAL HEALTH/FOOD AND AGRICULTURE ORGANIZATION (WHO/OIE/FAO) H5N1 EVOLUTION WORKING GROUP (2014) Revised and updated nomenclature for highly pathogenic avian influenza A (H5N1) viruses. *Influenza Other Respir. Viruses*, **8**, 384–388. https://doi.org/10.1111/irv.12230

WORLD HEALTH ORGANIZATION EXPERT COMMITTEE (1980). A revision of the system of nomenclature for influenza viruses: a WHO Memorandum. *Bull. WHO*, **58**, 585–591.

ZHANG Y., AEVERMANN B.D., ANDERSON T.K., BURKE D.F., DAUPHIN G., GU Z., HE S., KUMAR S., LARSEN C.N., LEE A.J., LI X., MACKEN C., MAHAFFEY C., PICKETT B.E., REARDON B., SMITH T., STEWART L., SULOWAY C., SUN G., TONG L., VINCENT A.L., WALTERS B., ZAREMBA S., ZHAO H., ZHOU L., ZMASEK C., KLEM E.B. & SCHEUERMANN R.H. (2017). Influenza Research Database: An integrated bioinformatics resource for influenza virus research. *Nucleic Acids Res.*, **45** (D1), D466–D474.

*
* *

NB: There are WOAH Reference Laboratories for avian influenza (please consult the WOAH Web site: https://www.woah.org/en/what-we-offer/expertise-network/reference-laboratories/#ui-id-3). Please contact the WOAH Reference Laboratories for any further information on diagnostic tests, reagents and vaccines for avian influenza

NB: FIRST ADOPTED IN 1989 AS AVIAN INFLUENZA (FOWL PLAGUE). MOST RECENT UPDATES ADOPTED IN 2021.

APPENDIX 3.3.4.1.

BIOSAFETY GUIDELINES FOR HANDLING HIGH PATHOGENICITY AVIAN INFLUENZA VIRUSES IN VETERINARY DIAGNOSTIC LABORATORIES

INTRODUCTION

The spread of high pathogenicity H5Nx avian influenza throughout Asia, Africa and Europe has led to an increase in the number of laboratories performing diagnostics for this pathogen. High pathogenicity avian influenza (HPAI) viruses, in general, are a serious threat to birds and mortality is often 100% in susceptible chickens. In addition, the agents can also pose a serious zoonotic threat, with approximately 60% mortality reported in humans infected with H5N1 HPAI virus. In recognition of the need for guidance on how to handle these viruses safely, the WOAH has established the following biocontainment guidelines for handling specimens that may contain HPAI virus. They are based on Chapter 1.1.4 *Biosafety and biosecurity: Standard for managing biological risk in the veterinary laboratory and animal facilities*, the World Health Organization[5], and Centers for Disease Control and Prevention[6].

BIOCONTAINMENT LEVELS

Samples for diagnostic testing for HPAI virus using the following techniques do not require high-level containment but should be carried out at an appropriate biosafety and containment level determined by risk analysis (see chapter 1.1.4.):

- Conventional and real-time reverse transcriptase polymerase chain reaction (RT-PCR)
- Antigen-capture assays
- Serology

Virus isolation and identification procedures for handling specimens that may contain high-titred replication-competent HPAI virus should as a minimum, include the following:

- Personnel protective equipment should be worn, including solid-front laboratory coats, gloves, safety glasses and respirators with greater than or equal to 95% efficiency.
- Specimens from potentially infected birds or animals should only be processed in type II or type III biological safety cabinets (BSC).
- Necropsies of birds should be performed in a Type II BSC while wearing respiratory protection, such as a N95 respirator, or in a Type III biological safety cabinet, or other primary containment devices with 95% efficient air filtration.
- Centrifugation should be performed in sealed centrifuge cups.
- Centrifugation rotors should be opened and unloaded in a BSC.

5 WHO laboratory biosafety guidelines for handling specimens suspected of containing avian influenza A virus, 12 January 2005.

6 Biosafety in Microbiological and Biomedical Laboratories, 5th edition. HHS Publication No. (CDC) 21-1112. https://www.cdc.gov/labs/pdf/CDC-BiosafetyMicrobiologicalBiomedicalLaboratories-2009-P.PDF 1 December 2009.

- Work surfaces and equipment should be decontaminated after specimen processing.
- Contaminated materials should be decontaminated by autoclaving or disinfection before disposal or should be incinerated.

If chickens or other birds or mammals are inoculated with HPAI viruses, inoculation should be done in appropriate containment including:

- Inoculated chickens should be held in animal isolation cabinets or other primary containment devices, or non-isolation cages/floor pens in specially designed containment rooms
- Animal isolation cabinets should be in a separate facility that is equipped to handle the appropriate biocontainment for HPAI.
- The room should be under negative pressure to the outside and the animal isolation cabinets should be under negative pressure to the room.
- Animal isolation cabinets should have HEPA-filtered inlet and exhaust air.
- Biosafety cabinet or other primary containment devices should be available in the animal facility to perform post-mortem examinations and to collect specimens.

*
* *

Overview of how Canada prevents, prepares and responds to bird flu outbreaks

This is Exhibit "D" referred to in the affidavit of Katrina Jones sworn before me at Whitehorse this 30 day of January 20 25

On this page

- Prevention and early warning
- Emergency preparedness
- Communications
- Response

Avian influenza (AI) is a contagious viral infection that can affect several species of poultry, such as chicken and turkey, as well as pet and wild birds. AI viruses can be classified into two categories-low pathogenic (LPAI) and high pathogenic (HPAI)-based on the severity of the illness caused in poultry. HPAI viruses typically cause severe illness and mortality, whereas LPAI viruses typically cause little or no clinical signs. Most AI viruses are low pathogenic; however, some subtypes are capable of becoming highly pathogenic. Historically, only the H5 and H7 LPAI virus subtypes are known to have the ability to become highly pathogenic and they are considered notifiable.

The Government of Canada attaches high priority to the threat of AI and is devoting significant resources to prevent the introduction and spread of AI in Canada. The Canadian Food Inspection Agency (CFIA) is at the forefront of that effort.

The CFIA, working with a number of Government of Canada partners, has

put in place a series of measures to limit the animal health risks-and associated economic repercussions of outbreaks-posed by AI. In the context of human health, these measures also reduce the potential risk that AI infection in birds will serve as the precursor to a human flu pandemic. International human and animal health authorities agree that efforts to protect human health are best directed at preventing, limiting and eradicating AI outbreaks in domestic poultry.

Prevention and early warning

There are a wide range of AI viruses continuously circulating within wild bird populations. The majority of these do not cause serious illness in animals or humans. The first lines of defence against an outbreak of AI in domestic poultry are prevention measures and early warning systems. The CFIA, in collaboration with other Government departments, has put in place safeguards to limit the introduction and spread of AI in Canada's domestic poultry populations.

Surveillance

The Canadian Government uses two different bird surveillance programs to detect AI viruses posing threats to domestic poultry at the earliest possible moment. The first program targets wild birds; the second one focuses on domestic flocks.

Wild bird surveillance

The CFIA, Environment Canada, the Public Health Agency of Canada and the Canadian Cooperative Wildlife Health Centre collaborate to conduct an annual survey of AI viruses in wild birds. The survey partners expect to find a variety of AI viruses, most of which commonly circulate in wild

birds with little or no impact on their health or the health of other animals. The survey includes sampling of live birds during the spring, summer and fall and continued year-round sampling of dead birds. The survey is intended to provide early detection of highly pathogenic AI in Canada and determine the presence and characteristics of the AI strains in North America's wild bird population.

Survey partners are particularly interested in AI viruses that are or have the potential to become highly pathogenic. These viruses, which include the H5 and H7 subtypes, can cause illness and death in poultry. The highly pathogenic H5N1 AI virus strain currently circulating in Asia, Africa and Europe has demonstrated the ability to affect poultry and wild birds, as well as humans and other mammalian species.

Survey results are reported as they are confirmed and are available at the Canadian Cooperative Wildlife Health Centre Website.

Commercial bird surveillance

The CFIA, in collaboration with industry, has designed a commercial bird surveillance program, called the Canadian Notifiable Avian Influenza Surveillance System (CanNAISS), to complement the wild bird survey. Samples are taken from live birds and tested in CFIA accredited labs. This survey helps us develop a better picture of AI viruses that might be circulating in Canadian poultry and can help to identify where breaches of on-farm biosecurity might have occurred and identify courses of corrective action. Additionally, abnormal patterns of flock productivity and mortality would be watched closely.

International bird surveillance

Through international cooperation and information sharing, Canada

continuously monitors AI developments around the world and adjusts import controls and disease response plans accordingly.

Biosecurity

AI virus can be transmitted directly from bird to bird through secretions and feces, and indirectly through human movement, contaminated feed, water and equipment. In light of the threat and risks associated with AI, increased attention has been drawn to the ongoing need to protect domestic poultry through the effective use of on-farm biosecurity measures. Biosecurity involves maintaining good hygiene practices and limiting exposure to external sources of contamination.

Commercial flocks

Most poultry and egg production industry associations already have biosecurity guidelines in place for their memberships to reference. The CFIA's role involves promoting best practices and providing technical advice across industry so that all producers are using the most effective measures possible and that these measures are being applied in a uniform fashion across the country.

Other flocks

The CFIA recognizes that not all poultry and egg production in Canada is done by large producers that are members of industry associations. There are smaller producers who maintain small flocks, or what may be called "backyard flocks." The CFIA, in collaboration with the provinces and territories, has implemented an awareness campaign for owners of these types of flocks to inform them of biosecurity best practices and encourage them to take the necessary steps to protect their flocks.

Import measures for live birds

These measures apply to countries which are recognized as being free of highly pathogenic AI in their domestic flocks. Canada continues to prohibit trade in poultry, poultry products and birds with any country until domestic poultry are proven to be free of highly pathogenic AI.

These measures are consistent with guidelines established by the World Organization for Animal Health (WOAH; founded as Office International des Épizooties (OIE)) and provide a foundation for safe trade while protecting animal and human health. Canada's import controls were developed in consultation with provincial governments, the Canadian poultry industry and Canada's principal poultry and bird trading partners: the United States and the European Union.

- Import measures for live birds to prevent the introduction of avian influenza in domestic birds

Emergency preparedness

While it is extremely important to have early warning systems and prevention measures in place to keep AI out of Canada, similar effort must be directed toward being prepared for the possibility of an outbreak. Since 2004, Canada has experienced one high pathogenic AI outbreak and testing has identified many different AI viruses, including H5 subtypes, which were determined to be low pathogenic. During these incidents, many valuable lessons are learned and experience is gained.

Emergency response team

The CFIA has a dedicated response team of experts that will be activated in the event of an AI outbreak. This group includes veterinarians,

executive management and field staff, will oversee the CFIA's response and coordinate actions with federal, provincial and municipal partners.

Development of detailed procedures for response

Preparedness requires that contingency plans be in place for every activity associated with an outbreak. Among the many detailed plans and procedures, there are plans for: humane and rapid destruction of infected flocks; minimizing the spread of virus; effective disposal of carcasses; movement restrictions on susceptible livestock and products; protecting the health and safety of staff deployed during an AI outbreak, protecting the health of farmers and producers during an AI outbreak, and capturing information in databases for epidemiological analysis of the outbreak.

Avian Influenza scenarios and exercises

The CFIA conducts a number of internal and external exercises to further enhance preparedness for a possible AI outbreak. Internally, the CFIA continues to enhance its ability to respond through ongoing emergency preparedness workshops and training events. Externally, the CFIA participates in exercises with industry as well as other government departments and levels of government to test response to AI in different parts of Canada.

Partnerships with other government departments, other levels of government and external bodies

The CFIA continues to work closely with other Government departments, other levels of government, the poultry and egg producing industries and the scientific and academic communities, all of which have a focus

on AI.

Partnerships with other federal government departments and agencies

At the Federal level, the CFIA's AI partners include, but are not limited to, Agriculture and Agri-Food Canada, the Department of Foreign Affairs and International Trade, Environment Canada, Health Canada, the Public Health Agency of Canada, Public Safety Canada and the Canada Border Services Agency.

The lead department or agency in the event of an AI outbreak is scenario dependent. If the scenario only involves animal health, then the CFIA will have the lead coordinating role in responding to the threat. If the scenario starts as an animal health issue, and then evolves into a human health issue, then the lead coordinating role would shift to the Public Health Agency of Canada. In the event that AI starts as a human health issue, the Public Health Agency of Canada would assume the lead role in coordinating the response.

The CFIA collaborates with these partner departments on AI and pandemic scenarios on an on-going basis.

Provinces and territories

The CFIA continues to communicate with its counterparts in the provinces and territories to ensure that information, policies, procedures, strategies, plans and communications products are shared and coordinated.

The CFIA, in collaboration with provincial governments, is continuously reviewing and updating the joint Foreign Animal Disease Emergency Support Agreements, which define the roles and responsibilities of each

partner in the case of a disease outbreak. These plans are based on four major disease control principles: rapid detection of newly infected livestock; halting the spread of the disease through movement controls and the rapid destruction of infected livestock; movement controls and surveillance on high risk livestock and proximal livestock; and preventing re-infection through the effective biocontainment of infective material (carcasses, manure and feed).

Industry and academia

The CFIA has solicited expertise from industry and the scientific and academic communities by striking an Avian Influenza Advisory Group. Representatives help to ensure that CFIA policies and action plans are sound. These consultations are ongoing and continue to provide valuable intelligence that helps to shape the CFIA's overall strategy to combat AI in Canada.

Partnerships with international bodies

The CFIA collaborates with leading international bodies such as the WOAH (World Organization for Animal Health), the Food and Agriculture Organization and the World Health Organization to share and distribute intelligence, and best practices with regard to combating Avian Influenza. The fight against AI is truly an international effort with many nations, including Canada, providing assistance to other areas of the world where resources may be limited and are needed to help contain the global spread of AI. This effort benefits all nations and serves the best interests of Canada.

The CFIA's National Centre for Foreign Animal Diseases in Winnipeg is recognized by the WOAH as an international reference laboratory for AI.

Additional capacity

65

It is understood that responding to an AI outbreak will require additional human resources, equipment and facilities. The CFIA determines how much "surge capacity" will be needed to address a specific threat and then develops unique contingency plans to add resources and capacity as needed. This is especially true for AI. Surge capacity planning with regard to AI focuses on the following areas:

Internal Staffing Reserve – ensuring the CFIA has enough staff, back-up staff and staff rotation for the duration of an AI outbreak.

External Staffing Reserve – ensuring that the CFIA has identified trained persons not currently on CFIA staff, but having relevant experience, so that they can be deployed during an AI outbreak, if required.

Equipment – ensuring that the CFIA can, at short notice, acquire and deploy the equipment required to address an outbreak of AI in Canada. This would include, but is not limited to, personal protective equipment for CFIA staff, vehicles, and depopulation equipment for the humane culling of infected animals.

Laboratories – Six provincial laboratories have been CFIA approved for AI sample testing. The CFIA maintains four labs of its own so that it can also conduct AI testing. CFIA lab staff can be mobilized to move closer to an AI outbreak anywhere in Canada.

Communications

The CFIA recognizes that communication is a key component in Canada's national effort to prevent, contain and eliminate AI outbreaks.

The CFIA maintains ongoing and frequent communications with federal

and provincial government partners, the animal health community, bird owners, industry, international disease control authorities and, most importantly, the Canadian public. Timely and transparent communication ensures that the most reliable and recent information is available to decision makers, stakeholders and Canadians. The CFIA recognizes that awareness and credible, science-based information are essential components of Canada's AI readiness and response capacity.

Response

In the event of an outbreak of AI in Canada, Canadians can be assured that the CFIA has action plans to guide effective and efficient response operations. These plans draw from previous experience in Canada and abroad, and the most current internationally accepted understanding of AI.

While specific response elements vary based on the virus and infected poultry species, the CFIA's actions generally include movement restriction, disease containment and surveillance components.

Disease containment

All infected flocks are humanely destroyed, and carcasses are disposed of in an environmentally acceptable fashion. Infected premises are thoroughly cleaned and disinfected before new birds can be introduced. Where highly pathogenic virus is present, flocks in the vicinity of infected premises and those from poultry operations that may have had contact with infected premises are also humanely destroyed and disposed of as a pre-emptive measure.

Surveillance, quarantine and segregation

Because each outbreak situation is unique, CFIA responses are flexible and may differ based on a variety of factors. For example, some disease response protocols are species specific. What follows, therefore, is the general approach to surveillance and segregation after an outbreak of AI in domestic poultry has been confirmed.

Quarantines restricting the movement of poultry and poultry products are placed on infected premises, poultry operations located in the vicinity of infected premises and other poultry operations that may have had contact with infected premises. Birds from quarantined premises are tested and monitored for evidence of AI infection

The CFIA may also ask domestic poultry producers to execute a segregation protocol. A segregation protocol seeks to minimize, if not eliminate, potential contact between wild birds and domestic or captive birds in the area after a case of HPAI has been confirmed.

- What to expect if your animals are infected
- Notifiable Avian Influenza Hazard Specific Plan

Vaccination against HPAI

Canada has historically maintained a stamping out policy for HPAI with the goal of achieving disease eradication in poultry and a return to disease-free status. However, the scale and duration of the recent outbreak, along with international movements towards exploring the use of vaccination as an additional tool to fight against HPAI, has prompted Canada to take action. In response, a task force was formed in June 2023 to study the challenges and opportunities for the development and implementation of an HPAI vaccination program.

- Highly Pathogenic Avian Influenza Vaccination Task Force

Date modified:

2023-11-20

Highly Pathogenic Avian Influenza Vaccination Task Force

This is Exhibit "E" referred to in the affidavit of Katrina Jones sworn before me at White Rock this 30 day of January 20 26

Related links

- Avian influenza (bird flu)
- Latest bird flu situation in Canada
- Detections of highly pathogenic avian influenza in Canada
- Overview of how Canada prevents, prepares and responds to bird flu outbreaks
- Fact Sheet – Avian Influenza

The Highly Pathogenic Avian Influenza (HPAI) Vaccination Task Force is dedicated to studying the challenges and opportunities for the development and implementation of an HPAI vaccination program.

This task force serves as a forum for discussion and information sharing that brings together insights from veterinarians, experts from academia, industry representatives and government representatives on issues relating to the potential use of vaccination against HPAI in Canada.

Background

The recent outbreak of H5N1 HPAI has resulted in the deaths of hundreds of millions of domestic and wild birds throughout the globe. HPAI has occurred in areas of the world where it had never occurred previously, such as countries in Central and South America. In Canada, millions of birds have been impacted since December 2021.

Canada has historically maintained a stamping out policy for HPAI with the goal of achieving disease eradication in poultry and a return to disease-free status. However, the scale and duration of this outbreak, along with international movements towards exploring the use of vaccination as an additional tool to fight against HPAI, has prompted Canada to take action. 70

In response, this task force was formed in June 2023 building on what has been done to date to bring government, experts and stakeholders together for discussion and consensus building regarding the potential use of vaccination against HPAI in Canada. The task force also informs the Canadian Food Inspection Agency's (CFIA) decision making process regarding the potential implementation of a vaccination program.

Topics of discussion

The task force is exploring whether Canada would benefit from a vaccination program. Topics of discussion include and are not limited to:

- availability of effective vaccines
    - what vaccines are available, for which species
- implementation considerations
    - logistics
    - roles and responsibilities of government, industry and veterinarians in a roll-out
- approaches for surveillance
    - requirements for differentiating infected from vaccinated animals (DIVA) methodology
    - how to meet surveillance requirements set by key trading partners

- trade implications
    - assessing potential trade implications that could result from vaccination, particularly for Canada's export markets
- identifying cost and benefits
    - cost of vaccines per dose
    - administration of vaccine
    - surveillance
    - assessment of economic costs and benefits to industry and government
    - cost and responsibility sharing
- knowledge exchange and identifying data gaps
    - international experiences/lessons learned
    - results of field trials
    - identifying Canadian-specific research needs
- any other considerations that may be relevant to the work of the task force
    - identification of any challenges or barriers, opportunities, and lessons learned

Looking ahead

- The HPAI Vaccination Task Force may inform:
    - policies or strategies developed by the CFIA that would outline conditions for vaccination in Canada, including which species to vaccinate in which region(s) in the event of HPAI vaccination
    - design and implementation of a potential vaccination program

Members

The task force is co-chaired by the CFIA and an industry representative.

Co-chairs

- Dr. Mary Jane Ireland, Chief Veterinary Officer for Canada, Canadian Food Inspection Agency
- Phil Boyd, Executive Director, Turkey Farmers of Canada

Members include industry representatives, veterinarians, academia experts and government representatives:

- Agriculture and Agri-food Canada
- Animal Health Canada
- Canada's Accredited Zoos and Aquariums
- Canadian Association of Poultry Veterinarians
- Canadian Food Inspection Agency
- Canadian Hatching Egg Producers
- Canadian Poultry and Egg Processors Council
- Canadian Poultry Genetics Exporters Association
- Canadian Veterinary Medical Association
- Chicken Farmers of Canada
- Egg Farmers of Canada
- Environment and Climate Change Canada
- Équipe québécoise de contrôle des maladies avicoles (EQCMA)
- Provinces and territories / Council of Chief Veterinary Officers
- Public Health Agency of Canada
- Representative of duck veterinarians
- Representatives of genetics / breeding sector
- Turkey Farmers of Canada
- University of Guelph

Additional information

- Animal Health Offices

Date modified:
2024-06-11

2.7 Immunity

2.7.1 Active

Infection with, or exposure to, AI viruses, as well as immunization with vaccines, stimulates an antibody response at both the systemic and the mucosal levels. A systemic Immunoglobin M response by five days post-infection is followed shortly by an Immunoglobin G response. The intensity of the antibody response varies with bird species, in the following order (from most intense to least):

1. chickens;
2. pheasants;
3. turkeys;
4. quail; and
5. ducks.

Antibodies against the surface proteins are neutralizing and protective. Protection has been primarily associated with antibodies directed to the HA protein; however, the presence of either HA or NA antibodies, or both, prevents clinical signs and death following challenge with HPAI viruses having homologous HA or NA subtypes. The level of protection against mucosal infection and subsequent shedding of the challenge virus may depend on the degree of sequence similarity in the HA of vaccine and challenge virus. The duration of protection is variable and depends on many factors, but in laying hens, protection against clinical signs and death has been demonstrated to be at least 30 weeks following a single immunization.

Immune response against internal proteins has not been shown to prevent clinical signs or death, but may shorten the period of virus replication and consequently reduce the shedding.

2.7.2 Passive

Studies on protection by maternal antibodies from homologous HA or NA have not been reported, but based on the available information about other viral avian diseases, protection against clinical signs and death from a homologous AI viral challenge is probable for the first two weeks after hatching. For surveillance purposes, the WOAH suggests that maternal antibodies derived from a vaccinated parent flock are usually found in the yolk and can persist in progeny for up to four weeks.

2.7.3 Vaccination

The modernized approach of the WOAH and the scientific community regarding AI vaccination makes vaccine use more acceptable. Vaccination has been used in various poultry species, and its effectiveness in preventing clinical signs and mortality is well documented. Developed countries should aim for eradication without the use of vaccines when facing a NAI outbreak. As part of preparedness for a disease outbreak, countries should identify available sources of NAI vaccines in advance.

This is Exhibit "F" referred to in the
affidavit of Katrina Jones
sworn before me at Whitehorse
this 30 day of January 2025

Open and Transparent Agency Policy

This is Exhibit G referred to in the affidavit of Katrina Jones sworn before me at White Rock this 30 day of January 20 25

On this page

1. Background

2. Policy Statement

3. Objectives

4. Scope

5. Authorities

6. Guiding Principles

7. Requirements

8. Exceptions

9. Roles and Responsibilities

10. References

11. Monitoring and Reporting

12. Inquiries

13. Effective Date

Annex 1: Definitions

1. Background

1.1 The CFIA's vision is to excel as a science-based regulator, trusted and respected by Canadians and the international community. To this end, preserving public confidence in the CFIA's (the Agency's) decisions and activities is key to protect its credibility and reputation.

To maintain public trust, the CFIA is committed to providing Canadians with information about its publicly-funded regulatory and scientific activities. Canadians are entitled to this information and it can help them to make informed decisions for themselves, their families, and businesses.

Transparency and openness are key values underpinning the CFIA's activities. As part of its ongoing evolution toward becoming a more responsive and accountable organization, the CFIA initially began to release more information about its decisions and activities in 2011 through its Transparency Agenda.

1.2 This policy represents a refresh to the CFIA's approach to openness and transparency, formalizes Agency practice and provides CFIA direction for implementing the next stage of its Transparency Agenda. This means the Agency will:

1.2.1 build on and expand existing transparency practices realized since the Transparency Agenda was first implemented

1.2.2 undertake new practices in order to keep pace with evolving public expectations influenced by transparency initiatives of other regulators both in Canada and around the world

1.2.3 proactively identify opportunities to make information– such as reports, documents, decisions and data – publicly available throughout the lifecycle of the Agency's programs and activities

1.2.4 embed openness and transparency into our programs, decisions and activities whenever possible by building them in from their inception as part of attaining the Agency's vision of becoming open by design

1.3 These practices and the CFIA's commitment to disclosing relevant information to its stakeholders go hand in hand with the direction taken by the Government of Canada's Open Government and Open Science initiatives.

1.4 This policy provides direction to CFIA employees in line with its obligations to comply with Treasury Board Secretariat of Canada (TBS) requirements to maximize release of data and information of business value to stakeholders. It should be read alongside the TBS Directive on Open Government, which provides mandatory Government of Canada requirements to become open by default, and in turn influences the CFIA's goal of becoming open by design.

2. Policy statement

The CFIA is open by design and releases relevant, accurate, and timely information to stakeholders about its regulatory and scientific activities, decisions, programs and services.

3. Objectives

The objectives of this policy are to:

3.1. preserve trust in Canada's regulatory system for food, plants and animals, by demonstrating visible and public accountability for delivery of the CFIA's regulatory programs and services

3.2. better inform Canadians about the CFIA's mandate to protect Canada's food, plants and animals, and provide information that will enhance their ability to make informed decisions for themselves, their families and their businesses

3.3. contribute to a fair, competitive business environment for regulated parties by providing tools to clarify industry's role in meeting regulatory requirements and information about compliance outcomes

3.4. provide consistent direction to all CFIA employees and clarify the important role they will play in supporting the Agency to deliver on its commitment to be open by design

4. Scope

This policy applies to the following:

4.1 All CFIA employees as well as temporary, and term staff

4.2 Contractors and students engaged by the Agency, subject to the terms and conditions of their contract

4.3 All CFIA information, except that which will not be disclosed in line with section 8 of this policy and other requirements of the *Access to Information Act* and *Privacy Act*

5. Authorities

This policy supports CFIA compliance with mandatory Government of Canada requirements issued by TBS under section 7 of the *Financial Administration Act*.

Relevant legislation relating to release of Government information is as

follows:

- *Access to Information Act*
- *Official Languages Act*
- *Privacy Act*

6. Guiding principles

The CFIA's Transparency Agenda is:

Open by Design

- Openness and transparency are integrated throughout the entire lifecycle of CFIA programs, policies, services and enabling technologies. From inception, consideration is given to how information generated will be publically released

User-Centric

- Relevant, accurate, and timely information is shared proactively with stakeholders, without waiting for an access to information request
- Context is provided so that both potential possibilities and limitations of use are clearly communicated

Inclusive

- Stakeholders and end-users are consulted and engaged as required to ensure openness and transparency initiatives are service-oriented and meet their intended objectives
- The Agency maintains, and is seen as maintaining, its regulatory independence

Diligent

- Consequences and impacts (both positive and negative) of providing information are fully considered and balanced prior to release
- Private and confidential information belonging to individuals and third parties is appropriately protected

Agile

- The CFIA's Transparency Agenda evolves and is responsive both to shifts in public and government expectations and changes in its operating environment as part of ensuring it is sustainably implemented

7. Requirements

7.1 CFIA information must be released in accordance with this policy and any applicable CFIA release procedures

7.2 Information must be released in a timely manner that allows users to derive maximum benefit from them for decision-making purposes

7.3 The CFIA shall prioritize release of information that:

7.3.1 is of high public interest

7.3.2 relates to Agency and Government of Canada priorities

7.3.3 contributes to informed decision making by Canadians about products they consume and/or use

7.3.4 promotes compliance by industry and the public with CFIA regulations

7.3.5 is frequently requested through channels including Access to Information requests, the Government of Canada's Open Government

Portal, informal requests received by the CFIA, media requests, and regular communications between the Agency and its stakeholders during the course of program delivery and engagement activities

7.4 All CFIA staff must continuously consider whether and how key information relating to the Agency's programs and services can be publicly released as part of their design, re-design, and approval

7.5 Open by design features that support transparency must be integrated into new information technology (IT) tools at their inception, built into older systems during upgrades, and be capable of releasing information to the public upon implementation

7.6 Agency information intended for the public must be created using plain language, contextualized, and made understandable by the broadest audience possible, maintaining scientific and technical rigour as appropriate

7.7 The CFIA organizes information that is released logically, visibly, in a downloadable format and accessible location that facilitates access by stakeholders

7.8 To facilitate release, information generated by CFIA programs and services must be created, stored and managed in compliance with approved information management (IM) and data management (DM) standards

7.9 Information posted to the CFIA website as a dataset must also be formatted in a machine-readable format and made available on the Government of Canada's Open Data Portal as an open dataset

7.10 Outcomes and outputs of initiatives that are part of the CFIA's Transparency Agenda, once completed and made publicly available:

7.10.1 shall, in consultation with and at the discretion of the Communications and Public Affairs Branch, be accompanied by any appropriate communications to inform stakeholders of their availability, including details such as where and how they may be accessed

7.10.2 if accompanied by formal communications, must be framed as part of the broader narrative about the Agency's openness and transparency objectives, through a business-line lens

7.11 Information that is confirmed to contain personal and/or confidential information must undergo further analysis to determine if it can be re-formatted or redacted to enable release

7.12 Decisions made not to release information that supports the objectives of this policy must be documented and include a rationale that references key considerations based on policies, standards and legislation as appropriate

7.13 Documentation noted in section 7.12 must be formatted and stored in a way that it can be made available upon request as part of facilitating reviews of the Agency's approach to openness and transparency, including those that may be initiated under section 11.1 of this policy

8. Exceptions

The CFIA may not disclose information that contains personal and/or confidential information. This includes and is not limited to information that:

8.1 is personal in nature or could lead to the identification of an individual or other people

8.2 belongs to third parties and is considered confidential business information

8.3 would harm the CFIA's ability to enforce its legislation, such as information about specific investigative techniques and investigations in progress

8.4 is scientific or technical information obtained through research and is awaiting publication, and if disclosed could reasonably be expected to deprive the employee of priority of publication

8.5 contains advice or recommendations developed for Ministers and/or Cabinet, and that are protected by the convention of Cabinet confidence

8.6 may harm relations or negotiations with any international, indigenous, provincial, territorial or municipal government

8.7 may threaten the safety of a person or present a risk to the security of any property or system

9. Roles and responsibilities

9.1 The CFIA President:

- Provides leadership on development of a culture of open by design at all levels throughout the Agency
- Incorporates commitments related to openness, transparency, and open by design into performance agreements of the Agency's senior management cadre, or other methods and instruments as appropriate as part of fostering this culture

9.2 Vice Presidents and special officers:

- Promote a culture of open by design within their branches and

organizations by clearly communicating expectations to employees and expected outcomes 84

- Verify that the requirements of this policy are met in Branch initiatives, programs and activities
- Apply a One Agency lens, ensuring that requirements of this policy are integrated into initiatives considered by CFIA Governance
- Ensure that the requirement to build in open by design to CFIA programs, services and initiatives is accounted for when developing budgets and allocating resources

9.3 The Digital Services Branch:

- Defines standards and guidelines for building openness and transparency into the CFIA's information management (IM) and information technology (IT) solutions to facilitate release of information to the public
- Includes or incorporates requirements for openness and transparency in specifications for IT system solutions
- Collaborates with CFIA groups to design and build system solutions that take into account these requirements for openness and transparency throughout the information lifecycle

9.4 Executives and Program Managers:

- Apply and promote the principles and requirements in this policy to their work units and identify eligible information for release
- Responsible for developing and documenting decisions within their group to comply with section 7.12 of this policy
- Ensure that human and financial resources to support openness and transparency elements of work undertaken by their units are considered and integrated into workplans and budgets

9.5 All CFIA employees:

- Apply the guiding principles and requirements of this policy to their day-to-day work
- Continuously seek to identify information and/or changes to business processes that will help the Agency attain its vision of being open by design

9.6 Legal Services and Access to Information and Privacy (ATIP – Integrity and Redress Secretariat):

- Assess the implications of proactively posting information under existing laws and advise that Agency practices comply with legal requirements
- Provide advice and options as to how information that cannot be released due to valid exceptions including confidentiality, privacy and security implications, can be redacted, edited or reshaped into a compliant format

10. References

10.1 Related policies and direction

Government of Canada

- Policy on Communications and Federal Identity
- Cabinet Directive on Regulation

Treasury Board of Canada Secretariat

- Policy on Access to Information
- Policy on Results
- Directive on Open Government
- Directive on Recordkeeping

- Canada's 2018-2020 National Action Plan on Open Government

Canadian Food Inspection Agency

- Stakeholder Engagement Framework
- Compliance Promotion Communications Framework
- Science Branch Scientific Publication Policy
- Consultation Policy and Framework
- CFIA Recorded Information Management Policy
- Information Governance and Information Management Roles and Responsibilities Directive
- Open Government Implementation Plan (OGIP)

10.2 Related Resources for CFIA employees

- Open & Transparent Agency Policy – Guidance Document for staff (in development)
- CFIA Open Government Portal Dataset Publishing Procedure

11. Monitoring and Reporting

11.1 The Program Policy Integration Division (PPID) in Policy and Programs Branch is responsible for maintaining this policy, and reviewing it every five years, or earlier if changes are made to any of the following:

11.1.1 The 2014 TBS Directive on Open Government

11.1.2 Changes to the *Access to Information* and/or *Privacy Act*, including any changes in common law as interpreted by the courts

11.1.3 Changes to CFIA legislation and regulations

11.2 Results of reviews conducted under section 11.1 will be reported to

the Agency's Information Governance Committee (IGC), chaired by the CIO/IMSO delegate, the CFIA's Chief Data and Risk Officer in the Digital Services Branch (DSB), and to Program and Policy Management Committee (PPMC) as required for information

87

12. Inquiries

Send questions or comments about this policy:

- **By e-mail:**
  transparency.transparence@inspection.gc.ca
- **By mail:**
  Director
  Program Policy Integration Division
  Policy Branch
  Canadian Food Inspection Agency
  1400 Merivale Road
  Ottawa, ON, Canada K1A 0Y9

13. Effective Date

This policy replaces the CFIA's 2013 policy on Transparency in Regulatory Decision Making and comes into effect May 1, 2019.

Annex 1: Definitions

Confidential Business Information (CBI):
As defined in section 20 of the *Access to Information Act*.

Data:
Digital structured information residing in fixed fields, such as relational

databases or spreadsheets, raw facts, and statistics with no specific context.

Information:

Is comprised of both structured (data) and unstructured (records) resources. Records are electronic and physical unstructured information such as documents, web pages, media and print. Data are electronic, structured information in fixed fields such as relational databases.

Open by default:

An organizational culture that favours disclosure over non-disclosure - A broad principle that favours releasing government information of value to Canadians, with information being withheld only for necessary privacy, confidentiality and security reasons.

Open by design:

Refers to strategies that are used to ensure that openness and transparency considerations are deliberately and thoughtfully hard-wired into the design phase of all CFIA programs and services, and integrated when improvements are made to existing ones.

Open government:

A governing culture that holds that the public has the right to access the documents and proceedings of government to allow for greater openness, accountability, and engagement.

Open science:

A commitment related to Open Government that seeks to maximize access to federally funded scientific research to encourage greater collaboration and engagement with the scientific community, the private sector, and the public.

Openness:

Receptive to free exchange of information, communications, change and new ideas as part of seeking excellence and continual improvement in

design and delivery of programs and services.

Personal information:

As defined in section 3 of the *Privacy Act*

Plain language:

Writing that is clear, concise, well-organized and formatted in a way that maximizes the chance that the reader will quickly find the information they need, understand it the first time they read it, and then be able to take any appropriate action based on that understanding.

Record:

Digital and physical unstructured information, such as e-mail messages, Word documents, web pages, media and print – data that has been interpreted and organized, adding context and meaning.

Release:

Make publicly available online in a downloadable format.

Relevant:

Addresses and is responsive to a demonstrable need, and/or communicates information about a program, policy or other entity that is a government priority or a federal responsibility.

Stakeholder:

An entity either internal or external to the CFIA that has an interest in the Agency's programs and services, or their related activities, resources or deliverables, such as regulated parties, individual companies and representative industry associations, academia, Canadians, consumers, and other levels of government.

Timely:

Information is made available within a timeframe that will maximize its usefulness to users.

Transparency:

Proactively providing relevant, accurate and timely information to the public to demonstrate accountability for delivery of programs and services, as part of supporting the right of Canadians to government information.

Date modified:

2023-12-14

This is Exhibit "14" referred to in the
affidavit of Katrina Jones
sworn before me at Whitehorse
this 30 day of January 20 25

CFIA's Policy for Providing Guidance on Regulatory Requirements

This policy outlines the commitments, practices, and tools applied by the Canadian Food Inspection Agency (CFIA) when providing Canadians and businesses with information and guidance on meeting regulatory obligations. It also identifies the conditions under which the CFIA will provide written responses to enquiries.

Agency context

The CFIA's core responsibility is to protect Canadians by safeguarding Canada's food system and the plant and animal resources on which we depend, and supporting the Canadian economy through the trade of Canadian goods.

The CFIA is committed to being fair and consistent in the application of regulations. The CFIA will, to the extent possible, endeavour to provide information to assist regulated parties and stakeholders in understanding their regulatory obligations. The following describes the CFIA's commitments in the areas of building awareness of regulatory requirements, responding to enquiries, service and stakeholder engagement.

Plain language commitment

- The CFIA (Canadian Food Inspection Agency) commits to have its regulations and guidance documents drafted in as plain language [1] as possible, limiting the use of specialized or technical language to those instances where it is necessary
- The CFIA (Canadian Food Inspection Agency) is committed to the publication of Frequently Asked Questions (FAQs) for all new or amended regulations that have business impacts. The CFIA (Canadian Food Inspection Agency) has posted FAQs (Frequently Asked Questions) for its most accessed regulations [2] to its website
- The CFIA (Canadian Food Inspection Agency) is committed to publishing FAQs (Frequently Asked Questions) for the areas of improvement identified through stakeholder check-ins, as well as for recurring questions

Building an awareness of regulatory requirements

- The CFIA (Canadian Food Inspection Agency) is committed to communicating regularly with Canadians and its stakeholders to promote awareness and understanding of regulatory compliance requirements, through compliance promotion activities and use of

online consultation/surveys, webinars and town halls, to facilitate the continual development of regulations and guidance tools

- The CFIA (Canadian Food Inspection Agency) is committed to developing products, such as guidance material, that are adapted to the needs of each regulated sector
- The CFIA (Canadian Food Inspection Agency) is committed to improving the accessibility of information regarding regulations and policies for regulated parties by making greater use of centralized services where there is a benefit to regulated parties. For example, the CFIA (Canadian Food Inspection Agency) is making regulatory guidance documents more accessible to stakeholders through its online Guidance Document Repository, a single repository for all guidance documents

Responding to enquiries

- The CFIA (Canadian Food Inspection Agency) is committed to responding to inquiries by stakeholders and Canadians in, to the extent possible, plain language, and in a clear, consistent and professional manner, in the official language of inquirer's choice in accordance with the requirements found in the *Official Languages Act* (OLA), and the Agency's Policy on Official Languages, in the form that the enquiries are made, either orally or written, or as appropriate
- The CFIA (Canadian Food Inspection Agency) commits to responding to enquiries in a timely manner. The CFIA (Canadian Food Inspection Agency) strives to acknowledge receipt of enquiries within five business days. The CFIA (Canadian Food Inspection Agency) does not provide legal advice to third parties about how specific regulations may apply to particular circumstances
- FAQs (Frequently Asked Questions) addressing recurring enquiries are posted to the CFIA (Canadian Food Inspection Agency)'s website

Service

Commitment to professional service

- The CFIA (Canadian Food Inspection Agency) is committed to provide timely, professional, courteous, impartial and respectful service, in both official languages as appropriate. A modern, digital service strategy is a key priority at the CFIA (Canadian Food Inspection Agency)
- As a science-based regulator, the CFIA (Canadian Food Inspection Agency) commits to service excellence and ensuring industry understands its role, responsibilities and accountabilities through robust compliance promotion activities, and standardized,

modern and user-friendly services. The CFIA (Canadian Food Inspection Agency) strives for continuous improvement in its processes and practices

Accountability

- The CFIA (Canadian Food Inspection Agency) provides services that are consistent with its regulatory obligations. The CFIA (Canadian Food Inspection Agency) has published a Statement of Rights and Service for Producers, Consumers and Other Stakeholders , as well as six accompanying guides to inspection to offer stakeholders and CFIA staff a clear, plain language explanation of the CFIA (Canadian Food Inspection Agency)'s commitment to:
  - transparent decision making
  - accessible and timely information
  - fair, respectful and unbiased interactions with stakeholders; and
  - responsiveness and continuous improvement
- To support continuous improvement to regulatory program delivery, transparency and predictability, the Complaints and Appeals Office provides an avenue for stakeholders to register complaints and appeals related to quality of service, administrative errors and regulatory decisions

Staff training

- The CFIA (Canadian Food Inspection Agency) continues to support employees by providing them with the necessary training to deliver high quality, professional services and to provide accurate, consistent and up-to-date information on regulatory requirements

Stakeholder engagement

As a regulator, the CFIA (Canadian Food Inspection Agency) engages with stakeholders, including the following groups:

- Regulated parties: individual companies and, in some cases, academia, including Official Language Minority post-secondary institutions, and government institutions, including Industry Value Chain Round Tables and Industry led Advisory committees
- Non-governmental organizations: representative industry associations and groups, and other non-governmental organizations
- Indigenous and other cultural groups
- Canadians: including consumers and consumer associations and groups, and other non-regulated parties such as micro and small businesses

- Other federal government departments and other levels of government: provincial, territorial and municipal governments, as well as established Federal/Provincial/Territorial mechanisms
- International stakeholders: foreign governments, international organizations
- Official Languages Minority Community (OLMC) organizations and industry groups.

Commitment to stakeholder engagement

- The CFIA (Canadian Food Inspection Agency) is committed to transparency, through the ongoing application of the Agency's Transparency in Regulatory Decision Making Policy
- The CFIA (Canadian Food Inspection Agency) is committed to engaging and consulting with Canadians and other stakeholders, as appropriate, to understand their perspectives on significant regulatory, policy and program issues that impact them. To develop effective policies and strategies, the CFIA (Canadian Food Inspection Agency) actively seeks out and values the perspectives of stakeholders who are affected by its decisions [3]

Stakeholder engagement practices

- The CFIA (Canadian Food Inspection Agency) engages regularly with its stakeholders through a variety of mechanisms in the regulatory development process. The CFIA (Canadian Food Inspection Agency)'s Consultation Policy and Framework aims to improve transparency and reduce duplication of efforts through an integrated, coordinated and consistent consultation and engagement process. As example, to foster ongoing dialogue, the CFIA (Canadian Food Inspection Agency) further leverages stakeholder involvement through:
  - Industry Value Chain Round Tables
  - Industry led Advisory committees
  - Federal/Provincial/Territorial mechanisms
- The CFIA (Canadian Food Inspection Agency) take proactive measures to consult with Official Languages Minority Community organizations, where appropriate, and in keeping with its obligations under Part VII (7) of the *Official Languages Act* related to the advancement of English and French
- Consultation opportunities can be found on CFIA (Canadian Food Inspection Agency)'s website and the Consulting with Canadians page on the website of the Government of Canada
- Stakeholders are also made aware of consultation opportunities through posting of the Forward Regulatory Plan on CFIA (Canadian Food Inspection Agency)'s website

- In addition to consultations, issues and concerns raised by regulated and non-regulated parties during ongoing contact are considered in the development of related materials and other additional outreach activities

Inquiries

For interpretation, clarification or inquiries regarding this policy please contact:

Director,
Regulatory, Legislative and Economic Affairs Division
Policy and Regulatory Affairs Directorate
Policy and Programs Branch
cfia.legislation-legislation.acia@inspection.gc.ca

Footnotes

1 Communications Policy of the Government of Canada

2 "Most accessed regulations" was determined by the number of times a regulation was accessed on Department of Justice's website in FY (fiscal year) 2013/2014.

3 Canadian Food Inspection Agency's Statement of Values

Date of last revision of this policy

2019-03-14

For more information

All of the government's Acts and Regulations can be found on the Justice Laws website.

Consult the following for links to the **Cabinet Directive on Regulation** and supporting policies and guidance, and for information on government-wide regulatory initiatives implemented by departments and agencies across the Government of Canada:

- Federal regulatory management
- Learn more about regulatory cooperation

To learn about upcoming or ongoing consultations on proposed federal regulations, visit:

- Consulting with Canadians
- *Canada Gazette*

Date modified:
2019-04-03

Field-ready lateral flow test for avian influenza

From: Innovation, Science and Economic Development Canada



The Canadian Food Inspection Agency (CFIA) is seeking an easy-to-use, rapid, and affordable lateral flow test to detect Avian Influenza (AI) and at the same time, H5 and H7 subtypes, with the same sensitivity and specificity as current molecular diagnostic tests used in the CFIA laboratory.

Challenge sponsor:
Canadian Food Inspection Agency (CFIA)

Funding mechanism:
Grant

Opening date:
August 30, 2023

Closing date:
October 11, 2023, 14:00 Eastern Time

This is Exhibit "I" referred to in the affidavit of Katrina Jones sworn before me at White Rock this 30 day of January 2025

Log in to view your submissions

Prospective applicants should refer to the Innovative Solutions Canada Grant Instructions and Procedures.

▼ Challenge

Problem statement

Avian influenza (AI), commonly known as "bird flu", is a contagious viral disease that primarily affects birds, particularly poultry. AI viruses are classified into 2 categories: low pathogenicity (LPAI) and high pathogenicity (HPAI) viruses, based on the severity of the illness caused in gallinaceous poultry. Wild birds, such as waterfowl and shorebirds, are natural reservoirs for influenza viruses, and the migration of these birds can lead to the spread of these viruses

across territorial boundaries. In humans, transmission can occur through close contact with infected birds or heavily-contaminated environments. In addition, on rare occasions, the HPAI virus can cause illness and sometimes death in humans.

The Canadian Food Inspection Agency (CFIA) has been actively addressing the current HPAI outbreak that began spreading within Canada starting in late 2021. HPAI infections in chickens and other flocks pose a threat to the poultry industry, leading to significant economic losses as infected birds may need to be culled to prevent the further spread of the disease. In 2022, exports of chicken and turkey were down by 32.3% and 8.7%, respectively compared to 2021 [1].

AI is currently diagnosed in CFIA laboratories by molecular methods that detect the genome of the virus using different types of real-time reverse transcriptase polymerase chain reaction (rRT-PCR) assays. Although these diagnostic tests are highly sensitive and specific, they are not easy to perform in the field causing a delay in generating results to farm staff in the field in a timely and accessible manner. This creates challenges when trying to rapidly and efficiently respond to an outbreak.

It has been demonstrated that lateral flow assays are able to detect different pathogens, including AI; however, the current lateral flow technology is not an appropriate substitute for rRT-PCR tests. The lack of sensitivity and specificity of current lateral flow tests are critical factors preventing these tests from being deployed and used in the field for diagnostic purposes.

This challenge aims to develop an easy-to-use, rapid, and affordable lateral flow test to detect AI and at the same time, H5 and H7 subtypes, with the same sensitivity and specificity as current molecular diagnostic tests used in the CFIA laboratory. The development of this technology would equip farmers, veterinarians, and CFIA inspectors with an easy-to-use tool to test animals for AI, which in turn could support the early detection of disease to help control and stop the spread of the disease.

Desired outcomes and considerations

Essential (mandatory) outcomes

The proposed solution must:

1. Be a lateral flow device that detects all avian influenza viruses in a oropharyngeal and cloacal swabs using the conserved regions of influenza A (e.g. nucleoprotein or matrix segments)
2. Be able to identify subtype H5 and H7 avian influenza viruses
3. Have a sensitivity approaching a cycle threshold range of 32 to 35, matching molecular assays (rRT-PCR assays) currently used for diagnostics

4. Have reliability and repeatability with high specificity similar to rRT-PCR assays
5. Provide a reliable qualitative signal (minimal probability of false positives and false negatives of > 2% indicating virus presence when concentrations are below a cycle threshold of 32per sample)
6. Have robust capacity to operate and produce results under varied temperature conditions (i.e. 5-35 degrees Celsius)
7. Be of a size and weight that makes the unit portable by a single individual for field use
8. Must be user-friendly (easy to use without any technical training or be used by non-experts)
9. Must be able to generate results in 30 minutes or less from the time of nasal swab acquisition
10. Be more cost-effective then molecular testing performed in a reference laboratory (not exceeding $20/test)

Additional outcomes

The proposed solution should:

1. Be suitable to identify the presence of influenza A virus antigen in animal tissue homogenate (e.g. gastrointestinal tract or nervous tissue)
2. Provide a reliable secondary or alternative qualitative signal when virus presence is below a cycle threshold of 32 in a sample
3. Provide a reliable signal intensity which increases in correlation with increased virus concentrations within the sample

Background and context

Avian influenza (AI), commonly known as "bird flu", is a contagious viral infection that can affect several species of commercial poultry species, as well as domestic and wild birds. AI viruses can be classified into 2 categories: low pathogenicity (LPAI) and high pathogenicity (HPAI) viruses, based on the severity of the illness caused in gallinaceous poultry species. Most AI viruses are low pathogenicity—these typically cause little or no signs of illness in infected birds. However, high pathogenicity AI viruses can cause severe illness and mortality in birds.

AI viruses are divided by subtypes based on 2 glycoproteins found in the surface of the virus: hemagglutinin, or "H" protein, and neuraminidase, or "N" protein. There are 16 H types and 9 N subtypes, leading to a total of 144 combination of possible virus subtypes. The H5 and H7 virus subtypes are of particular concern, given their ability to mutate from low to high pathogenicity after they infect gallinaceous poultry species. These 2 H-subtype viruses have been known to cause serious disease or mortality in domestic poultry, yet low pathogenic H5 and H7 viruses are quite common in wild waterfowl.

Avian influenza viruses have evolved into two phylogenetically different lineages (North

American and Eurasian) owing to natural geographic barriers, and separate distribution and migration of waterfowl. In a rare situation, these viruses can move across these barriers along continental margins in the Pacific and Atlantic parts of Canada where some of the migratory flyways overlap. As a result, exchange of gene segments from viruses belonging to both lineages or dispersal of complete genetically diverse strains takes place. For example, the H5N1 strain that has been reported in various parts of Europe is distinctly different from the Asian strain. In Canada, HPAI and low pathogenicity H5 and H7 avian influenza viruses are a reportable disease under the Health *of Animals Act* [2]. All cases must be reported to the CFIA.

HPAI (e.g., H5N1) outbreaks pose a significant risk on Canada's poultry industry and can have widespread consequences including high rates of poultry mortality, culling of birds to control the spread of disease, and impacts on producers' ability to export their animals. In addition, some HPAI virus strains like the A/Goose/Guangdong/1/1996 (GsGD linage) H5NX viruses can have effects on wildlife – mortality has been observed in a broad range of species ranging from wild birds, with sporadic spill over to domestic and wild carnivore mammals such as dogs and cats—to skunks, foxes, and marine mammals (dolphins and seals).

The current gold-standard for infectious disease diagnostics, including AI, requires laboratory confirmation of the disease. The National Centre for Foreign Animal Disease (NCFAD) in Winnipeg is a World Organisation for Animal Health (WOAH) reference laboratory for AI. This is where AI detections in Canada are confirmed by molecular methods (rRT-PCR) followed by virus isolation and genome sequencing. As a first step, a rRT-PCR assay is used to detect the presence of avian influenza genetic material is present in the clinical sample. If present, an additional rRT-PCR assay that target the presence of H5 and H7 proteins is conducted. The presence of either of either viral subtype triggers further molecular testing to confirm the presence of a HPAI or LPAI strain. Although rRT-PCR assays are scientifically robust, they are labour intensive and require expensive laboratory equipment. In addition, the process is time-consuming; samples must be transported to the laboratory followed by testing, a process which can take over 4 hours to generate results. The current approach does not give farm staff real-time accurate information about their flocks and therefore, they can not make informed decisions.

There is a growing need to develop a rapid, user-friendly and cost-effective diagnostic test kit that could be used on the field by a range of users including farm staff and veterinarians. Access to these types of test kits would help with the early and rapid detection of the disease and/or outbreaks, thus allowing farm staff to quarantine their animals quickly, ultimately helping to reduce disease spread.

References

1 Page 1 – Criteria – 066 Annual Poultry Export/Import Report – Monthly Breakdown with Prior Year Comparison – Agricultural Industry Market Information System (AIMIS)

2 FactSheet – Avian Influenza – Canadian Food Inspection Agency

▼ **Maximum grant value and travel**

Multiple grants could result from this challenge.

Phase 1:

- The maximum funding available for any Phase 1 Grant resulting from this Challenge is : $150,000.00 CAD
- The maximum duration for any Phase 1 project funded by a grant resulting from this Challenge is up to 6 months
- Estimated number of Phase 1 grants: 2

Phase 2:

- The maximum funding available for any Phase 2 Grant resulting from this Challenge is : $1,000,000.00 CAD
- The maximum duration for any Phase 2 project funded by a grant resulting from this Challenge is up to 24 months
  - Note: Only eligible businesses that have completed Phase 1 could be considered for Phase 2.
- Estimated number of Phase 2 grants: 1

Note: Selected companies are eligible to receive one grant per phase per challenge.

This disclosure is made in good faith and does not commit Canada to award any grant for the total approximate funding. Final decisions on the number of Phase 1 and Phase 2 awards will be made by Canada on the basis of factors such as evaluation results, departmental priorities and availability of funds. Canada reserves the right to make partial awards and to negotiate project scope changes.

Travel

No travel is anticipated. The kick-off meeting and final review meeting will have the flexibility of being by telephone or videoconference.

Kick-off meeting

All communication will take place by telephone or videoconference.

Progress review meeting(s)

Any progress review meetings will be conducted by telephone or videoconference.

Final review meeting

All communication will take place by telephone or videoconference.

▼ Eligibility

Solution proposals can only be submitted by a small business that meets all of the following criteria:

- for profit
- incorporated in Canada (federally or provincially)
- 499 or fewer full-time equivalent (FTE) employees *
- research and development activities that take place in Canada
- 50% or more of its annual wages, salaries and fees are currently paid to employees and contractors who spend the majority of their time working in Canada *
- 50% or more of its FTE employees have Canada as their ordinary place of work *
- 50% or more of its senior executives (Vice President and above) have Canada as their principal residence *

* Calculations must take into account and include affiliated businesses, such as parent companies and subsidiaries, that are either in or outside of Canada.

▼ Evaluation criteria

The applicant must complete the Challenge Stream Electronic Submission Form with a degree of information sufficient to enable Canada's assessment of the proposal against the criteria and the Evaluation Schema. The information must demonstrate how the proposal meets the criterion.

Part 1: Mandatory Criteria

Proposals must meet all mandatory criteria identified by achieving a "Pass" in order to proceed to Part 2. Proposals that do not meet all mandatory criteria will be deemed non-responsive and given no further consideration.

Mandatory Criteria

(Applicant's proposal must address)

Question 1 a: Scope

Describe the proposed solution and demonstrate how it responds to the challenge. Include in your description the scientific and technological basis upon which the solution is proposed and clearly demonstrate how the solution meets all of the Essential (Mandatory) Outcomes (if identified) in the Desired Outcomes section in the Challenge Notice.

Evaluation Schema (Mandatory - Pass/Fail)

Pass

The Applicant's proposed solution is clearly articulated, within the scope for the challenge and addresses all Essential (Mandatory) Outcomes (if identified) in the Challenge Notice.

Fail

The proposed solution is articulated as out of scope for the challenge.
OR
The proposal does not clearly demonstrate how the proposed solution addresses all Essential Outcomes listed in the challenge.
OR

The proposed solution is poorly described and does not permit concrete analysis.
OR
There is little to no scientific and/or technological evidence that the proposed solution is likely to meet the challenge.

Question 2: Current Technology Readiness Level (TRL)

- Indicate the current TRL of the proposed solution. (Drop Down Menu of the Challenge Stream Electronic Submission Form)
- Describe the research and development activities that have taken place to bring the proposed solution to the stated TRL.

Evaluation Schema (Mandatory - Pass/Fail)

Pass: The Applicant has demonstrated that the proposed solution is currently between TRLs 1 and 6 (inclusive), and provided justification by explaining the research and development (R&D) that has taken place to bring the solution to the stated TRL.

Fail: The Applicant has not provided sufficient evidence to demonstrate that the current TRL is between 1 to 6 (inclusive) including:

- *There is insufficient/no evidence provided for TRL judgment.*
- *The solution involves the development of basic or fundamental research.*
- *The solution is demonstrated at TRL 7 or higher.*
- *Insufficient/unclear/no justification explaining the R&D that took place to bring the solution to the stated TRL.*
- *The explanation simply paraphrases the description of a given TRL level.*

Question 3a: Innovation

Demonstrate how the proposed solution meets one or more of the ISC definitions of innovation below:

- An invention *, new technology or new process that is not currently available in the marketplace.
- Significant modifications to the application of existing technologies/components/processes that are applied in a setting or condition for which current applications are not possible or feasible.
- An improvement in functionality, cost or performance over an existing technology/process that is considered state-of-the-art or the current industry best practice.

* An "invention" is defined for the purposes of ISC as: "A manufacturing design or any other new and useful improvement that is new or novel, that is, not commonly known or not an obvious derivative of an existing way of doing things."

Evaluation Schema (Mandatory – Pass/Fail)

Pass:

The Applicant has demonstrated that the proposed solution meets one or more of the ISC definitions of innovation.

Fail:

- Applicant has not provided sufficient evidence to demonstrate that the proposed solution meets any of the ISC definitions of innovation; OR
- Applicant has demonstrated that the proposed solution is an incremental improvement, "good engineering", or a technology that would go ahead in the normal course of product development (i.e. the next version or release).

Question 3b: Advance on State of the Art

Describe in detail the competitive advantages and level of advancement over existing technologies. Where appropriate, name existing technologies as well as potential substitutes or competitors.

To demonstrate this, proposals should include the following information:

- Improvements (minor or major) over existing technologies or substitutes. Use direct comparison.
- How the proposed innovation will create competitive advantages in existing market niches or market spaces.

Evaluation Schema (Mandatory Criteria – Pass/Fail + Points)

0 points/Fail:

- The Applicant has not demonstrated that the proposed solution advances the state-of-the-art over existing technologies, including available competing solutions; OR
- The proposed solution improves minimally upon the current state of the art, though not sufficiently enough to create competitive advantages in existing market niches; OR
- The stated advancements are described in general terms but are not substantiated with specific, measurable evidence.

5 points/Pass:

- The Applicant has demonstrated that the proposed solution offers one or two minor improvements to existing technologies, including available competing solutions, that have potential to create competitive advantages in existing market niches.

12 points/Pass:

- The Applicant has demonstrated that the proposed solution offers three or more minor improvements to existing technologies, including available competing solutions, that together are likely to create competitive advantages in existing market niches; OR
- The Applicant has demonstrated that the proposed solution offers one significant improvement to existing technologies that is likely to create competitive advantages in existing market niches

20 points/Pass:

- The Applicant has demonstrated that the proposed solution offers two or more significant improvements to existing technologies, including available competing solutions that are likely to create competitive advantages in existing market niches and could define new market spaces; OR
- The Applicant has demonstrated that the proposed solution can be considered a new benchmark of state of the art that is clearly ahead of competitors and that is likely to define new market spaces

Part 2: Point-Rated Criteria

Proposals must meet the overall minimum pass mark of 50% to be deemed responsive. Proposals that do not achieve the minimum pass mark will be declared non-responsive and given no further consideration.

Point-Rated Criteria

(Applicant's proposal to address)

Question 1b: Scope

Demonstrate the scientific and technological basis of how the proposed solution addresses the *Additional Outcomes* (if identified) in the Desired Outcomes section in the Challenge Notice. If no Additional Outcomes are identified in the Challenge Notice, text entered in this section will not be considered.

If no *Additional Outcomes* are identified in the Challenge Notice, Applicants will receive 10 points.

Evaluation Schema (Point-Rated)

i. Insufficient or no information provided to demonstrate that the solution will address any of the Additional Outcomes. *0 points*
ii. Information provided clearly demonstrates that the solution will address some (<50%) of the Additional Outcomes. *3 points*
iii. Information provided clearly demonstrates that the solution will address most (50% or more) of the Additional Outcomes. *6 points*
iv. Information provided clearly demonstrates that the solution will address all (100%) of the Additional Outcomes. *10 points*

Question 4: Phase 1 Science and Technology (S&T) Risks

Describe potential scientific and/or technological risks to the successful development of the proof of feasibility and how they will be mitigated in Phase 1.

Evaluation Schema (Point-Rated)

i. Insufficient or no information provided to demonstrate that the Applicant has considered potential risks and mitigation strategies and/or information provided

contains significant gaps. *0 points*

ii. Information provided demonstrates that the Applicant has considered some potential risks and associated mitigation strategies but there are minor gaps in risks and/or associated mitigation strategies. *5 points*

iii. Information provided clearly demonstrates that the Applicant has sufficiently considered the risks and defined associated mitigation strategies. *10 points*

Question 5: Phase 1 Project Plan

Demonstrate a feasible Phase 1 project plan by completing the table.

- Indicate if any milestones and activities will be completed concurrently
- Indicate the estimated exit TRL at the completion of Phase 1. (Drop Down Menu of the Challenge Stream Electronic Submission Form)

Evaluation Schema (Point-Rated)

i. Insufficient or no information provided to demonstrate a feasible project plan for Phase 1 and/or the project plan exceeds the maximum duration indicated in the Challenge Notice. *0 points*

ii. Project plan for Phase 1 is conceivably feasible but not clearly demonstrated and/or includes gaps. *10 points*

iii. Information provided clearly demonstrates a feasible project plan for Phase 1. *20 points*

Question 6: Phase 1 Project Risks

Describe potential project risks to the successful development of the proof of feasibility and how they will be mitigated in Phase 1.

Applicants should address the following risks, as applicable:

- Human Resources
- Financial
- Project Management
- Intellectual Property
- Other project-related risks

Note to Applicants: S&T risks should not be included in this section. Question 4 addresses S&T risks.

Evaluation Schema (Point-Rated)

i. Insufficient or no information provided to demonstrate that the Applicant has considered potential risks and mitigation strategies and/or information provided contains significant gaps. *0 points*
ii. Information provided demonstrates that the Applicant has considered some potential risks and associated mitigation strategies but there are minor gaps in risks and/or associated mitigation strategies. *5 points*
iii. Information provided clearly demonstrates that the Applicant has sufficiently considered the risks and defined associated mitigation strategies. *10 points*

Question 7: Phase 1 Implementation Team

Demonstrate how the project implementation team has the required management and technological skill sets and experience to deliver the project plan for Phase 1 by completing the table. A member of the implementation team can have more than one role. 113

Evaluation Schema (Point-Rated)

i. Insufficient or no information provided to demonstrate that the project team has the required management and technological skill sets and experience to deliver the Phase 1 project plan. *0 points*
ii. Information is provided but there are minor gaps in required management and/or technological skill sets and/or experience to deliver the Phase 1 project plan. *10 points*
iii. Information provided clearly demonstrates that the project team has the required management and technological skill sets and experience to deliver the Phase 1 project plan. *20 points*

Question 8: Inclusivity

If your business were to receive funding from Innovative Solutions Canada, describe what actions (e.g., recruitment strategy, internships, co-op placements, etc.) might be taken in Phase 1 to support the participation of under-represented groups (e.g., women, youth, persons with disabilities, Indigenous people, visible minorities) in the research and

development of the proposed solution. Each Applicant in their response to this question must focus only on describing relevant programs, policies, or initiatives that it currently has in place or would put in place to support the R&D effort in Phase 1.

Note: Do not provide any personal information of individuals employed by your company or that of your subcontractors in the response.

Evaluation Schema (Point-Rated)

i. No description and/or concrete examples of actions provided that would be taken to encourage greater participation of under-represented groups. *0 points*
ii. A description and concrete examples of actions to encourage greater participation of under-represented groups provided.*5 points*

Question 9: Phase 1 Financial Proposal

Demonstrate a realistic financial proposal for the Phase 1 project plan by completing the table.

Evaluation Schema (Point-Rated)

i. Insufficient information provided and/or information provided significantly lack credibility. Does not demonstrate a realistic financial proposal for the Phase 1 project plan. *0 points*
ii. Information is provided but some costs lack credibility and/or are unclear for the Phase 1 project plan. 7.*5 points*
iii. Information provided contains credible elements to clearly demonstrate a realistic financial proposal for the Phase 1 project plan. *15 points*

Question 10: Phase 1 Financial Controls, Tracking and Oversight

Describe the financial controls, tracking and oversight that will be used to manage the public funds throughout Phase 1. Applicants should indicate if an individual or firm will be managing the public funds and provide their credentials and/or relevant experience.

Evaluation Schema (Point-Rated)

i. Insufficient or no information provided to demonstrate the Applicant's ability to manage public funds in Phase 1. *0 points*
ii. Information provided is vague and/or contains gaps. The Applicant has some controls, tracking and/or oversight in place to manage the public funds in Phase 1. *5 points*
iii. Information provided clearly demonstrates that the Applicant has strong financial controls, tracking and oversight to manage public funds in Phase 1. *10 points*

Question 11: Phase 2 Overview

Demonstrate a realistic overview for the prototype development plan if selected to participate in Phase 2.

Responses should include:

- key tasks
- estimated cost for materials
- human resources
- project risks and mitigation strategies

Note: A more detailed proposal will be requested if selected to participate in Phase 2.

Evaluation Schema (Point-Rated)

i. Insufficient or no information provided to demonstrate that the Applicant has contemplated a realistic overview for the Phase 2 prototype development. *0 points*
ii. Information provided demonstrates a conceivably realistic overview for Phase 2 prototype development, however there are gaps and/or the strategy is vague. *6 points*
iii. Information provided demonstrates that the Applicant has a clear and realistic overview. *12 points*

Question 12: Commercialization Approach

Demonstrate a realistic overall commercialization approach/business model that can successfully take the technology/service to market, and how the technology/service will help you develop and sell other products.

Responses should include:

- Target markets (excluding Government of Canada)
- Non-ISC funding sources
- Transition to a commercially-ready product or service
- Any other indicators of commercial potential and commercial feasibility

Note: A more detailed proposal will be requested if selected to participate in Phase 2.

Evaluation Schema (Point-Rated)

i. Insufficient or no information provided to demonstrate that the proposed solution has commercial potential. *0 points*
ii. Some information provided to demonstrate that the proposed solution has commercial potential, however there are gaps in the commercialization approach. *6 points*
iii. A realistic commercialization approach is provided that demonstrates that the proposed solution has commercial potential. *12 points*

Question 13: Resulting Benefits to Canada

Describe the benefits that could result from the commercialization of the proposed solution. Applicants should consider the potential benefits using the following three categories and provide justification for each claim:

- Innovation Benefits: Expected contribution towards the enhancement or development of new industrial or technological innovations within your firm. Responses could include: potential spillover benefits, creation of intellectual property, impact on productivity of the new technology, etc.
- Economic Benefits: Forecasted impact on the growth of Canadian firms, clusters and supply chains, as well as its expected benefits for Canada's workforce. Responses could include: number of jobs created, number of high-paying jobs, investment in Canada's economy, etc.
- Public Benefits: Expected contribution to the broader public to the degree that the solution is expected to generate social, environmental, health, security or other benefits to Canada. Responses could include: solution-related environmental benefits, solution-related accessibility benefits, and solution-related impact on Indigenous communities.

Evaluation Schema (Point-Rated)

i. Innovation Benefits

Benefit not identified or insufficient claim of benefit. *0 points*

Benefit has marginal increment or limited justification. *1 point*

Benefit is significant and well justified. 2 *points*

ii. Economic Benefits

Benefit not identified or insufficient claim of benefit. *0 points*

Benefit has marginal increment or limited justification. *1 point*

Benefit is significant and well justified. *2 points*

iii. Public Benefits.

Benefit not identified or insufficient claim of benefit. *0 points*

Benefit has marginal increment or limited justification. *1 point*

Benefit is significant and well justified. *2 points*

▼ Questions and answers

▶ Question : The Essential Outcomes state that the solution should be of a size and weight that makes the unit portable by a single individual for field use. Should the unit include additional equipment?

All incoming questions regarding this specific challenge should be addressed to solutions@ised-isde.gc.ca.

All enquiries must be submitted in writing no later than ten calendar days before the Challenge Notice closing date. Enquiries received after that time may not be answered.

You can also consult the Frequently asked questions about the Innovative Solutions Canada Program.

A glossary is also available.

Date modified:
2025-01-08

Latest bird flu situation

We are currently responding to cases avian influenza in domestic birds across Canada. Anyone with birds must practice good biosecurity habits to protect poultry and prevent disease.

To date, the most common avian influenza virus in domestic birds has been highly pathogenic avian influenza (HPAI), subtype H5N1.

- On November 8, 2024, the CFIA confirmed the presence of the HPAI H5N2 subtype in poultry in British Columbia.
- On November 25, 2024, the CFIA detected low pathogenic avian influenza (LPAI), subtype H5, in Quebec.
- The HPAI virus found in U.S. dairy cattle has not been detected in birds or any other animals in Canada.

Avian influenza is not a food safety concern. There is no evidence to suggest that eating cooked poultry or eggs could transmit the virus to humans.

Most requested

- CFIA's Response to Highly Pathogenic Avian Influenza (HPAI) on British Columbia Ostrich Farm
- Biosafety advisory: Avian influenza A(H5N1)
- Animals susceptible to H5N1 HPAI
- Information for travellers: Restrictions from the United States
- Restrictions on poultry exports
- Avian influenza in wild birds
- Countries recognized as being free from HPAI
- Statement: Government of Canada provides an update on HPAI

This is Exhibit "J" referred to in the affidavit of Katrina Jonas sworn before me at White Rock this 30 day of January 2025

Services and information

HPAI in livestock
Information about HPAI in dairy cows in the U.S. and guidance for producers and veterinarians.

Status by province

Avian influenza detections by province and estimated number of infected birds.

Moving flocks and poultry products through control zones

Map of affected areas, permits and conditions.

Permits and conditions

What is required for the movement of birds and by-products through a control zone.

Investigations and orders

Current and recent investigations in each province.

Infected and high risk premises

What to expect, compensation, cleaning and disinfection.

HPAI science and research

Science and research related to the prevention, detection, response and management of HPAI in animals.

Facts about avian influenza (bird flu)

General information about bird flu and reducing the spread of the disease.

HPAI dashboards

Data on HPAI in Canadian domestic birds and wildlife.

Date modified:

2025-01-27

Google Maps

Castlegar, British Columbia to Edgewood, British Columbia V0G 1J0

Drive 219 km, 3 hr 1 min



Map data ©2025 Google 20 km

via BC-6 N and BC-6 — 3 hr 1 min
Fastest route, the usual traffic — 219 km
⚠ This route includes a ferry.

via BC-6 N — 3 hr 2 min
221 km

This is Exhibit "K" referred to in the affidavit of Katrina Jones sworn before me at White Rock this 30 day of January 20 25

Explore Edgewood

Restaurants Hotels Gas stations Parking Lots More

Measure distance
Total distance: 60.50 km (37.60 mi)

Google Maps

Vernon, British Columbia to Edgewood, British Columbia V0G 1J0

Drive 136 km, 1 hr 47 min



Map data ©2025 Google 10 km

via BC-6 Best route	1 hr 47 min 136 km
via BC-6 and Edgewood Rd/Inonoaklin Valley Rd	1 hr 47 min 136 km

This is Exhibit "L" referred to in the affidavit of Katrina Jones sworn before me at White Rock this 30 day of January 2025

Explore Edgewood

Restaurants Hotels Gas stations Parking Lots More

Measure distance
Total distance: 100.35 km (62.35 mi)

This is Exhibit "M" referred to in the affidavit of Katrina Jones sworn before me at White Rock this 30 day of January 2025

ORDER NO. / N° DE COMMANDE	DEPT. / SERV.	DATE: May 23/2021

SOLD TO / VENDU À: Mountain Man Dog Sled Adventures
ADDRESS / ADRESSE: Chris & Taryn Schwanke
3240 McGillivray Creek Rd.
Heffley Creek, BC. V0E 1Z1

SHIP TO / EXPÉDIER À: SELLER
ADDRESS / ADRESSE: Universal Ostrich Farms Inc
301 Langille Rd.
Edgewood, BC V0G 1S0

SHIPPING DATE / DATE D'EXPÉDITION	VIA	TERMS / CONDITIONS	TAX REG. NO. / N° DE TAXE	SOLD BY / VENDU PAR

QUANTITY / QUANTITÉS	DESCRIPTION	PRICE / PRIX	AMOUNT / MONTANT
1	Rooster 444 wt - 4 years old. Blue/Black	7500	
1	Rooster - BT- 5 years old. Blue	7500	
1	Hen - 234 232 BT - 5 years old Blue/Black	7500	
1	Hen 233. BT- 4 years old Black	7500	
1	Hen 231 BT- 4 years old Black.	7500	
1	Hen 234 BT- 4 year old. - Blue/Black	7500	
	Deposit Paid $22,500 April/20		
	Final Payment Due immediately. 22,500 May 23/2021		
	Paid. 1 Kab Incubator $4500 + Hatcher.	$4500	
		TVH - HST TPS - GST	
		PST - TVP	$49,500
		TOTAL $	49,500

SALES ORDER
FORMULAIRE DE VENTE

Court File No. T292-25

FEDERAL COURT

BETWEEN:

UNIVERSAL OSTRICH FARMS INC.

APPLICANT

- and -

CANADIAN FOOD INSPECTION AGENCY

RESPONDENT

APPLICATION UNDER THE *FEDERAL COURTS ACT*,
R.S.C. 1985, C. F-7, S. 18.1

AFFIDAVIT

I, Michael Carter, lawyer, of 1321 Johnston Street, White Rock, British Columbia, MAKE OATH AND SWEAR THAT:

1. I am the lawyer for the Applicant in this matter.

2. I certify that the Certificate attached as Exhibit "A" is a true copy of a Certificate Concerning Code of Conduct for Expert Witnesses received from Dr. Jeff Wilson.

3. I certify that the report attached as Exhibit "B" is a true copy of a report received from Dr. Jeff Wilson dated January 30, 2025.

SWORN (OR AFFIRMED) BEFORE ME at White Rock, British Columbia on January 30, 2025)



A commissioner for taking affidavits for British Columbia)



MICHAEL D. CARTER

KATRINA CORY JONES
A Commissioner for Taking Affidavits
For British Columbia
My Appointment Expires December 31, 2025
1321 Johnston Road, White Rock, B.C. V4B 3Z8
(604) 536-5002

Court File No._____

FEDERAL COURT

BETWEEN:

UNIVERSAL OSTRICH FARMS LTD.
APPLICANT

- and-

CANADIAN FOOD INSPECTION AGENCY
RESPONDENT
APPLICATION UNDER THE *FEDERAL COURTS ACT,*

R.S.C. 1985, c. F-7, s. 18.1

CERTIFICATE CONCERNING CODE OF CONDUCT FOR EXPERT WITNESSES

I, Dr. Jeff Wilson, having been named as an expert witness by the applicant, Universal Ostrich Farms Ltd., certify that I have read the Code of Conduct for Expert Witnesses set out in the schedule to the *Federal Courts Rules* (and attached hereto) and agree to be bound by it.

Date: January 29, 2025

This is Exhibit "A" referred to in the affidavit of Michael Carter sworn before me at Whitehorse this 30 day of January 20 25

Dr. Jeff Wilson
4564 Nassagaweya-Puslinch TL
Moffat Ont L0P1j0

Code of Conduct for Expert Witnesses

General Duty to the Court

1 An expert witness named to provide a report for use as evidence, or to testify in a proceeding, has an overriding duty to assist the Court impartially on matters relevant to his or her area of expertise.

2 This duty overrides any duty to a party to the proceeding, including the person retaining the expert witness. An expert is to be independent and objective. An expert is not an advocate for a party.

Experts' Reports

3 An expert's report submitted as an affidavit or statement referred to in rule 52.2 of the *Federal Courts Rules* shall include

(a) a statement of the issues addressed in the report;

(b) a description of the qualifications of the expert on the issues addressed in the report;

(c) the expert's current *curriculum vitae* attached to the report as a schedule;

(d) the facts and assumptions on which the opinions in the report are based; in that regard, a letter of instructions, if any, may be attached to the report as a schedule;

(e) a summary of the opinions expressed;

(f) in the case of a report that is provided in response to another expert's report, an indication of the points of agreement and of disagreement with the other expert's opinions;

(g) the reasons for each opinion expressed;

(h) any literature or other materials specifically relied on in support of the opinions;

(i) a summary of the methodology used, including any examinations, tests or other investigations on which the expert has relied, including details of the qualifications of the person who carried them out, and whether a representative of any other party was present;

(j) any caveats or qualifications necessary to render the report complete and accurate, including those relating to any insufficiency of data or research and an indication of any matters that fall outside the expert's field of expertise; and

(k) particulars of any aspect of the expert's relationship with a party to the proceeding or the subject matter of his or her proposed evidence that might affect his or her duty to the Court.

4 An expert witness must report without delay to persons in receipt of the report any material changes affecting the expert's qualifications or the opinions expressed or the data contained in the report.

Expert Conferences

5 An expert witness who is ordered by the Court to confer with another expert witness

(a) must exercise independent, impartial and objective judgment on the issues addressed; and

(b) must endeavour to clarify with the other expert witness the points on which they agree and the points on which their views differ.

Expert Testimony Regarding High Pathogenic Avian Influenza (HPAI) in Ostriches – Request for Stay of Execution

Prepared for: Michael Carter, Legal Counsel for Universal Ostrich Farm
Prepared by: Jeff Wilson, Novometrix Research Inc.
Date: January 30, 2025

Introduction

I, Dr. Jeff Wilson, provide this expert testimony in support of a request for a stay of execution regarding the ordered culling of ostriches at Universal Ostrich Farm in British Columbia. As an expert in outbreak management, epidemiology, public health, and poultry pathology I will address two key questions relevant to this case:

1. The low risk to public safety if proper measures are taken, with a net increase in public safety if proper testing is conducted under an appropriate protocol.
2. The irreparable harm caused by culling, including the loss of unique genetics, natural and acquired resistance to HPAI, and the potential public health benefits derived from ostrich antibodies to SARS and HPAI; also the broader benefits of engaging poultry industry stakeholders in a best practice approach to HAPI management for subsequent scaling across the poultry industry.

In preparing this report I have relied on the facts set out in the letter from Cleveland Doan LLP dated January 29, 2025, a copy of which is attached hereto.

Expert Credentials

I am President of Novometrix Research Inc. and Special Graduate Faculty at the University of Guelph. My qualifications and experience include:

- Doctor of Veterinary Medicine (DVM), University of Guelph
- Doctor of Veterinary Science (DVSc) in Pathology, specializing in avian pathology, University of Guelph
- PhD in Epidemiology, specializing in zoonotic diseases, University of Guelph
- 18 years as a cross-appointed professor of Public Health Epidemiology at the University of Guelph and as a senior epidemiologist and manager at the Public Health Agency of Canada (PHAC)
- Founded and co-led the PHAC unit responsible for zoonotic disease epidemiology; heavily involved in outbreak response (e.g., Walkerton), surveillance, and epidemiological response
- Over 30 years of extensive involvement in poultry infectious disease research and industry projects

This is Exhibit "B" referred to in the affidavit of Michael Carter sworn before me at Whitehorse this 30 day of January 2025

- Heavily involved in alignment of complex networked efforts to address wicked problems, which often involve disparate worldviews, knowledge, training, personality issues, money, politics, and other competing factors.
- Experience and activities related to HPAI include contributions to key frameworks and initiatives such as the Pillars of Outbreak Response, Community Network Integration (CNI), the Universal Quality Management System (UQMS), the National Poultry Network (NPN), among others including relevant peer reviewed publications.
- While I have graduate training and experience in the application of methods related to immunology and virology, my expertise here focuses primarily on infectious disease epidemiology in birds and humans, human and animal infectious disease outbreak management, management of outbreaks of HPAI, and the alignment of large networks to address complex multistakeholder ('wicked') problems.

Question 1: Lack of Significant Risk to Public Health and Safety from Delayed / non-Culling and the Potential for Improved Outcomes Under a Best Practices Protocol

I propose that management of potential HPAI infection in the ostriches in question involve a collaborative effort to postpone or avoid immediate culling managed under best practices. This delay in culling would allow for a detailed study to:

- Identify the specific pathogens involved,
- Assess potential natural herd immunity, and
- Determine whether the birds are actively shedding infectious virus, thereby evaluating their actual risk as a source of transmission to other animals or humans.

To ensure both public and animal health are prioritized, I recommend structuring this as a formal action research project. This approach would not only minimize any potential public health risk but also create an opportunity for improved long-term outcomes compared to the currently proposed culling directive by the CFIA.

This research project will adhere to and assess the effectiveness of established best practices for HPAI outbreak response—specifically, the **Pillars of Outbreak Response.** The methodology and framework for this approach have been outlined in detail in the *Canadian Journal of Veterinary Research*, co-authored by myself and senior CFIA staff and key poultry industry stakeholders[1]

Managing the Flock Under Outbreak Response Best Practices

The proposed approach to managing this project will follow a structured, evidence-based framework grounded in **best practices for outbreak response**, specifically the **Pillars of Outbreak Response**[1]

Pillar 1: Leadership Team

A properly structured, inclusive, and collaborative **project leadership team** will be established. This team will be led by individuals with **practical outbreak response experience** and include relevant experts and stakeholders. Its guiding principles will be:

- **Collaboration, transparency, and evidence-based decision-making**
- A focus on **rapid resolution of the outbreak**, rather than personal or institutional gain

The leadership (and advisory) teams will include:

- Local public health officials legally mandated to oversee human disease prevention and control
- Senior and operational-level representatives from CFIA and PHAC
- Academic experts, independent professionals, and consultants
- Ostrich and poultry industry experts and influencers, as appropriate

Pillar 2: Data Collection and Evidence Gathering

Effective outbreak management requires **comprehensive data collection** to determine the most appropriate intervention. This action research project will:

- Gather all **relevant literature and expert opinions** to assess animal and human health implications
- Document human and animal clinical signs and symptoms
- Identify and conduct **necessary laboratory tests**, including:
    - Antibody levels in ostriches and in-contact humans
    - Potential virus shedding
    - Testing of ostrich egg yolks, which are used in preventive and therapeutic antibody production for human and animal disease

Pillar 3: Evidence-Based Interventions

Interventions will be determined and implemented **based on scientific evidence and consensus among the leadership team**. Following established outbreak response best practices, possible interventions may range from:

- No action (if no significant risk is identified)
- Enhanced biosecurity measures
- Immune modulation including nutrition, vaccination etc
- Depopulation (culling)
- Other as required

Each option will be **evaluated in a balanced manner**, considering the **full range of potential consequences** before implementation.

Pillar 4: Transparent and Effective Communication

A **comprehensive, factual, and transparent** communication process will be implemented under the guidance of the leadership team. It will be **multi-directional** and include **all relevant stakeholders**, including the public. Communication strategies will:

- Be tailored to the situation
- Avoid **public relations exercises** that create the illusion of effectiveness without substantiated results

Broader Business Framework for Outbreak / Project Management

In addition to these four pillars, proper outbreak response requires a **robust business process** to ensure:

- Effective leadership and management
- Proper human resource allocation
- Adequate adn transparent budgets and funding
- Operational business systems within a network-wide quality management system

This is particularly critical in **complex, multi-stakeholder outbreaks** occurring across various locations. These principles have been further detailed in the **context of HPAI outbreaks**, along with the risks associated with failing to implement them properly[1]

To align distributed stakeholders in collaboratively solving **complex, "wicked" problems**, this project will be aligned under the **Community Network Integration (CNI) framework** including its Universal Quality Management System (UQMS) framework[2]

Managing the Period of Reprieve

Delaying culling under the conditions described above **not only mitigates potential risks** but also **creates opportunities for improved outcomes** compared to immediate depopulation. Key considerations include:

Potential for HPAI Transmission

A primary concern is whether ostriches could transmit HPAI to:

- Wild birds
- Other ostriches
- Other poultry and domestic animals
- HUmnas

However, based on **discussions with farm owners and technical experts**, it is my understanding that:

- The farm is **relatively isolated** from other farms in the area.

- ***Biosecurity measures that meet CFIA standards*** *are already in place to* prevent transmission.
- Additional **public health-aligned biosecurity measures** are in effect to prevent **animal-to-human transmission** on the farm and beyond.

Evidence of Acquired Immunity in the Flock

There is strong evidence suggesting that the ostriches have **acquired immunity**, based on:

1. A **previous outbreak within the past year** with symptoms consistent with HPAI.
2. **Higher mortality in younger ostriches** compared to older birds, suggesting the latter developed immunity.
3. The **absence of clinical signs or mortality** following the most recent mortality wave.

Potential Acquired Immunity in the Farm Family

The self-reported **absence of HPAI-like symptoms** among farm family members since the most recent disease wave in the ostriches suggests they, too, may have **developed some level of immunity**.

Implications for Transmission and Future Flock Management

- **Acquired immunity in both the birds and people** will **help prevent further transmission** to other animals and humans, both on and off the farm.
- If the current flock is culled, **repopulating the farm with new ostriches will likely introduce birds with no immunity to HPAI.**
- Unlike the existing flock, which has likely developed immunity, these **new birds would be susceptible to reinfection** from wild waterfowl.
- The **new, susceptible birds could pose a greater threat** by serving as a **reservoir for reinfection**, potentially spreading HPAI to:
    - Humans and animals on the farm
    - Neighboring farms
    - Wild waterfowl, which could further disseminate the virus regionally.

Confirming the Presence of HPAI

All of these risk assessments **assume that HPAI was indeed the cause of illness in the ostriches.** However, this **has yet to be definitively confirmed.**

- More comprehensive testing—**as outlined in the research-based approach above**—is necessary to establish whether the birds were infected with HPAI or another pathogen entirely.

- A systematic investigation of **virus shedding, antibody levels, and clinical outcomes** will provide a **clearer understanding of the situation** before making irreversible decisions.

Public Health Value of Antibodies to SARS and HPAI Produced in Ostrich Eggs

It is my understanding that the ostriches in question are **being utilized to produce antibodies in their eggs against the SARS virus**, which are valuable for:

- Research aimed at controlling SARS
- Clinical applications in the event of future SARS outbreaks

If these birds also **possess antibodies to HPAI**—which appears likely based on the evidence outlined above—then their eggs could likewise be **critical for research and potential clinical applications in human HPAI cases**.

This is highly significant because **HPAI is arguably the most imminent candidate for a future human pandemic**. Given this reality, **depopulating the farm could, in fact, increase public health risk** by eliminating a valuable resource for pandemic preparedness.

From a public health and outbreak management perspective, it is reasonable to conclude that maintaining the flock—under the structured, best-practice outbreak response framework described above—**poses a lower risk to Canadian public health than culling them prematurely**.

Benefits to Commercial Poultry, Mammalian Species, and Public Health from Managing this Outbreak Under a Best Practices Project Framework

The current approach to HPAI control in animals and humans in Canada is **not aligned with established best practices**. This conclusion is based on **extensive interviews** with multiple stakeholders, including:

- Industry representatives
- Government officials
- Academics and researchers
- Non-governmental organizations
- Medical professionals
- The general public

As a result, the response has become **disorganized and ineffective**[3,4] If Canada is to **effectively manage HPAI**, it is critical to bring the outbreak response **in line with internationally recognized best practices**. Failing to do so could **exacerbate the current crisis**, leading to:

- Continued mass depopulation of domestic poultry
- Increased economic instability within the agrifood sector

- A heightened risk of catastrophic human infection and mortality

Failure of Leadership and Lack of Collaboration

Despite **multiple requests** from industry insiders and technical experts, **senior managers at CFIA and PHAC have so far refused to engage in a collaborative outbreak management approach** under established best practices

The reasons for this reluctance are likely **multifaceted**, including:

- Political influences affecting outbreak management
- A lack of understanding of proper outbreak response strategies—particularly for outbreaks of this magnitude and complexity
- Institutional reluctance to relinquish control over the management of the outbreak

Industry Support for a Collaborative Approach

Many **stakeholders within the commercial poultry industry** support the principles outlined here and recognize the **need for a more structured, evidence-based response**. However, based on our interviews, many hesitate to openly advocate for change due to concerns over **potential reprisals from CFIA and PHAC.**

The Public Health and Economic Risks of Mismanagement

The **failure to implement best practices** in managing the national HPAI outbreak poses **grave risks**:

- Economic instability in Canada's agrifood sector
- Increased likelihood of HPAI mutating into a strain capable of human-to-human transmission
- A heightened risk of a human pandemic with high mortality

HPAI has been present in Canada for **several years**, evolving **year by year**. Given its historically **high human mortality rate (~50%)**, and the potential for **developing sustained human-to-human transmission through mutation**, it could trigger **a national epidemic/ pandemic** with severe consequences.

Why the Ostrich Outbreak is an Opportunity for Reform that is in the Public Interest

Unlike previous HPAI outbreaks in commercial poultry, this **ostrich outbreak presents unique conditions** that **make government and industry collaboration under best practices more feasible**:

- CFIA senior management has indicated a **willingness to explore a more collaborative approach**, including the potential for:
    - Culling fewer animals

    - Conducting additional antibody and viral shedding tests
- **The commercial poultry industry is not yet significantly engaged in this outbreak**, reducing external pressures
- **The smaller size and scope of the outbreak** make it more manageable under a collaborative framework

Building a Model for Future Outbreak Management

Discussions with poultry industry leaders and academic experts suggest that the **ostrich outbreak could serve as a precedent for bringing key stakeholders together** under best practices (**i.e., the Pillars of Outbreak Response**).

From my experience in **network alignment across multiple sectors**, I believe that this outbreak **could serve as a model for best practices**, including:

- Strengthening trust across the stakeholder network
- Extending the collaborative approach to broader HPAI management, including in:
    - Commercial poultry
    - Dairy cattle
    - Companion animals (e.g., cats)

Currently, based on my discussions with industry representatives. such an approach **remains otherwise elusive.**

Reducing Public Health Risks Across Canada

Managing the ostrich outbreak under **a structured, best-practices approach** thus has the potential to:

- Substantially reduce human health risks
- Enhance safety across the Canadian public—not just for HPAI, but for a wide range of emerging infectious diseases

The Role of the Court in Compelling Collaboration

Given the **public health significance** of this outbreak—and the ongoing **resistance of CFIA and PHAC senior management** to fully collaborate under best practices—**I recommend that the court consider compelling their participation** through legal means.

This could include:

1. **A court order or similar legal directive** mandating good-faith participation of CFIA and PHAC in best-practice outbreak management.
2. **A court-mandated collaborative oversight audit**, with:
    - **Regular progress evaluations**
    - **Comprehensive outcome assessments** across key domains, including:

- Public health
- Animal health
- Governance and regulatory compliance
- Economic impact

Additionally, this **oversight mechanism could be extended** to other large organizations involved in HPAI management, such as:

- Chicken Farmers of Canada
- Canadian Animal Health Institute

The final structure of this oversight should be determined in consultation with **the collaborative outbreak/project advisory team** to ensure transparency, accountability, and alignment with best practices.

Question 2: Potential for Irreparable Harm Caused by the Destruction of the Ostriches

The risks associated with **slaughtering the ostriches** have been detailed above, but I will summarize the most critical concerns here:

1. **Loss of Naturally Acquired Immunity to HPAI**
   - The existing flock has **likely developed natural immunity to HPAI.**
   - If the birds are culled and replaced, the new flock will **almost certainly lack immunity**, making them:
     - More susceptible to HPAI infection
     - A greater risk for transmitting the virus to other animals and humans
2. **Critical Role in Antibody Production**
   - These ostriches are actively used for **SARS antibody production for human use.**
   - If they also possess **HPAI antibodies**, they could be **valuable for research and clinical applications** in preventing and treating human HPAI infections.
3. **Potential Genetic Selection for HPAI Resistance**
   - The **younger birds have experienced higher mortality**, suggesting that the surviving birds may have been **naturally selected for resistance to HPAI.**
   - This makes them **uniquely valuable for ongoing research**, particularly for:
     - SARS and HPAI antibody production
     - Genetic studies on resistance mechanisms
4. **Rare Genetic and Immunological Value**
   - **Naturally immune or genetically resistant ostriches are likely rare**, both in Canada and globally.
   - Ostriches are **particularly valuable for human antibody production** due to the **large quantity of antibodies their eggs produce** compared to other bird species.
5. **Confirmation of the Outbreak's True Cause is Still Needed**

- The assumption that this outbreak is caused by HPAI **has yet to be definitively verified**.
- A **proper outbreak response project**—as outlined above—will **confirm the actual pathogen(s) involved** and guide appropriate action.

6. **Broader Public Health and Scientific Benefits**
   - Conducting a **collaborative research project under outbreak response best practices** with this flock could provide **immeasurable benefits**, including:
     - **Improved HPAI management** in:
       - Commercial poultry
       - Mammalian livestock
       - Companion animals
       - Wildlife and humans
     - **Restoring public trust** in government, industry, and academic institutions involved in infectious disease control.

Destroying these ostriches **without fully assessing their immunity, genetic resistance, and antibody production potential** would thus be an **irreversible loss**—not just for the farm, but for **public health, pandemic preparedness, and scientific progress**. The court should therefore strongly consider **supporting the research-based approach outlined above**, which offers a **lower-risk, higher-benefit alternative** to immediate culling.

Conclusion and Request

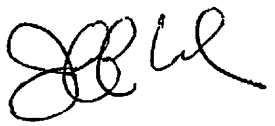
Given the **scientific, public health, and biosecurity concerns outlined above**, I strongly recommend that the court **grant a one to two-month stay of execution** to allow for **a proper scientific assessment and testing of the ostriches**.

This temporary pause will:

- **Enable comprehensive data collection** to determine the true nature of the outbreak.
- **Ensure public safety** through enhanced surveillance and scientifically sound risk assessment.
- **Prevent the irreversible loss of a unique genetic and immunological resource** that could be critical for future HPAI and SARS research.

The alternative—**immediate culling**—would not only be **scientifically unsound** but also **counterproductive** to broader public health and biosecurity efforts. The destruction of these birds **without full investigation** *could* ***increase the long-term risk to both human and animal populations***, rather than mitigating it.

I am available for further consultation or testimony as needed.



Jeff Wilson, DVM, DVSc, PhD
President, Novometrix Research Inc.
Special Graduate Faculty, University of Guelph

References

[1] Wilson et al **It's time to apply outbreak response best practices to avian influenza: A national call to action.** Can J Vet Res. 2024 Jul;88(3):94–98.

[2]Wilson JB, Salman M, Janzen E, et al. Community Network Integration: An approach to alignment of One Health partners for solutions to 'Wicked' problems of antimicrobial resistance. Prev Vet Med 2020;175:104870.

[3]Inside Canada's chaotic response to avian flu

4A planned response a056fc862707dc92fc24919722f043d7fb2cbce4.pdf

CLEVELAND DOAN
Barristers & Solicitors

Michael D. Carter*
*Practicing through a law corporation
Email michael@clevelanddoan.com
Phone 604 536 5002
File No. 26408

January 29, 2025

VIA EMAIL

Dr. Jeff Wilson
RR 1 Moffat, Ontario

Dear Dr. Wilson,

Re: Medical Opinion regarding Universal Ostrich Farms Inc.

We are the lawyers for Universal Ostrich Farms Inc. We are writing to request that you provide us with an opinion on a number of matters relating to a potential culling of ostriches.

When preparing your opinion please base it on the facts set out in the "Facts" section of this letter. If you rely on additional facts please describe those facts in your opinion.

Facts

1. Universal Ostrich Farms Inc ("UOF") is located at 301 Langille Road, Edgewood, British Columbia (the "Property").

2. The Property is approximately 10 kilometres northwest of Edgewood, British Columbia.

3. According to Statistics Canada, the 2021 Census Profile of Edgewood lists a total population of 235 people.

4. The nearest population centres are Vernon, at over 90 kilometres by air, and Castlegar, at over 70 kilometres by air.

5. UOF raises ostriches at the Property.

6. As of February 2020 UOF was raising about 250 ostriches on the Property.

7. At that time some ostriches in the herd became sick. Tissue samples were taken from a deceased ostrich and were sent for analysis. A report from the BC Animal Health Centre returned positive results for "Proteus sp., Pseudomonas aeruginosa and E. coli (non-haemolytic)".

8. Ten ostriches died around February 2020.

9. In the following year UOF began increasing the size of the herd, including by purchasing some ostriches from other producers.

10. As of December 1, 2024 there were approximately 450 ostriches being raised at the Property (the "Herd").

11. On about December 10, 2024 representatives from UOF began noticing some ostriches in the Herd were showing signs of illness.

12. In the coming week ostriches began to die from apparent illness.

13. On December 30, 2024 representatives from the Canadian Food Inspection Agency ("CFIA") attended at the Property and took swab samples from two of the dead ostriches.

14. CFIA tested using the Avian Influenza matrix and H5H7 PCR test, and the test result was positive for the H5N1 type of Avian Influenza.

15. On December 31, 2024 CFIA issued a written Requirement to Quarantine, which was amended on January 2, 2025, January 12, 2025 and January 24, 2025.

16. UOF has been complying with the requirements of the quarantine.

17. Between about December 12, 2024 and January 15, 2025 69 ostriches died of the H5N1 type symptoms.

18. No ostriches have died of H5N1 symptoms since January 15, 2025.

19. The only ostriches of the Herd that died of H5N1 type symptoms belonged to the group of ostriches that did not experience the pseudomonas infection in 2020.

20. Four ostriches have died of non-H5N1 type symptoms in January 2025. Three of these ostriches slipped on the ice and injured themselves, and one ostrich was caught in a fence.

Requested Opinion

Please provide your opinion on the following questions:

1. Is there a significant risk to public health and safety from not culling the ostriches on February 1, 2025; and

2. If the Herd has achieved herd immunity, is there anything rare and valuable about the Herd that would be lost if the ostriches were culled?

Given the urgent nature of this matter, we look forward to receiving your report as soon as possible.

Yours truly,

CLEVELAND DOAN LLP
Per:
MICHAEL D. CARTER

CURRICULUM VITAE

for

JEFFREY BOYD WILSON

RR 1 Moffat, Ontario,
Canada L0P 1J0
(519) 824-7771
jbwilson@novometrix.com

1. POSITION

President, Novometrix Research Inc.

President, LifeU

Editor in Chief, Applied Network Integration

Special Graduate Faculty, University of Guelph

2. DEGREES

PhD	Epidemiology, University of Guelph, 1991
DVSc	Anatomic Pathology, University of Guelph, 1987
DVM	Doctor of Veterinary Medicine, University of Guelph, 1982

3. EMPLOYMENT HISTORY

1991 -	President, Novometrix Research Inc.
2016-	Editor in Chief, Applied Network Integration
2015-	President, LifeU
1999 - 2009	Associate Professor of Epidemiology, Department of Population Medicine, University of Guelph
1999 - 2009	Section Head, Targeted Studies, Division of Enteric, Foodborne, and Waterborne Diseases, Laboratory Centre for Disease Control, LCDC
1991 - 1999	Assistant Professor of Epidemiology, Department of Population Medicine, University of Guelph
1993 - 1999	Chief, Enteric and Foodborne Diseases, Bureau of Communicable Disease Epidemiology, Laboratory Centre for Disease Control, Health Canada

1991 - 1993	Field Epidemiologist, Bureau of Communicable Disease Epidemiology, Laboratory Centre for Disease Control, Health Canada
1987-1991	PhD student, Department of Population Medicine, University of Guelph
1985-1987	DVSc student, Department of Pathology, University of Guelph
1985 - 1986	Pathology Consultant, Department of Pathology, University of Guelph
1982 - 1984	Clinical Veterinarian, Veterinary Emergency Clinic, London, Ontario

4. HONOURS

2023	Health 2.0 Leadership Award Short List
2022	AIM2Flourish global prize nominee
2000	Health Canada Team Award (Walkerton *E. coli* outbreak)
1987-1991	Medical Research Council of Canada Fellowship
1989	J.F. McCorquodale Award (Public Health)
1977-1978	Ontario Agricultural College Dean's List
1977	Ontario Agricultural College Proficiency Prize
1976	Ontario Scholar
1976	Ontario Board of Education Silver Medal

5. Active Graduate Supervision

- Negin Esfandiari, MSc. Application of quality management to a global One Health fundraising platform, 2022-
- Sanna Noor, MSc. Management of One Health networks: a business approach, 2020-
-
- Preeti Sharma, MSc. Development of a global literature and data repository for pandemic response, 2022-
-
- Abelhard Jauwena, MSc. Application of a novel quality management system to One Health networks, 2022-
- Erin Suganda, MSc. Network approach to transformation of companion animal medicine, 2022-
- Kyle Grice, MSc. National Consensus Conference on the COVID-19 Response and Lessons Learned: Ontario Region, 2021-2023.
- Treasure Haines, PhD. A novel integrative approach to network alignment and

management for One Health, 2019-2021.

- Jeff Aramini, DSi. Transformative approaches in One Health, 2017-2019.
- Jocelyn Rivers PhD. High leverage strategies for pedagogy (Rivers Method), 2016-2019.
- Jocelyn Rivers, PhD. A model for integration of public health networks, 2016- (Co-supervised with Dr. Andrew Papadopoulos)
- Alessia Guthrie, PhD, Epidemiology of in season honeybee colony losses in Ontario, 2105-2018 (Co-supervised with Dr. Andria Jones-Bitton)
- Andrew Papadopoulos, PhD, Governance models for food safety, 2008-2010 (Co-supervised with Dr. Cate Dewey)
- Aliya Pardhan, PhD. An epidemiologic investigation of foodborne illness in the Northwest Territories, Canada, 2008-2011.
- James Valcour, PhD, Climate and enteric illness in New Brunswick: implications for climate change, 2008-2009 (Co-supervised with Dr. David Waltner-Toews)
- Andrea Nesbitt, MSc, A survey of food consumption patterns and lifestyle risk factors for foodborne illness in the City of Waterloo, 2004-2006
- Victoria Keegan, MSc, The epidemiology of enteric disease in C-EnterNet's pilot site, Waterloo, Ontario, 2004-2006
- Victoria Edge, PhD, Analysis of clusters of G.I. illness, 2000-2002 (Co-supervised with Dr. Wayne Martin)
- Agricola Odoi, PhD, Epidemiology of waterborne infections in Canada, 1998-2002 (Co-supervised with Dr. Wayne Martin)
- Jeffery Aramini, PhD, The use of temporal-spatial analyses in the epidemiological investigation of endemic and epidemic waterborne gastroenteritis,1998-2002
- Leah Budd, MSc, Burden of illness related to *Salmonella* Typhimurium DT104 infection, 2000-2001
- Shannon Majowicz, PhD, Baseline study of G.I. illness, 2000-2004
- James Valcour, MSc, Development of indices of animal density for spatial analyses of enteric disease events, 1998-2000

- Michael Ford, MSc, Temporal and spatial distributions of *Salmonella* Typhimurium infection in Ontario, 1998-2000
- Shannon Majowicz, MSc, Surveillance for Cryptosporidium infections in Ontario, 1998-1999
- Pascal Michel, PhD, An epidemiologic study of human cases of verocytotoxigenic *E. coli* infection reported in Ontario, 1993-1997
- Mary Chow, MSc, A case-control study of giardiasis in Waterloo Region, 1991-1992

6. Graduate Student Committee Memberships (In Addition to Students Named Above)

- Heather Chalmers, MSc, Investigations in equine left recurrent laryngeal nerve paralysis, 2008-2014
- Heidi Berrol, MSc, Investigating the spatial risk distribution of West Nile virus disease in birds and humans in southern Ontario, 2004-2006
- Richard Arsenault, MSc, *Campylobacter* and *Salmonella* positive commercial broiler farms in Ontario and associated risk factors, 2002-2005
- Jane Parmley, PhD, An epidemiological investigation into the use of human health databases for surveillance of zoonotic, enteric disease in Alberta, 2001-2005
- Jeff Smale, MSc, Bootstrap analysis of transitional generalized additive models: A case study, 2001
- Brian Mangal, MSc, Transitional generalized additive models relating to drinking water quality to gastrointestinal illness in the greater Vancouver Regional District, 2000
- Judy Greig, MSc, A descriptive analysis of giardiasis cases reported in Ontario, 1990-1998, 2000
- Adrian Unc, PhD, Migration of enteropathogens in ground water, 1999
- Holy Teneg Akwar, PhD, Antimicrobial use and resistance among *E. coli* and enterococci of pigs and humans, 1998-
- Stephane Lair, DVSc, Epidemiology and pathology of neoplasia in the captive population of the Black-Footed Ferret (*Mustela nigripes*), 1996-1998

- Patrick Boerlin, MSc, Associations between virulence factors of shiga toxin-producing *Escherichia coli* and disease in humans, 1996-1998
- David Jordan, PhD, Pre-slaughter control of beef carcass contamination with *Escherichia coli* O157: a risk assessment approach, 1995-1998
- Natalie Bruneau, PhD, Aspects of uncertainty and decision-making in fish disease control programs in Ontario, Canada, 1993-1997
- George Nasinyama, PhD, Diarrhea and *Salmonella* infections in humans and animals in Kampala district, Uganda. 1992-1996
- Katrina Smith, MSc, A case control study of verocytotoxigenic *Escherichia coli* infection in cats with diarrhea, 1993-1996
- Jennifer Yessis, MSc, Relationship between drinking water quality and gastrointestinal illness on farms in the Waterloo Region, 1993-1994

7. Graduate Student Examining Committee Membership

- Federica ter Woort, DVSc, Histologic Evaluation of the Lung in Actively Racing Horses, 2012
- Gillian Alton, MSc, Re-emergence of canine leptospirosis and its risk factors, Ontario, 2009
- Xi Zhang, MSc, Salmonellosis in humans and animals in Ontario: A temporal study, 2002
- Pia Muchaal, MSc, Risk factors for acute diarrhea in peri-urban households in southern Cameroon, 2002
- Agricola Odoi, PhD, A spatial epidemiologic study of giardiasis cases reported in southern Ontario, 1990-1998, 2002
- Shannon Majowicz, PhD, The burden and distribution of gastrointestinal illness in the community, 2004
- Brent Avery, MSc, Antimicrobial use in sheep and antimicrobial resistance among *Salmonella spp.* And *Escherichia coli* from cull ewes in Alberta, 2003
- Agricola Odoi, PhD, A spatial epidemiologic study of giardiasis cases reported in Southern Ontario: 1990-1998, 2002
- Jeffery Aramini, PhD, The use of temporal-spatial analyses in the

epidemiological investigation of endemic and epidemic waterborne gastroenteritis, 2002

- Judy Greig, MSc, A descriptive analysis of giardiasis cases reported in Ontario: 1990-1998, 2000
- James Valcour, MSc, Associations between indicators of agricultural intensity and the incidence of human verocytotoxigenic *Escherichia coli* infection, 2000
- Annette O'Connor, DVSc, A seroepidemiological investigation of undifferentiated bovine respiratory disease, 2000
- Nirmala Budhram, MSc, Environmental pollution and psycho social health in Kathmandu, 2000
- Emily Martin, MSc, *Escherichia coli* in tom turkeys and their environment, 2000
- Carol Tinga, MSc, Veterinary technical and professional skills: Perceptions of value, instruction received, competence, and comfort in students and recent graduates of a veterinary college, 2000
- Michael Ford, MSc, A descriptive study of human cases of *Salmonella* Typhimurium and *Salmonella* Typhimurium DT104 infection imported in Ontario, 2000
- Tom Johnson, MSc, The impact of porcine colonic spirochetosis and non-specific colitis in the Ontario swine industry, 1999
- Shannon Majowicz MSc, Descriptive analysis of endemic Cryptosporidiosis cases reported in Ontario, 1996-1997,1999
- Dirk Werber, MSc, Epidemiological studies of antibiotic resistance in pigs,1999
- Simon Ferrazzi, MSc, Evaluation of Ontario's emergency health services "Symptom Relief Drug Program" on hospital utilization, 1999
- Heba Atalla, MSc, Food Safety and Quality Assurance Research Project, 1999
- Patrick Boerlin, MSc, Associations between virulence factors of shiga toxin-producing *Escherichia coli* and disease in humans, 1998
- Christopher O'Callaghan, PhD, A study of the epidemiology of theileriosis on smallholder dairy farms in Kiambu District, Kenya, 1998
- David Jordan, PhD, Pre-slaughter control of beef carcass contamination with *Escherichia coli* O157: a risk assessment approach, 1998

- Patricia Rutherford, MSc, Food Handling Techniques, 1997
- Abdunaser Dayhum, MSc, Preliminary studies of the effects of various pre-slaughter factors on fecal shedding and beef carcass contamination with *Escherichia coli* , 1997
- Christine Power, MSc, Repeatability of the Petrifilm HEC test and agreement with a hydrophobic grid membrane filter (HGMF) method for the enumeration of *Escherichia coli* O157:H7 on beef carcasses, 1996
- George Nasinyama, PhD, Diarrhea and *Salmonella* infections in humans and animals in Kampala district, Uganda, 1996
- Abdelhamid Elfadil, PhD, An epidemiologic study of cellulitis in broiler chickens in southern Ontario, 1995
- Jennifer Yessis, MSc, The influence of well characteristics on private well water quality and acute gastrointestinal illness, 1994.

8. PUBLICATIONS AND PRESENTATIONS

Chapters in Books

BrainShift: Transform your life by understanding and changing beliefs. Jeff Wilson. New Metric Publications, 2006.

Human infection verocytotoxin-producing *Escherichia coli* associated with exposure to farms and rural environments, in Stewart, Flint, Chesson (eds), Farm animals as a reservoir of *Escherichia coli* 0157:H7, (CAB International, Wallingford, UK, 1999).

Shiga Toxin-Producing *Escherichia coli* Infections in Canada, in Kaper, O'Brien (eds), *Escherichia coli* 0157:H7 and other Shiga Toxin-Producing *E. coli* Strains, (American Society for Microbiology, Washington, D.C.,1998) pp. 23-29.

Verocytotoxin-producing *Escherichia coli* (VTEC) in the food chain: preharvest and processing perspectives, in Karmali, Goglio (eds), Recent advances in Verocytotoxin-producing *Escherichia coli* infections. (Elsevier Publications, 1994).

Verocytotoxigenic *Escherichia coli* infection on dairy farms in southern Ontario, in Recent advances in Verocytotoxin-producing *Escherichia coli* infections, (Elsevier Publications, 1994).

Papers in Refereed Journals

Publications invited, accepted and/ or in press

Wilson, J, Grice, K, Grice, L et al. Summary of the National Consensus Conference on the COVID-19 Response and Lessons Learned: Ontario Region. Invited paper by the Canadian Journal of Public Health, 2023

Wilson, J, Grice, K, Grice, L et al. Summary of the National Consensus Conference on the COVID-19 Response and Lessons Learned: Ontario Region. Invited paper by the Canadian Veterinary Journal, 2023.

Wilson, J, Salman, M, Rivers, J et al. A network approach to integrated community health. Applied Network Integration, 2023.

De Monte, R, Arn, J, **Wilson, J** et al. Evaluation of a novel quality management system with application to distributed networks. Applied Network Integration, 2023.

Wilson, J, Winckelmans, I, Roberts, T, Li-Byarlay, H, Guthrie, A, Wilson, M, Wilson, L, Delaney, C, Kasab-Bachi, H, Vonk, M, Rivers, J. A Process for Integration of Global Networks to Achieve Sustainability of Aquaculture and Aquatic Ecosystems. Emerging Animal Species, 2023.

Wilson, J, Haines, T, Aramini, J, Rivers, J. An integrated approach to management of vaccine preventable disease in Canada. Applied Network Integration, 2023.

Wilson, J, Haines, T, Aramini, J, Rivers, J. Application of the Pillars of Outbreak Response to Covid-19 infection. Applied Network Integration, 2023

Published articles

Wilson, J, Rivers, J, Anholt, M, Onawola, D, Lantos, G, Speicher, J, De Monte, Sal, Kasab-Bachi, Hind, Haines, T, Noor, S, Gillam, W, Suganda, E, Aramini, J. Veterinary leadership: Time for us to step into our own power. Canadian Veterinary Journal, 63(6): 647-648, 2022.

Guthrie, A, Wilson, G, Nassr, M, **Wilson, J.** Honey bee health and productivity in Ontario, Canada, a multifactorial network approach. Part 1: Literature review. Applied Network Integration 2: 1-51, 2022.

Guthrie, A, Wilson, G, Nassr, M, **Wilson, J.**. Honey bee health and productivity in Ontario, Canada, a multifactorial network approach. Part 2: Cross-sectional study

of beekeeper management practices and production. Applied Network Integration 2: 52-87, 2022.

Guthrie, A, Wilson, G, Nassr, M, **Wilson, J.**. Honey bee health and productivity in Ontario, Canada, a multifactorial network approach. Part 3: Management and disease factors associated with in-season colony loss. Applied Network Integration 2: 88-119, 2022.

Guthrie, A, Wilson, G, Nassr, M, **Wilson, J.**. Honey bee health and productivity in Ontario, Canada, a multifactorial network approach. Part 4: Spatial and statistical examination of association of corn presence with in season colony loss. Applied Network Integration 2: 120-158, 2022.

Guthrie, A, Wilson, G, Nassr, M, **Wilson, J.**. Honey bee health and productivity in Ontario, Canada, a multifactorial network approach. Part 5: Conclusions and recommendations. Applied Network Integration 2: 159-172, 2022.

Guthrie, A, Wilson, G, Nassr, M, **Wilson, J.**. Honey bee health and productivity in Ontario, Canada, a multifactorial network approach. Part 6: Real world applications to pollinator networks. Applied Network Integration 2: 173-214, 2022.

Wilson, J, Salman, M , Janzen, E Sparagano, O, Speer, N, Pantaleon, L, La Jeunesse, C, Häsler, B, Wills, M, Rielander, D, Du Preez , R, Nguyen Thi Minh, T, Le Thanh, H, Guthrie, A, Wilson , M, Hayes , F, London , S, Churchyard , R, Gillam , W, Noor, S, Delaney, C, Briggs H, Cook, K, Rivers J. Community Network Integration: An approach to alignment of One Health partners for solutions to 'Wicked' problems of antimicrobial resistance. Preventive Veterinary Medicine, 175, 2020.

Swirski, A, Kasab-Bachi, H, Rivers, J, **Wilson, J**. Data Driven Enhancements to the Intestinal Integrity (I2) Index: A Novel Approach to Support Poultry Sustainability. MDPI Agriculture, 2020.

Masic, A, Liu R, Simkus K, Masic A, **Wilson J**, Baker J, Sanchez P, Saleem A, Harris C, Durst T, Arnason, J. Safety evaluation of a new anxiolytic product containing botanicals Souroubea spp and Platanus spp. Canadian Journal of Veterinary Research 82(1): 3-11, 2018.

Kasab-Bachia H, Arrudab A, Robertsa T, **Wilson J**. The use of large databases to inform the development of an intestinal scoring system for the poultry industry. Preventive Veterinary Medicine 146:130-135, 2017.

Kadykalo S, Roberts T, Thompson M, **Wilson J,** Lang M, Espeisse O. The value of anticoccidials for sustainable global poultry production. International Journal of Antimicrobial Agents 49:3, 2017.

Wilson, J, Winckelmans, I, Roberts, T, Li-Byarlay, H, Guthrie, A, Wilson, M, Wilson, L, Delaney, C, Kasab-Bachi, H, Vonk, M, Rivers, J. A Process for Integration of Global Networks to Achieve Sustainability of Aquaculture and Aquatic Ecosystems. Applied Network Integration 1: 1-6, 2017

Wilson, J. Bring your own ball and bat to school: how respectful disruptive innovation can transform almost anything. Applied Network Integration 1: 12-13, 2017.

Wilson, M. **Wilson, J.** The consequences of convenience: Ecological and philosophical. Applied Network Integration 1: 7-11, 2017.

Aramini, J, Noori, H, Wilner, S, Domurath, A, Coviello, N, Esfandiari, N, **Wilson, J.** Alignment of value chain players in the pet care industry to create customer value: Literature review and qualitative analysis. Applied Network Integration 1: 14-30, 2017.

Chan G, Guthrie A, Sivaramalingam T, **Wilson J**, Vancraeynest D, Moody R, Clark S. A Framework for assessment of the efficacy of antimicrobials in the control of necrotic enteritis in broiler chickens. Journal of Applied Poultry Research 24:246–256, 2015.

Chan G, Guthrie A, Sockett P, **Wilson J**, Moody R, Clark S. Economic cost-benefit analysis of the use of bacitracin methylene disalicylate in broilers affected with necrotic enteritis. Journal of Applied Poultry Research, 2014 00:1–6, 2015.

Roberts TE, **Wilson J**, Guthrie A, Cookson KC, Vancraeynest D, Schaeffer J, Moody RL, Clark SR. New issues in science in broiler chicken intestinal health: emerging technology and alternative intervention. Journal of Applied Poultry Research. 1:24(2): 257-66, 2015.

Roberts TE, **Wilson J**, Guthrie A, Cookson KC, Vancraeynest D, Schaeffer J, Moody RL, Clark SR. New issues in science in broiler chicken intestinal health: intestinal microbial composition, shifts, and impacts. World's Poultry Science Journal. 2015 1:71(02):259-70, 2015.

Pardhan-Ali A, **Wilson J**, Edge VL, Furgal C, Reid-Smith R, Santos M, McEwen SA. Community-level risk factors for notifiable gastrointestinal illness in the Northwest Territories, Canada, 1991-2008. BMC Public Health 13(1):63, 2013.

Papadopoulos A, Sargeant JM, Majowicz SE, Sheldrick B, McKeen C, **Wilson J**, Dewey CE. Enhancing public trust in the food safety regulatory system. Health Policy 2012.

Paradis M, Gebhart. CJ, Toole D, Vessie G, Winkelman NL, Bauer SA, **Wilson JB**, McClure CA. Subclinical ileitis: Diagnostic and performance parameters in a

multi-dose mucosal homogenate challenge model. J Swine Health Prod 20(3):137-141, 2012.

Pardhan-Ali A, Berke O, **Wilson J**, Edge VL, Furgal C, Reid-Smith R, Santos M, McEwen SA. A spatial and temporal analysis of notifiable gastrointestinal illness in the Northwest Territories, Canada, 1991-2008. International Journal of Health Geographics 11(1):1-10, 2012.

Pardhan-Ali A, **Wilson J**, Edge VL, Furgal C, Reid-Smith R, Santos M, McEwen SA. A descriptive analysis of notifiable gastrointestinal illness in the Northwest Territories, Canada, 1991–2008. BMJ Open 2:e000732 doi:10.1136, 2012.

Varela N, Dick P, **Wilson J**. Assessing the existing information on the efficacy of bovine vaccination against *Escherichia coli* O157: H7–a systematic review and meta-analysis. Zoonoses and Public Health 2012.

Byra C, Gadbois P, Cox WR, Gottschalk M, Farzan V, Bauer SA, **Wilson JB**. Decreased mortality of weaned pigs with *Streptococcus suis* with the use of in-water potassium penicillin G. The Canadian Veterinary Journal 52(3):272, 2011.

Skinner JT, Bauer S, Young V, Pauling G, **Wilson J**. An economic analysis of the impact of subclinical (mild) necrotic enteritis in broiler chickens. Avian Diseases 54(4):1237-1240, 2010.

Wilson J, Conly J, Wong T, Jayaraman G, Sargeant J, Papadopoulos A, Young V, Quist-Moyer M, Bauer S. Strategies to control community-associated antimicrobial resistance among enteric bacteria and methicillin-resistant *Staphylococcus aureus* in Canada–executive summary. The Canadian Journal of Infectious Diseases & Medical Microbiology 21(3):133, 2010.

Keegan VA, Majowicz SE, Pearl DL, Marshall BJ, Sittler N, Knowles L, **Wilson JB**. The epidemiology of enteric disease in C-EnterNet's pilot site, Waterloo, Ontario, 1990-2004. Canadian Journal of Infectious Diseases and Medical Microbiology (accepted for publication) 2009.

Nesbitt A, Majowicz S, Finley R, Marshall B, Pollari F, Sargeant J, Ribble C, **Wilson J**, Sittler N. High-risk food consumption and food safety practices in a Canadian community. Journal of Food Protection 72(12):2575-2586, 2009.

Akwar HT, Poppe C, **Wilson J**, Reid-Smith RJ, Dyck M, Waddington J, Shang D, McEwen SA. Prevalence and patterns of antimicrobial resistance of fecal *Escherichia coli* among pigs on 47 farrow-to-finish farms with different in-feed medication policies in Ontario and British Columbia. Canadian Journal of Veterinary Research 72(2):195, 2008.

Akwar HT, Poppe C, **Wilson J**, Reid-Smith RJ, Dyck M, Waddington J, Shang D, McEwen SA. Associations of antimicrobial uses with antimicrobial resistance of fecal *Escherichia coli* from pigs on 47 farrow-to-finish farms in Ontario and British Columbia. Canadian Journal of Veterinary Research 72(2):202, 2008.

Gadbois P, Brennan J, Bruce H, **Wilson J**, Aramini J. The role of penicillin G potassium in managing *Clostridium perfringens* in broiler chickens. Avian Diseases 52(3):407-411, 2008.

Nesbitt A, Majowicz S, Finley R, Pollari F, Pintar K, Marshall B, Cook A, Sargeant J, **Wilson J**, Ribble C. Food consumption patterns in the waterloo region, Ontario, Canada: A cross-sectional telephone survey. BMC Public Health 8(1):370, 2008.

Akwar T, Poppe C, **Wilson J**, Reid-Smith R, Dyck M, Waddington J, Shang D, Dassie N, McEwen S. Risk factors for antimicrobial resistance among fecal *Escherichia coli* from residents on forty-three swine farms. Microbial Drug Resistance 13(1):69-76, 2007.

Akwar T, Poppe C, **Wilson J**, Reid-Smith R, Dyck M, Waddington J, Shang D, Dassie N, McEwen S. Risk factors for antimicrobial resistance among fecal *Escherichia coli* from residents on forty-three swine farms. Microbial Drug Resistance 13(1):69-76, 2007.

Beroll H, Berke O, **Wilson J**, Barker IK. Investigating the spatial risk distribution of West Nile virus disease in birds and humans in southern Ontario from 2002 to 2005. Population Health Metrics 5(3):1-16, 2007.

Paradis M, Gottschalk M, Rajic A, Ravel A, **Wilson JB**, Aramini J, McClure CA, Dick CP. Seroprevalence of *Lawsonia intracellularis* in different swine populations in 3 provinces in Canada. The Canadian Veterinary Journal 48(1):57, 2007.

Bagg R, Vessie GH, Dick CP, Duffield T, **Wilson JB**, Aramini JJ. Milk residues and performance of lactating dairy cows administered high doses of monensin. Canadian Journal of Veterinary Research 69(3):180, 2005.

Charron DF, Thomas MK, Waltner-Toews D, Aramini JJ, Edge T, Kent RA, Maarouf AR, **Wilson J**. Vulnerability of waterborne diseases to climate change in Canada: A review. Journal of Toxicology and Environmental Health, Part A 67(20-22):1667-1677, 2004.

Doré K, Buxton J, Henry B, Pollari F, Middleton D, Fyfe M, Ahmed R, Michel P, King A, Tinga C, **Wilson J**. Risk factors for *Salmonella* Typhimurium DT104 and non-DT104 infection: A Canadian multi-provincial case-control study. Epidemiology and Infection 132(3):485-493, 2004.

Edge VL, Pollari F, Lim G, Aramini J, Sockett P, Martin SW, **Wilson J**, Ellis A. Syndromic surveillance of gastrointestinal illness using pharmacy over-the-counter sales. A retrospective study of waterborne outbreaks in Saskatchewan and Ontario. Canadian Journal of Public Health 95(6):446, 2004.

Majowicz S, Doré K, Flint J, Edge V, Read S, Buffett M, McEwen S, McNab W, Stacey D, Sockett P, **Wilson J**. Magnitude and distribution of acute, self-reported gastrointestinal illness in a Canadian community. Epidemiology and Infection 132(4):607-617, 2004.

Martin SW, Michel P, Middleton D, Holt J, **Wilson J**. Investigation of clusters of giardiasis using GIS and a spatial scan statistic. International Journal of Health Geographics 3(1):11, 2004.

Odoi A, Martin S, Michel P, Holt J, Middleton D, **Wilson J**. Determinants of the geographical distribution of endemic giardiasis in Ontario, Canada: A spatial modelling approach. Epidemiology and infection 132(5):967-976, 2004.

Paradis M, Pauling G, Brennan J, Winkelman N, Bagg R, Dick C, **Wilson J**. Evaluation of tylosin tartrate in drinking water for treatment of porcine proliferative enteropathy (ileitis). Journal of Swine Health and Production 12:176-180, 2004.

Paradis M, Vessie GH, Merrill JK, Dick CP, Moore C, Charbonneau G, Gottschalk M, MacInnes JI, Higgins R, Mittal K, Girard C, Aramini JJ, **Wilson JB**. Efficacy of tilmicosin in the control of experimentally induced *Actinobacillus pleuropneumoniae* infection in swine. Canadian Journal of Veterinary Research 68(1):7, 2004.

Brennan J, Skinner J, Barnum D, **Wilson J**. The efficacy of bacitracin methylene disalicylate when fed in combination with narasin in the management of necrotic enteritis in broiler chickens. Poultry Science 82(3):360-363, 2003.

Duffield T, Bagg R, Kelton D, Dick P, **Wilson J**. A field study of dietary interactions with monensin on milk fat percentage in lactating dairy cattle. Journal of Dairy Science 86(12):4161-4166, 2003.

Karmali MA, Mascarenhas M, Petric M, Dutil L, Rahn K, Ludwig K, Arbus GS, Michel P, Sherman PM, **Wilson J**. Age-specific frequencies of antibodies to *Escherichia coli* verocytotoxins (shiga toxins) 1 and 2 among urban and rural populations in southern Ontario. Journal of Infectious Diseases 188(11):1724-1729, 2003.

MacInnes JI, Paradis M, Vessie GH, Slavic L, Watson S, **Wilson JB**, Aramini JJ, Dick CP. Efficacy of prophylactic tilmicosin in the control of experimentally

induced *Haemophilus parasuis* infection in pigs. Journal of Swine Health and Production 11(4):174-180, 2003.

Martin SW, Michel P, Holt J, Middleton D, **Wilson J**. Geographical and temporal distribution of human giardiasis in Ontario, Canada. International Journal of Health Geographics 2(1):5, 2003.

Odoi A, Aramini J, Majowicz S, Meyers R, Martin WS, Sockett P, Michel P, Holt J, **Wilson J**. The status of drinking water in Ontario, Canada (1992-1999). Canadian Journal of Public Health 94(6):417-421, 2003.

Brennan JJ, Bagg RB, Vessie G, **Wilson JB**, Barnum DA, Moore G, Zimmermann A, Dick P, Poe S. Water-soluble tylosin tartrate (Tylan Soluble Powder) for treatment of necrotic enteritis in broiler chickens. Poultry Science. 80(Suppl. 1): 565, 2002.

Sylvestre A, **Wilson J**, Hare J. A comparison of 2 different suture patterns for skin closure of canine ovariohysterectomy. The Canadian Veterinary Journal 43(9):699, 2002.

Valcour JE, Michel P, McEwen SA, **Wilson JB**, Valcour J, Michel P, McEwen S, **Wilson J**. Associations between indicators of livestock farming intensity and incidence of human shiga toxin-producing *Escherichia coli* infection. Emerging Infectious Diseases 8(3):252, 2002.

Wilson JB, Honour S, Pauling GE, O'Connor B, Benjamin M, Paradis MA, Dick CP. Surveillance for porcine proliferative enteropathy in Alberta by using routine diagnostic laboratory data. The Canadian Veterinary Journal 43(8):604, 2002.

Brennan J, Bagg R, Barnum D, **Wilson J**, Dick P. Efficacy of narasin in the prevention of necrotic enteritis in broiler chickens. Avian Diseases:210-214, 2001.

Brennan J, Moore G, Poe S, Zimmermann A, Vessie G, Barnum D, **Wilson J**. Efficacy of in-feed tylosin phosphate for the treatment of necrotic enteritis in broiler chickens. Poultry science 80(10):1451-1454, 2001.

Greig JD, Michel P, **Wilson JB**, Lammerding AM, Majowicz SE, Stratton J, Aramini JJ, Meyers RK, Middleton D, McEwen SA. A descriptive analysis of giardiasis cases reported in Ontario, 1990-1998. Canadian Journal of Public Health 92(5):361-365, 2001.

Majowicz SE, Michel P, Aramini JJ, McEwen SA, **Wilson JB**. Descriptive analysis of endemic Cryptosporidiosis cases reported in Ontario, 1996-1997. Canadian Journal of Public Health 92(1):62-66, 2001.

Nathalie Bruneau N, Thorburn MA, **Wilson J**, Meek A. Hatchery-level predictive values for infectious pancreatic necrosis virus and *Aeromonas salmonicida* in Ontario, Canada. Preventive Veterinary Medicine 48(2):129-141, 2001.

Bagg R, Vessie G, **Wilson J**, Dick P. Comparison of the effects of monensin and decoquinate on feed intake and growth performance in dairy calves up to weaning age. Canadian Journal of Animal Science 80(4):721-723, 2000.

Michel P, **Wilson J**, Wayne Martin S, Clarke R, McEwen S, Gyles C. Estimation of the under-reporting rate for the surveillance of *Escherichia coli* O157: H7 cases in Ontario, Canada. Epidemiology and infection 125(1):35-45, 2000.

Nasinyama G, McEwen S, **Wilson J**, Waltner-Toews D, Gyles C, Opuda-Asibo J. Risk factors for acute diarrhoea among inhabitants of Kampala district, Uganda. South African Medical Journal 90(9):891, 2000.

Boerlin P, McEwen SA, Boerlin-Petzold F, **Wilson JB**, Johnson RP, Gyles CL. Associations between virulence factors of shiga toxin-producing *Escherichia coli* and disease in humans. Journal of clinical microbiology 37(3):497-503, 1999.

Michel P, **Wilson JB**, Martin SW, Clarke RC, McEwen SA, Gyles CL. Temporal and geographical distributions of reported cases of *Escherichia coli* O157: H7 infection in Ontario. Epidemiology and Infection 122:193-200, 1999.

Holton D, **Wilson J**, Ellis A, Haldane D, April N, Grimsrud K, Friesen B, Spika J. A Canadian multicentre case-control study of sporadic *Escherichia coli* 0157: H7 infection. The Canadian Journal of Infectious Diseases 10(2):117, 1999.

Isaacs S, Abernathy T, Hart B, **Wilson J**. Public health inspectors in restaurants: What they do and why. Canadian Journal of Public Health 90(5):348, 1999.

Jordan D, McEwen S, Lammerding A, McNab W, **Wilson J**. Pre-slaughter control of *Escherichia coli* O157 in beef cattle: A simulation study. Preventive Veterinary Medicine 41(1):55-74, 1999.

Jordan D, McEwen S, Lammerding A, McNab W, **Wilson J**. A simulation model for studying the role of pre-slaughter factors on the exposure of beef carcasses to human microbial hazards. Preventive Veterinary Medicine 41(1):37-54, 1999.

Jordan D, McEwen SA, **Wilson JB**, McNab WB, Lammerding AM. Reliability of an ordinal rating system for assessing the amount of mud and feces (tag) on cattle hides at slaughter. Journal of Food Protection 62(5):520-525, 1999.

Raina PS, Pollari FL, Teare GF, Goss MJ, Barry DA, **Wilson JB**. The relationship between *E. coli* indicator bacteria in well-water and gastrointestinal

illnesses in rural families. Canadian Journal of Public Health 90(3):172-175, 1999.

Wilson JB, Pauling GE, McEwen BJ, Smart N, Carman PS, Dick CP. A descriptive study of the frequency and characteristics of proliferative enteropathy in swine in Ontario by analyzing routine animal health surveillance data. The Canadian Veterinary Journal 40(10):713, 1999.

Jackson SG, Welch K, Goodbrand BR, Odorico VG, Johnson RP, Alves D, Rahn K, **Wilson JB**, Khakhria R. *Escherichia coli* O157:H7 diarrhea associated with well water and infected cattle on an Ontario farm. Epidemiology and Infection 120: 17-20, 1998.

Michel P, **Wilson J**, Martin S, Clarke R, McEwen S, Gyles C. A descriptive study of verocytotoxigenic *Escherichia coli* (VTEC) cases reported in Ontario, 1990-1994. Canadian Journal of Public Health 89(4):253, 1998.

Nasinyama GW, McEwen SA, Waltner-Toews D, Gyles CL, **Wilson J**. Factors associated with occurrence of *Salmonella* in broiler and layer flocks of chickens in Kampala district, Uganda. Bulletin of Animal Health Production in Africa 46:75-80, 1998.

Nasinyama GW, McEwen SA, **Wilson JB**, Waltner-Toews D, Gyles CL. Risk factors for *Salmonella* infection among diarrhoea patients in Kampala district, Uganda. Uganda Veterinary Journal (Special Issue) Vol. 2(5), 1998.

Nasinyama GW, McEwen SA, Waltner-Toews D, Gyles CL, **Wilson J**, Opuda-Asibo J, Poppe C. *Salmonella* in broiler and layer flocks of chicken in Kampala district, Uganda. Uganda Veterinary Journal 4(6):85-92, 1998.

Rahn K, Renwick SA, Johnson RP, **Wilson JB**, Clarke RC, Alves D, McEwen SA, Lior H, Spika J. Follow-up study of verocytotoxigenic *Escherichia coli* infection in dairy farm families. Journal of Infectious Diseases 177(4):1139-1140, 1998.

Smith KA, Kruth S, Hammermueller J, Gyles C, **Wilson JB**. A case-control study of verocytotoxigenic *Escherichia coli* infection in cats with diarrhea. Canadian Journal of Veterinary Research 62(2):87, 1998.

Wilson J, Johnson R, Clarke R, Rahn K, Renwick S, Karmali M, Michel P, Spika J. Emerging patterns in the epidemiology of Verocytotoxin-Producing *Escherichia coli* Infection in Canada. Canadian Journal of Infectious Diseases, 1998.

Wilson J, Renwick S, Clarke R, Rahn K, Alves D, Johnson R, Ellis A, McEwen S, Karmali M, Lior H. Risk factors for infection with verocytotoxigenic *Escherichia*

coli in cattle on Ontario dairy farms. Preventive Veterinary Medicine 34(2):227-236, 1998.

Nasinyama GW, McEwen SA, Waltner-Toews D, Gyles CL, **Wilson J**, Opuda-Asibo J, Poppe C. Factors associated with the occurrence of *Salmonella* in broiler and layer flocks of chickens in Kampala district, Uganda. Epidemiologie et Sante Animale 31-32:04.24.1-3, 1997.

Rahn K, Renwick S, Johnson R, **Wilson J**, Clarke R, Alves D, McEwen S, Lior H, Spika J. Persistence of *Escherichia coli* O157: H7 in dairy cattle and the dairy farm environment. Epidemiology and infection 119(2):251-259, 1997.

Wilson JB, Johnson RP, Clarke RC, Rahn K, Renwick SA, Alves D, Karmali MA, Michel P, Orrbine E, Spika JS. Canadian perspectives on verocytotoxin-producing *Escherichia coli* infection. Journal of Food Protection 60(11):1451-1453, 1997.

Johnson RP, Clarke RC, **Wilson JB**, Read SC, Rahn K, Renwick SA, Sandhu KA, Alves D, Karmali MA, Lior H. Growing concerns and recent outbreaks involving non-O157: H7 serotypes of verotoxigenic *Escherichia coli*. Journal of Food Protection 59(10):1112-1122, 1996.

Lee-Han H, Bell BP, **Wilson J**, Stratton J, Sax R. Missed opportunities for measles immunization: Waterloo region, Ontario, 1990-1991. Canadian Journal of Public Health 87(6):404-406, 1996.

Rahn K, **Wilson J**, McFadden K, Read S, Ellis A, Renwick S, Clarke R, Johnson R. Comparison of vero cell assay and PCR as indicators of the presence of verocytotoxigenic *Escherichia coli* in bovine and human fecal samples. Applied and Environmental Microbiology 62(12):4314-4317, 1996.

Reymond D, Johnson R, Karmali M, Petric M, Winkler M, Johnson S, Rahn K, Renwick S, **Wilson J**, Clarke R. Neutralizing antibodies to *Escherichia coli* vero cytotoxin 1 and antibodies to O157 lipopolysaccharide in healthy farm family members and urban residents. Journal of Clinical Microbiology 34(9):2053-2057, 1996.

Sandhu KS, Clarke RC, McFadden K, Brouwer A, Louie M, **Wilson J**, Lior H, Gyles CL. Prevalence of the *eaeA* gene in verotoxigenic *Escherichia coli* strains from dairy cattle in southwest Ontario. Epidemiology and infection 116(1):1-7, 1996.

Wilson J, Sockett P, Spika J, Johnson W. Summary of the national consensus conference on foodborne, waterborne and enteric disease surveillance. The Canadian Journal of Infectious Diseases 7(3):174, 1996.

Wilson JB, Clarke RC, Renwick SA, Johnson RP, Karmali MA, Lior H, Alves D, Gyles CL, Sandhu KS, McEwen SA. Verocytotoxigenic *Escherichia coli* infection in dairy farm families. Journal of Infectious Diseases 174(5):1021-1027, 1996.

Johnson RP, Boag L, Anderson S, Holtslander R, Rahn K, Clarke RC, Renwick SA, Alves D, **Wilson JB**, Spika J. *Brucella abortus* serology in cattle infected with *E. coli* O157:H7. Veterinary Record 135: 382-383, 1994.

Renwick SA, **Wilson JB**, Clarke RC, Lior H, Borczyk AA, Spika J, Rahn K, McFadden K, Brouwer A, Copps A. Evidence of direct transmission of *Escherichia coli* 0157: H7 infection between calves and a human. Journal of Infectious Diseases 168(3):792-793, 1993.

Wilson JB, McEwen SA, Clarke RC, Leslie KE, Waltner-Toews D, Gyles CL. Risk factors for bovine infection with verocytotoxigenic *Escherichia coli* in Ontario, Canada. Preventive Veterinary Medicine 16(3):159-170, 1993.

Julian R, **Wilson JB**. Pen oxygen concentration and pulmonary hypertension-induced right ventricular failure and ascites in meat-type chickens at low altitude. Avian Diseases:733-735, 1992.

Wilson J, McEwen S, Clarke R, Leslie K, Wilson R, Waltner-Toews D, Gyles C. Distribution and characteristics of verocytotoxigenic *Escherichia coli* isolated from Ontario dairy cattle. Epidemiology and Infection 108(3):423-439, 1992.

Wilson JB, McEwen SA, Clarke RC, Leslie KE, Waltner-Toews D, Gyles CL. A case-control study of selected pathogens including verocytotoxigenic *Escherichia coli* in calf diarrhea on an Ontario veal farm. Canadian Journal of Veterinary Research 56(3):184, 1992.

Wilson J, Julian R, Barker I. Lesions of right heart failure and ascites in broiler chickens. Avian Diseases:246-261, 1988.

Julian R, Summers J, **Wilson J**. Right ventricular failure and ascites in broiler chickens caused by phosphorus-deficient diets. Avian Diseases:453-459, 1986.

Abstracts to 2005

Majowicz SE, Sockett PN, Doré K, Edge VL, Flint J, Read S, **Wilson JB**. The burden of acute gastrointestinal illness in Hamilton, Ontario, Canada. Hamilton/NSAGI Federal Food Safety and Nutrition, 2005

Paradis MA, McKay RI, Michael R, Mulvey G, Vessie GH, Winkelman NL, Gebhart, CJ, Dick PC, McClure CA, **Wilson J**. Comparison of Tylan and Lincomix administered in feed for the prevention of porcine proliferative enteropathy (Ileitis). International Pig Veterinary Society, 2004.

Paradis MA, Vessie G, Merrill JK, Dick P, Moore C, Charbonneau G, Gottschalk, M, MacInnes J, Higgins R, Mittal KR, Girard C, Aramini J, **Wilson JB**. Efficacy of tilmicosin in the control of experimentally induced *Actinobacillus pleuropneumoniae* infection in swine. The Canadian Journal of Veterinary Research 68:7-11, 2004.

Majowicz S, Flint J, Doré K, Edge V, Stratton J, **Wilson J**. Infectious Gastrointestinal Illness in the Community: the Canadian Perspective.

Krenten-Boaretto B, Buxton JA, Doré K, Fyfe M, Middleton D, McEwen S, and the Multi-Provincial *Salmonella* Typhimurium Case-Control Study Group. Using provincial client registries for control selection; lessons learned.

Majowicz SE, Doré K, Edge VL, Flint JA, Read S, Buffett MC, **Wilson JB**, Sockett, P. Drinking water and enteric illness in a Canadian population: A pilot survey. 10th Canadian National Conference and 1st Policy Forum on Drinking Water, Halifax, Nova Scotia, April 2002.

Aramini J, Meyers R, Lim G, Ellis A, Stratton J, Majowica S, **Wilson JB**, Sockett P. Temporal-spatial analyses of a waterborne disease event: Walkerton, Ontario - May, 2000. International Conference on Water and Health, Ottawa, Ontario, May, 2002.

Brennan JJ, Bagg RB, Vessie G, **Wilson JB**, Barnum DA, Moore G. Enteritis in broiler chickens. Elanco Global Enteritis Symposium, Cambridge, England.

Wilson JB, Brennan J, McKay R, Bagg R, Dick P, Vessie G, Moore G, Poe SE, Zimmermann A, Barnum DA. Efficacy of tylosin tartrate administered in drinking water for the treatment of necrotic enteritis in broiler chickens. Elanco International Poultry Enteritis Symposium, Cambridge, England, July, 2002.

Greig JD, McEwen SA, Michel P, **Wilson JB**. A descriptive analysis of giardiasis cases reported in Ontario, 1990-1998. International Association for Food Protection Annual Meeting, Atlanta, Georgia, USA, August 6-9, 2000.

Brennan JJ, Moore G, Poe S, Vessie G, **Wilson JB**, Dick P, Barnum DA, Aimmermann A. Efficacy of dietary tylosin phosphate (Tylan) for control of necrotic enteritis in broiler chickens. International Poultry Health Conference, Montreal, Quebec, Canada, August 17-21, 2000.

Brennan JJ, Horne M, **Wilson JB**, Barnum DA. Efficacy of bacitracin methylene disalicyclate fed in combination with diclazuril for prevention of necrotic enteritis in broiler chickens. International Poultry Health Conference, Montreal, Quebec, Canada, August 17-21, 2000.

Papers read at scientific conferences but not published (to 2002)

Paradis MA, Higgins R, Lariviere S, DeLasalle F, **Wilson JB**, Dick P. *In-vitro* antimicrobial activity of tilmicosin against field strains of selected porcine pathogens. International Pig Veterinary Society Conference, 2002.

Paradis MA, MacInnes JI, Slavic L, Watson S, Vessie GH, Dick PC, **Wilson JB**. Efficacy of tilmicosin in reducing the severity of experimentally induced *Haemophilus parasuis* infection in swine. International Pig Veterinary Society Conference, 2002.

Paradis MA, MacInnes JI, Slavic L, Watson S, Vessie GH, Dick PC, **Wilson JB**. Efficacy of tilmicosin in the management of experimentally induced *Haemophilus parasuis* infection in swine. American Association of Swine Veterinarians Conference, 2002.

Waltner-Toews D, Aramini J, Charron D, Edge T, Kent R, Maarouf A, **Wilson JB**, Yurzk T. Impacts of global climate change on the incidence of waterborne diseases in Canada. Managing Shared Waters Conference, Hamilton, Ontario, Canada, June, 2002.

Odoi A, Martin SW, **Wilson JB**, Michel P, Holt J. Application of spatial scan statistics and geographical information systems (GIS) in the investigation of spatial disease clusters. CAVEPM 2002, Guleph, Ontario, May, 2002.

Aramini J, McLean M, **Wilson JB**, Holt J, Copes R, Allen B, Sears W. Drinking water quality and health care utilization for gastrointestinal illness in greater Vancouver. Thirty-Sixth Central Canadian Symposium on Water Pollution Research, Burlington, Ontario, Canada, 2001.

Aramini JJ, Majowicz SE, Allen OB, Holt J, Robertson W, McLean M, Meyers R, Berger H, Ford M, Michel P, Sockett P, **Wilson JB**. Temporal and spatial analysis of drinking water-related risk factors for infectious gastroenteritis in Canada. Ontario Ministry of the Environment, Toronto, Ontario, Canada, March 1, 2000.

Wilson JB. Subclinical necrotic enteritis in broiler chickens. Roche Scientific Symposium, Miami, Florida, USA, 2000.

Pauling GE, Paradis MA, Dick PC, Brennan J, **Wilson J**. Evaluation of tylosin tartrate in drinking water for the treatment of porcine proliferative enteropathy. American Association of Swine Practitioners, St. Louis, Missouri, USA, 1999.

Wilson JB. Antimicrobial resistance in enteric pathogens. LCDC Antimicrobial Resistance Workshop, Ottawa, Ontario, Canada, 1999.

Aramini J, **Wilson JB**. National surveillance for waterborne diseases. Canadian Water and Waste Water Association, Quebec City, Quebec, Canada, 1998.

Isaacs S, Abernathy T., **Wilson J**. The role of the public health inspector in food safety. Canadian Public Health Association Annual Conference, St. John's, Newfoundland, Canada, 1998.

Isaacs S, Abernathy T, **Wilson J**, Mathias R. The Central West Committee food safety evaluation project. Association of Public Health Epidemiologists in Ontario Program Evaluation Workshop, Toronto, Ontario, Canada, 1998.

Rahn K, Shin S, **Wilson J**, Johnson RP, Alves D, McNab B, Lachowski W, Spika J. Milk as a potential source of human exposure to *Mycobacterium paratuberculosis*. Canadian Society of Microbiologists, Guelph, Ontario, Canada, 1998.

Winkelman NL, Pauling GE, Brennan J, **Wilson J**. Use of challenge model to measure the impact of subclinical porcine proliferative enteritis on growth performance in pigs. American Association of Swine Practitioners, Des Moines, Iowa, USA, 1998.

Michel P, **Wilson JB**, Martin SW, McEwen SA, Clarke RC, Gyles CL. Temporal and spatial distributions of cases of verocytotoxigenic *Escherichia coli* infection in Southern Ontario. Geographic Information System in Public Health, 3rd. National Conference, San Diego, California, USA, 1998.

Johnson R, Karmali M, Mascarennas M, Johnson S, Perry M, **Wilson J**, Clarke R, Spika J. Serologic evidence of infection of dairy farm families with non-0157 verotoxin-producing *Escherichia coli*. Third International Conference on Verocytotoxigenic *E. coli* Infections, Baltimore, Maryland, USA, 1997.

Jordan D, McEwen SA, Lammerding AM, McNab WB, **Wilson JB**. Estimating the effect of pre-slaughter factors on the exposure of beef carcasses to *Escherichia coli* using a simulation model. Protecting the Public Against Food Borne Pathogens: *E. coli,* Washington, D.C., USA, 1997.

Wilson J, Johnson RP, Clarke RC, Rahn K, Renwick S, Michel P, Johnson W, Khakhria R, Todd E, Spika J. Current trends and activities related to verocytotoxigenic *E. coli* (VTEC) infection in Canada. World Health Organization Consultation on the Prevention and Control of Enterohaemorrhagic *Escherichia coli* (EHEC) Infection, Geneva, Switzerland, 1997. (Invited speaker).

Wilson JB. Global control of the *Helicobacter pylori* epidemic. Annual Conference of the Canadian Association of Gastroenterologists, Quebec City, Quebec, Canada, 1997 (invited speaker).

Wilson JB, Clarke RC, Johnson R, Rahn K, Michel P, Ellis A, Spika J. Current trends and emerging issues in foodborne diseases. Canadian Public Health Association Second National Conference on Communicable Disease Control, Toronto, Ontario, Canada, 1997. (Invited speaker).

Wilson JB. Collaborative approach to foodborne, waterborne and enteric disease surveillance. First Annual Interagency Meeting on Food Safety and Nutrition Research, Ottawa, Ontario, Canada, 1997.

Isaacs S, Abernathy T, **Wilson J**, Mathias R. Food safety program evaluation: A Central West initiative Amany partners, many opportunities. Meeting of Ontario Health Unit Epidemiologists, Toronto, Ontario, Canada,1997.

Michel P, **Wilson JB**. An epidemiologic study of reported cases of verocytotoxigenic *Escherichia coli* (VTEC) infection in Ontario: temporal and geographical distributions. First Annual Interagency Meeting on Food Safety and Nutrition Research, Ottawa, Ontario, Canada, 1997.

Michel P, **Wilson J**, Martin W, Clark R, McEwen S, Gyles C. Le *E. coli* vérocytotoxinogène, de la ferme à la table. Présentation orale. Assemblée annuelle de le Ordre des Médecin Vétérinaire du Québec, Quebec City, Quebec, Canada, 1997.

Ellis A, **Wilson J**, Sockett P, Isaacs S, Hockin J, Doré K, Harwig J, Lammerding A. Risk factors and economic impact of sporadic *Campylobacter* infection in Wellington, Dufferin, Halton and Waterloo Counties. First Annual Interagency Meeting on Food Safety and Nutrition Research, Ottawa, Ontario, Canada, 1997.

Michel P, **Wilson J**, Martin, M., McEwen S, Clarke R, Gyles C. Temporal and Spatial distributions of verocytotoxigenic *E. coli* infection in southern Ontario. LCDC, Health Canada, Ottawa, Ontario, Canada, 1997.

Wilson J, Clarke RC, Johnson R, Rahn K, Michel P, Renwick S, Lior H, Karmali MA, Alves D, Gyles CL, McEwen SA, Spika J. VTEC Infection in Canada. University of Toronto Microbiology/Infectious Disease Research Day, Toronto, Ontario, Canada, 1997.

Wilson J, Clarke RC, Johnson R, Rahn K, Michel P, Renwick S, Lior H, Karmali MA, Alves D, Gyles CL, McEwen SA, Spika J. VTEC Infection in Canada. Department of Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario, Canada, 1997. (invited speaker).

Wilson JB. Foodborne disease surveillance in Canada. Presentation to the Federal/Provincial Committee on Food Safety, Ottawa, Ontario, Canada, 1997.

Johnson R, Rahn K, Michel P, **Wilson J.**. Renwick S, Lior H, Alves D, Gyles CL,

McEwen SA, Spika J. VTEC Infection in Canada: Preharvest and processing perspectives. University of Toronto Microbiology/Infectious Disease Research Day, Toronto, Ontario, Canada, 1997.

Rahn K, Clarke RC, Johnson R, **Wilson JB**, Renwick S, Lior H, Karmali MA, Alves D, Gyles CL, McEwen SA, Spika J. International Importance of *Escherichia coli* O157:H7 and other serotypes of VTEC. Ontario Food Protection Association, Toronto, Ontario, Canada, 1996.

Wilson JB. The emerging health significance of verocytotoxigenic *E. coli* of serotypes other than O157:H7. Canadian Association of Public Health Inspectors Annual Conference, Guelph, Ontario, Canada, 1996. (invited speaker).

Clarke RC, Johnson R, **Wilson JB**, Rahn K, Renwick S, Lior H, Karmali MA, Alves D, Gyles CL, McEwen SA, Spika J. Canadian Perspective on VTEC Infections. Canadian Association of Clinical Microbiology and Infectious Disease, Hamilton, Ontario, Canada, 1996.

Wilson J, Clarke RC, Johnson R, Rahn K, Renwick S, Lior H, Karmali MA, Alves D, Gyles CL, McEwen SA, Spika J. Canadian Perspective on VTEC Infection. Health Studies Department, University of Waterloo, Waterloo, Ontario, Canada, 1996.

Rahn K, Clarke RC, Johnson R, **Wilson JB**, Renwick S, Lior H, Karmali MA, Alves D, Gyles CL, McEwen SA, Spika J. Canadian Perspective on VTEC Infection. Rapid Methods in Microbiology Workshop, University of Wisconsin, Madison, Wisconsin, USA, 1996.

Michel P, **Wilson** J, Clarke RC, Johnson R, Rahn K, Renwick S, Lior H, Karmali MA, Alves D, Gyles CL, McEwen SA, Spika J. Use of a Geographic Information System to Map VTEC cases in Ontario. Guelph Group for Research in Food Safety, Guelph, Ontario, Canada, 1996.

Johnson RP, Clarke RC, **Wilson JB**, Rahn K, Renwick S, Read SC, Karmali MA, Gyles CL. Verotoxin-producing *Escherichia coli*: Farm prevalence and production intervention strategies. 83rd Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Seattle, Washington, USA, 1996.

Johnson RP, **Wilson JB**. Canadian views on verocytotoxigenic *Escherichia coli*. International Life Sciences Institute of North America, Symposium on Global Perspectives on *Escherichia coli* O157:H7 and Other Serotypes. 83rd Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Seattle, Washington, USA, 1996.

Rahn K, Johnson RP, **Wilson JB**, Renwick SA, Stewart B, Clarke RC, Odumeru J, Alves D, Johnson W, Clark CG, Karmali MA, Spika J. Occupational exposure

of abattoir workers to verocytotoxigenic *Escherichia coli* (VTEC), *Salmonella* spp and *Campylobacter* spp. Annual Meeting of the American Society of Microbiology, New Orleans, Louisiana, USA, 1996.

Wilson JB. Summary of the National Consensus Conference on Foodborne and Enteric Disease Surveillance. *Meeting on Food and Waterborne* Disease Outbreak Surveillance, Division of Disease Surveillance, LCDC, Health Canada, Ottawa, Ontario, Canada, 1996.

Wilson JB, Clarke RC, Renwick S, Rahn K, Lior H, Karmali MA, Johnson R, Alves D, Gyles CL, Sandhu KS, McEwen SA, Spika J. The interface between human and animal health. Ontario Veterinary Association Annual Conference, Ottawa, Ontario, Canada, 1996.

Wilson JB, Clarke RC, Renwick S, Rahn K, Lior H, Karmali MA, Johnson R, Alves D, Gyles CL, Sandhu KS, McEwen SA, Spika J. Modeles de transmission d'*Escherichia coli* verocytotoxinogene de l'animal a l'homme. Colloque Epidemiologie Animale et Protection de la Sante Publique, Huitiemes Entretiens Jacques Cartier, Geneva, Switzerland, 1995. (invited speaker).

Wilson JB, Clarke RC, Renwick S, Rahn K, Lior H, Karmali MA, Johnson R, Alves D, Gyles CL, Sandhu KS, McEwen SA, Spika J. The emerging health significance of verocytotoxigenic *Escherichia coli* (VTEC) of serotypes other than O157:H7. International Conference on coliforms and *E. coli*: problem or solution, Leeds, England, 1995. (invited speaker).

Smith K, Hammermueller J, Kruth S, Gyles C, **Wilson JB**. A case-control study of verocytotoxigenic *E. coli* infection in cats with diarrhea. The 13th Annual Conference of the American College of Veterinary Internal Medicine, Orlando, Florida, USA, 1995.

Johnson RP, Clarke RC, **Wilson JB**, Read SC, Rahn K, Sandhu KS, Alves D, Karmali MA, Lior H, McEwen SA, Spika J, and Gyles CL. Growing concerns and recent outbreaks involving non-O157:H7 serotypes of verotoxigenic *Escherichia coli*. International Association of Milk, Food, and Environmental Sanitarians, Pittsburgh, Pennsylvania, USA, 1995.

Johnson RP, Rahn K, Renwick S, **Wilson J**, Clarke RC, Spika J, Karmali MA, Alves D, Lior H. Persistence of *Escherichia coli* O157:H7 and other Verotoxigenic *E. coli* on Ontario dairy farms. 5th Annual Joint Agri-Food Safety Research Meeting, Nepean, Ontario, Canada, 1995.

Johnson RP, Clarke RC, **Wilson JB**, Read SC, Renwick SA, Rahn K, Alves D, McEwen SA, Gyles CL, Lior H, Spika J. Verotoxigenic *Escherichia coli* in ground beef - Canadian situation. Health Canada Workshop on Risk Management of Microbial Contaminants in Raw Foods of Animal Origin, Ottawa, Ontario, 1995.

Reymond D, Johnson RP, Karmali A, Petric M, Winkler M, Johnson S, Rahn K, Renwick S, **Wilson J**, Clarke RC, Spika J. Prevalence of antibodies to verocytotoxin 1 and *Escherichia coli* O157 lipopolysaccharide in dairy farm families and urban residents. Annual Meeting of the American Society of Microbiology, Washington, D.C., USA,1995.

Rahn K, Ellis A, **Wilson J**, McFadden K, Read S, Renwick, S. Comparison of vero cell assay and polymerase chain reaction as indicators of the presence of verocytotoxigenic *Escherichia coli* (VTEC) in bovine and human fecal samples. 45th Annual Meeting Canadian Society of Microbiologists, Kingston, Ontario, Canada, 1995.

Johnson RP, Rahn K, Renwick S, **Wilson J**, Clarke RC, Spika J, Karmali MA, Alves D, Lior H. Persistence of *Escherichia coli* O157:H7 and other verocytotoxigenic *E. coli* on Ontario dairy farms. Annual Meeting of the American Society of Microbiology, Washington, D.C., USA, 1995.

Read SC, Johnson W, Khakhria R, Woodward D, McFadden K, Brouwer MA, Johnson RP, Rahn K, Spika J, **Wilson J**. Characterization of Verocytotoxigenic *Escherichia coli* strains from human and animal sources. Annual Meeting of the Canadian Association of Clinical Medicine and Infectious Diseases, Winnipeg, Manitoba, Canada, 1995.

Read SC, Johnson W, Khakhria R, Woodward, D., McFadden K, Brouwer MA, Johnson RP, Rahn K, **Wilson J**, Spika J. Characterization of verocytotoxigenic *Escherichia coli* strains from human and animal sources. 5th Annual Joint AAFC Agri-Food Safety Research Meeting, Nepean, Ontario, Canada, 1995.

Wilson JB. Foodborne Disease Surveillance. National Consensus Conference on Foodborne and Enteric Disease Surveillance, Ottawa, Ontario, Canada, 1995.

Wilson JB, Clarke RC, Renwick S, Rahn K, Johnson RP, Alves D, Karmali MA, Lior H, McEwen SA, Spika J. Verocytotoxigenic *E. coli* infection on dairy farms in Ontario. Second International Conference on Verocytotoxigenic *E. coli* infections, Bergamo, Italy, 1994.

Rahn K, Ellis A, **Wilson J**, McFadden K, Read S, Renwick S. Comparison of vero cell assay and polymerase chain reaction as indicators of the presence of verocytotoxigenic *Escherichia coli* (VTEC) in bovine and human fecal samples. 4th Annual AGCAN Agri-Food Safety Research Meeting, Nepean, Ontario, Canada, 1994.

Rahn K, Johnson RP, **Wilson JB**, and the VTEC Research Group. Occupational exposure of abattoir workers to verotoxigenic *Escherichia coli, Salmonella sp., and Campylobacter sp.* 4th Annual Joint AGCAN Agri-Food Safety Research

Meeting, Nepean, Ontario, Canada, 1994.

Nasinyama GW, McEwen SA, **Wilson J**, Waltner-Toews D, Gyles C, Opudas-Asibo J. An epidemiologic study of non-typhoidal *Salmonellae* and Verocytotoxigenic *Escherichia coli* (VTEC) in humans and human foods of animal origin in Uganda. International Symposium on Veterinary Epidemiology and Economics, Paris, France, 1994.

Clarke RC, **Wilson JB**, Read SC, Renwick S, Rahn K, Johnson RP, Alves D, Karmali MA, Lior H, McEwen SA, Spika J, Gyles CL. VTEC in the food chain: preharvest and processing perspectives. Second International Conference on Verocytotoxigenic *E. coli* infections, Bergamo, Italy, 1994.

Rahn K, Clarke RC, Johnson R, **Wilson JB**, Renwick S, Lior H, Karmali MA, Alves D, Gyles CL, McEwen SA, Spika J. Verocytotoxigenic *Escherichia coli*, *Salmonella* and *Campylobacter* in abattoir workers and abattoir environments. Annual Agcan Joint Meeting in Agri-Food Safety Research, Ottawa, Ontario, Canada, 1994.

Clarke RC, **Wilson JB**, Renwick SA , Rahn K, Johnson RP, Alves D, Karmali MA, Lior H, McEwen SA, Spika JS. The dairy farm as a model for animal-human transmission. 81st Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, San Antonio, Texas, USA, 1994.

Wilson JB. Ontario Farm Groundwater Quality Survey. Canadian Institute of Public Health Inspectors Annual Conference, Niagara Falls, Ontario, Canada, 1994. (Invited Speaker).

Wilson JB. Waterborne Disease in Canada. Canadian Public Health Association National Conference on Communicable Disease Control, Toronto, Ontario, Canada, 1994. (Invited Speaker).

Alves D, **Wilson JB**, Renwick S, Clarke R, Karmali M, Lior H. Verocytotoxigenic *Escherichia coli* infection on dairy farms in southern Ontario. Canadian Veterinary Medical Association Conference, Toronto, Ontario, Canada, 1994.

Alves D, **Wilson JB**, Renwick S, Clarke R, Karmali M, Lior H. Verocytotoxigenic *Escherichia coli* infection on dairy farms in southern Ontario. Canadian Animal Diseases Conference, Chicago, Illinois, USA, 1994.

Rahn K, **Wilson JB**, Clarke C, Renwick S, Johnson RP, Spika J, Karmali M, Alves D, Lior H. Verocytotoxigenic *Escherichia coli* infection on dairy farms in southern Ontario. Annual Meeting of the American Society of Microbiology, Las Vegas, Nevada, USA, 1994.

Rahn K, Ellis A, **Wilson J**, McFadden K, Read S, Renwick S. Comparison of

vero cell assay and polymerase chain reaction as indicators of the presence of verocytotoxigenic *Escherichia coli* in bovine and human fecal samples. Annual Meeting of the American Society of Microbiology, Las Vegas, Nevada, USA, 1994.

Johnson RP, Rahn K, **Wilson JB**. Verotoxigenic *Escherichia coli* (VTEC) infection in humans and cattle on dairy farms in Ontario. Conference of Research Workers in Animal Diseases, Chicago, Illinois, USA, 1993.

Lior H, Clarke R, **Wilson JB**, Renwick S, Alves D, Karmali MA. Verocytotoxigenic *Escherichia coli* infection in humans and cattle on dairy farms in Ontario, Canada. Food Micro '93, Berlin, Germany, 1993.

Sandhu KS, Clarke RC, Louie M, Lior H, **Wilson J**, McFadden K, Gyles CL. Prevalence of the *eaeA* gene in verocytotoxigenic *Escherichia coli* strains from dairy cattle in southern Ontario. Annual Meeting of the American Society of Microbiology, Atlanta, Georgia, USA, 1993.

Renwick S, Clarke R, **Wilson JB**, Lior H, Karmali M. Verocytotoxigenic *Escherichia coli* infection in humans and cattle on dairy farms in Ontario. Canadian Veterinary Medical Association Conference, Toronto, Ontario, Canada, 1993.

Rahn K , Clarke RC, Johnson R, **Wilson JB**, Renwick S, Lior H, Karmali MA, Alves D, Gyles CL, McEwen SA, Spika J. Verocytotoxigenic *Escherichia coli* infection in humans and cattle on dairy farms in southwestern Ontario. Third Annual Agcan Joint Meeting in Agri-Food Safety Research, Ottawa, Ontario, Canada, 1993.

Wilson JB. Epidemiology of verotoxigenic *Escherichia coli* infections. Annual Meeting of the Northeast Regional Section, American Organization of Analytical Chemists, Guelph, Ontario, Canada, 1993. (Invited Speaker).

Wilson JB. Human health, bacteria and water quality. OAC Agricultural Conference, Guelph, Ontario, Canada, 1993.

Wilson JB. Hospital outbreak of *Salmonella enteritidis* infection, Owen Sound. LCDC Seminar Series, Health and Welfare Canada, Ottawa, Ontario, Canada, 1993.

Wilson JB, Clarke RC. Verocytotoxigenic *Escherichia coli infection* in humans and cattle on dairy farms in Ontario. Centre for Disease Control, Atlanta, Georgia, 1993.

Wilson JB, McEwen SA, Clarke RC. Verocytoxigenic *E. coli* contamination of milk and associated risk factors. International Association of Meat and Food

Environmental Scientists, Toronto, Ontario, Canada,1992.

Bell B, Lee Han H, **Wilson JB**, Wong T. Missed opportunities for measles immunization, Waterloo Region, Ontario, 1990-1991. Canadian Public Health Association National Conference on Immunization Issues and Priorities, Toronto, Ontario, Canada, 1992.

Wilson JB, Gyles CL, McEwen SA, Clarke RC, Leslie KE. Epidemiology of verocytotoxigenic *E. coli* in Ontario dairy cattle. International Symposium on Veterinary Epidemiology and Economics, Ottawa, Ontario, Canada, 1991.

Wilson JB. Verocytotoxigenic *E. coli* in Ontario dairy cattle. LCDC Seminar Series, Health and Welfare Canada, Ottawa, Ontario, Canada, 1991.

Wilson JB, Kleinbeernink T. The politics of garbage. Guelph Interaction Conference, Guelph, Ontario, Canada, 1990.

Wilson JB, Kleinbeernink T., Hoornweg, D. The politics of garbage. Guelph Interaction Conference, Guelph, Ontario, Canada,1989.

Wilson JB. Verocytotoxigenic *E. coli* infection in Ontario dairy cattle. Ontario Milk Marketing Board Research Day, Guelph, Ontario, Canada, 1988.

Wilson JB. Ascites in broiler chickens caused by right ventricular failure. North Eastern Conference on Avian Diseases, Baltimore, Maryland, USA, 1985.

Wilson JB. Right ventricular failure and ascites in broilers. Ontario Academy of Avian Medicine, Guelph, Ontario, Canada,1985.

Wilson JB. Right ventricular failure and ascites in broiler chickens. Ontario Poultry Health Conference, Kitchener, Ontario, Canada, 1985.

Julian RJ, **Wilson JB**. Ascites in broiler chickens caused by high levels of carbon monoxide. North Eastern Conference on Avian Disease, Pennsylvania State, University Park, Pennsylvania, USA, 1984.

Poster presentations at scientific conferences (to 2012)

Varela NP, Dick P, Wilson JB. Assessing the Existing Information on the Efficacy of Bovine Vaccination against Escherichia coli O157:H7 – A Systematic Review and Meta-analysis. John Waters Zoonotic Disease Workshop, Calgary, Canada, 2012.

Aramini JJ, Majowicz SE, Allen OB, Holt J, Robertson W, McLean M, Meyers R, Berger H, Ford M, Michel P, Sockett P, **Wilson JB**. Temporal and spatial analysis of drinking water-related risk factors for infectious gastroenteritis in

Canada. Assessing exposure to disinfection by-products in epidemiologic studies, Ottawa, Ontario, Canada, 2000.

Valcour J, Michel P, **Wilson JB.** The development of animal population density indicators and their relationship to VTEC infection in Ontario. International Congress on Ecosystem Health, Sacramento, California, USA, 1999.

Rahn K, Shin S, **Wilson J**, Johnson RP, Alves D, McNab B, Lachowski W, Spika J. Milk as a potential source of human exposure to *Mycobacterium paratuberculosis*. American Society of Microbiology, Atlanta, Georgia, USA, 1998.

Michel P, **Wilson J**, Martin M, McEwen S, Clarke R, Gyles C. Temporal and Spatial distributions of verocytotoxigenic *E. coli* infection in southern Ontario. Third International Conference on Verocytotoxigenic *E. coli* infections, Baltimore, Maryland, USA, 1997.

Rahn K, Johnson RP, **Wilson JB**, Renwick SA, Stewart B, Clarke RC, Odumeru, J, Alves D, Johnson W, Clark CG, Karmali MA, Spika J. Occupational exposure of abattoir workers to verocytotoxigenic *Escherichia coli* (VTEC), *Salmonella* spp and *Campylobacter* spp. Annual Meeting of the American Society of Microbiology, New Orleans, Louisiana, USA, 1996.
h, Ontario, Canada, 1994.

FOR PERSONAL USE ONLY

It's time to apply outbreak response best practices to avian influenza: A national call to action

Jeff Wilson, Teresa Cereno, Mike Petrik, Negin Esfandiari, Derek Davy, Aaya Mahdi, Jeff Aramini, William Joseph Gilliam, Treasure Hunt, Jocelyn Rivers

Abstract

Cases of high pathogenicity avian influenza (HPAI) in Canada are upon us again and with reports of infection in US dairy cattle and a dairy farmer in the United States, concern has been raised. Although panic isn't helpful, this heightened level of concern is appropriate, given that reports of human infections with the H5N1 virus often indicate high mortality rates. These can range from 14 to 50%. The current devastating impact of the virus on the poultry industry, as well as its propensity to mutate are also reasons for concern. At the same time, HPAI provides an opportunity for the poultry and livestock industries to align and organize coherently for the management of all zoonotic diseases and other industry issues. To manage HPAI more effectively, it is essential to align all stakeholders under Outbreak Response Best Practices using a formal Quality Management System (QMS). The objective of this article is to describe this approach with examples drawn from management of the Walkerton waterborne disease crisis. We urge the veterinary profession to rise to the challenge of HPAI and use it as a context in which to align more coherently with national stakeholders for the prevention and management of all priority issues within the areas of Agri-food and Public Health.

Résumé

Les cas de grippe aviaire hautement pathogène (HPAI) sont de nouveau aux portes du Canada et, avec les rapports d'infection chez des bovins laitiers américains et chez un producteur laitier aux États-Unis, des inquiétudes ont été soulevées. Même si la panique n'aide pas, ce niveau d'inquiétude accru est approprié, étant donné que les rapports d'infections humaines par le virus H5N1 indiquent souvent des taux de mortalité élevés. Ceux-ci peuvent aller de 14 à 50 %. L'impact dévastateur actuel du virus sur l'industrie avicole, ainsi que sa propension à muter sont également des motifs d'inquiétude. Dans un même temps, l'HPAI offre aux secteurs de la volaille et de l'élevage l'opportunité de s'associer et de s'organiser de manière cohérente pour la gestion de toutes les maladies zoonotiques et d'autres problèmes industriels. Pour gérer l'HPAI plus efficacement, il est essentiel d'aligner toutes les parties prenantes sur les meilleures pratiques de réponse aux épidémies en utilisant un système de gestion de la qualité (QMS) formel. L'objectif de cet article est de décrire cette approche avec des exemples tirés de la gestion de la crise des maladies d'origine hydrique à Walkerton. Nous exhortons la profession vétérinaire à relever le défi de l'HPAI et à l'utiliser comme un contexte dans lequel s'aligner de manière plus cohérente avec les parties prenantes nationales pour la prévention et la gestion de toutes les questions prioritaires dans les domaines de l'agroalimentaire et de la santé publique.

(Traduit par Docteur Serge Messier)

Novometrix Research Inc., 4564 Nassagaweya-Puslinch TL, Moffat, Ontario L0P 1J0 (Wilson, Esfandiari, Aramini, Hunt); Canadian Food Inspection Agency (CFIA-ACIA), 59 Camelot Drive, Ottawa, Ontario K1A 0Y9 (Cereno); Petrik Veterinary Consultants, Cambridge, Ontario (Petrik); Econse Water Purification Systems Inc., 120 Nebo Road, Unit #4, Hamilton, Ontario L8W 2E4 (Davy); Translational and Molecular Medicine, Faculty of Medicine, University of Ottawa, 75 Laurier Avenue East, Ottawa, Ontario K1N 6N5 (Mahdi); Balsillie School of International Affairs, Wilfrid Laurier University, Waterloo, Ontario N2L 6C2 (Gilliam); Department of Population Medicine, Ontario Veterinary College, University of Guelph, 50 Stone Road East, Guelph, Ontario N1G 2W1 (Rivers).

Address all correspondence to Dr. Jeff Wilson: telephone: (519) 731-4834; email: Jbwilson@novometrix.com

Disclosure statement

Novometrix Research Inc. specializes in consulting, research, data analytics, and training to tackle complex One Health problems, encompassing human, animal, and environmental health. Based in Guelph, Canada, Novometrix has applied its Community Network Integration (CNI) process to various issues, such as pollinator sustainability, global poultry industry optimization, and outbreak management, including the Walkerton water crisis.

Jeff Wilson DVM, DVSc (Pathology), PhD (Epidemiology)
President, Novometrix Research and
Special Graduate Faculty, University of Guelph
Outbreak Lead for the homelessness epidemic in Guelph Wellington and
National Lead for Avian Influenza Pandemic Response Best Practices, Canada

Received May 16, 2024. Accepted June 11, 2024.

0487
047
FOR PERSONAL USE ONLY

Cases of high pathogenicity avian influenza (HPAI) in Canada threaten once again and with recent reports of infection and transmission in US dairy cattle and at least one dairy farmer in the United States, concern has been raised to new heights (1,2). Although panic is not helpful, this heightened concern is highly appropriate. Given reports of human infections with the H5N1 virus over several years, often with high mortality rates, *e.g.*, 14 to 50% (3), the current devastating impact of the virus on the Canadian poultry industry, and its well-established propensity to mutate (4), the ongoing HPAI outbreak should be considered a national emergency in Canada.

Comparing the current situation to past failures, such as the inertia before the COVID-19 pandemic, highlights the need for proactive measures to avoid similar widespread impacts. The delayed response to COVID-19 demonstrated how critical timely coordination is in managing public health crises. The danger of avian influenza and the absence of enough funding for research from the poultry sector are 2 major issues facing Canadian agriculture today. At the same time, the HPAI outbreaks constitute a national opportunity for the poultry and livestock industries — and Agri-food more broadly — to align and organize for the management of all zoonotic diseases and important issues beyond them by creating coherently aligned network teams (5,6). Basic principles of risk management indicate that the prudent time to declare an emergency is not when we have devastating human mortality across the country — that would be too late. At that point, all of us in the veterinary profession will have no excuse for our inaction and will rightfully be held to account. The correct time to declare an emergency is when the conditions indicating a high potential risk of infection and serious impact on human health are upon us. That time is now. It's time for all hands on deck, with eyes wide open and drawing on the best that all of us have to offer, while mitigating negative effects on human and animal health, as well as economic and social impacts.

Managing an outbreak requires adherence to established guidelines. An effective approach for handling such situations is to follow Outbreak Response Best Practices.

Novometrix Research and its collaborators have summarized the body of knowledge and experience that make up these best practices under a framework we call the Pillars of Outbreak Response. The approach applies to outbreaks of all sizes and durations and includes not only those of infectious diseases, but also chronic disease and socioeconomic determinants and outcomes (7). The Pillars provide: i) a description of the outbreak management process; ii) a strategic plan for the management of any outbreak; and iii) an evaluation framework for response to outbreaks in progress.

The Pillars of Outbreak Response

Pillar 1 — Leadership

Pillar 1 consists of creating and managing the outbreak leadership team. Managing an outbreak is inherently practical. The objective is usually to discover the cause of the outbreak and eliminate it in the short term, treat affected people/animals and address collateral damage, and put measures in place to prevent future outbreaks.

Unlike academic research or broad policy interventions, the objective is usually eminently clear, and the effectiveness of the players is often on very public display. The team should be led by people with practical experience in outbreak response and include all relevant stakeholders. It should be guided by values of collaboration, transparency, and evidence-based decision-making and focus on rapid resolution of the outbreak, rather than on personal or institutional gain. The leadership team is almost invariably the key element that distinguishes success from failure (8).

Pillar 2 — Information and data

Pillar 2 consists of obtaining and correctly analyzing, sharing, and interpreting all relevant information and data required to find the cause(s) of the outbreak and devising rational interventions that address all outcomes.

This includes i) peer-reviewed literature, gray literature, and media reports and interviews with experts/key informants, including those working at the ground level; and ii) secondary databases, *e.g.*, those created for administrative or research purposes, and primary data sources, *i.e.*, those collected specifically for managing the outbreak.

Data analysis is used to determine the nature and extent of the outbreak and its causes(s), for example through statistical analysis. It is also used to determine performance characteristics of tests, such as sensitivity, specificity, and predictive values.

Pillar 3 — Interventions

Pillar 3 consists of devising, evaluating, and implementing potential interventions. The specific interventions naturally depend on the nature of the outbreak, *e.g.*, infectious *versus* chemical, economic. These interventions are guided by information and analyses undertaken in Pillar 2.

Interventions are typically implemented sequentially, beginning in the short term with those that seem likely to be effective and have a low probability of harm or excessive cost. As more data are gathered and initial interventions evaluated, these are often followed by interventions that are more specific, perhaps more costly, and require more time to implement.

Pillar 4 — Communication

Pillar 4 consists of establishing a communication process that is complete, factual, transparent, and multi-directional and involves all required stakeholders, including the public. Methods of communication depend on the situation and can include face-to-face and video/phone meetings, use of both conventional media and social media, printed flyers, and public meetings. In each case, the messaging should be coherent, consistent across sources, and easy to understand. There is no place in a serious outbreak response for public relations campaigns designed to create the impression of effectiveness when it does not exist.

FOR PERSONAL USE ONLY

Management of the pillars: Community network integration and quality management systems

Running an outbreak response can be a complex endeavor, involving distributed networks consisting of many different people, priorities, approaches, and resources. Like any project, its success is limited by the effectiveness of its management processes.The most effective process for managing complex projects is a formal Quality Management System (QMS). Most such systems are used to manage networks of limited scope, particularly corporate value chains. Community Network Integration (CNI), along with its unique distributed Quality Management System (QMS), is a validated and evidence-based process for managing large, distributed networks (9–12).

The CNI process has been used to manage multiple outbreaks or their components. Its administrative functions, which are listed in Table I, are drawn from standard business best practices, but with modifications to support optimal distributed network functioning. These are discussed in the following case study. Community Network Integration is also grounded in principles of social psychology that have been described in a previous article (11).

Table I. Administrative functions for managing outbreaks and other projects under Community Network Integration (CNI).

Community Network Integration administrative functions	Examples of functional failure in conventional networks
Mission	Unclear objectives and success criteria; mission creep
Vision	Parochial or short-term vision; incoherence
Values	Lack of transparency, infighting, politics, ethical violations
Leadership	Failure of any or all management functions
Governance	Lack of accountability, strategic failure, ethical violations
Culture	Weak performance, excuses, conflict, siloing
Human resources	Inadequate performance, training gaps
Marketing, sales, fundraising	Inadequate resourcing, project continuity
Communications	Misunderstandings; incoherent or contradictory media strategy
Products, services, projects	Project failure
Physical assets	Inadequate physical space, equipment
Finance	Financial failure, cost overruns
Legal	Legal liability, lawsuits
Information technology (IT)	Inadequate IT to support business functions and networks
Systems	Inadequate or inappropriate business systems to support any or all functions
Quality management	Failure of any or all management functions

Case study: The Walkerton waterborne illness tragedy

Before COVID-19, arguably the best-known outbreak in Canada was the Walkerton waterborne crisis in which 7 children died after consuming drinking water contaminated by *Escherichia coli* O157:H7 from a faulty municipal well (13).

The outbreak was successfully resolved by following what is now known as the Pillars approach. The outbreak leadership team (Pillar 1) was, importantly, led by individuals with extensive practical training and experience in outbreak response. It included all relevant stakeholders and deliberately sought to create a culture of collaboration, transparency, evidence-based decision-making, and effective communication.

The team focused squarely on rapid resolution of the outbreak, rather than on personal or institutional gain or reputation management. The team held regular weekly meetings with key stakeholders and transparently shared information that was required in order to manage the situation under established principles of good governance and leadership.

With an initial leadership team established, an operational team was created, and Pillar 2 (information, data, and analyses) began. Peer-reviewed papers, reports, *etc.* were assembled and shared and experts were consulted on everything from tests for *E. coli* to risk factors for infection and outbreak management. Experts and local individuals were consulted. Surveillance of cases was begun through local doctors' offices and pharmacies, with the collaboration of local media.

A standardized questionnaire was administered to cases and randomly selected controls to obtain information on i) health outcomes, ii) risk factors, and iii) demographics. Regression analysis helped to rule in municipal water as the outbreak source, including the specific well involved, and to rule out other potential sources of infection. Pillar 3 (interventions) was based on analyses from Pillar 2. This included i) an initial boil water advisory, ii) subsequent decommissioning of the offending well, and iii) a province-wide review of all small communal water systems and requirements for testing and remediation.

Throughout the outbreak, communications were coordinated by the leadership team as described previously (Pillar 4). For the most part, communication was thorough, honest, transparent, and multi-directional and involved all required stakeholders, including the public. Local and national media cooperated with the outbreak team to assist in the outbreak response. Every effort was made to develop messaging that was coherent, consistent across sources, and easy to understand.

FOR PERSONAL USE ONLY

Table II. Questions for reflection on outbreaks in progress.

Area	Questions for reflection
Pillars	Does an effective and active outbreak team exist as defined in this article?
	Do we have a complete, centralized, and shared data and information framework for managing the outbreak?
	What is missing and how can we fill the gaps?
	Is the information being used to guide interventions and communications?
	Are the interventions being attempted consistent with the evidence?
	Is there an evaluation framework for interventions that is being used to guide modifications?
	Are interventions being prioritized and implemented sequentially (short, medium, and long term) and evaluated/modified promptly?
	Are internal and external communications appropriate as defined in this article?
	What changes need to be made to the communication strategy?
Community Network Integration (CNI) administrative function	Is the leadership team ensuring that the network is being led and managed coherently according to known principles of business effectiveness?
	What are the gaps that are limiting our effectiveness?
	How can they be rectified?
	Is the outbreak response being managed under a Quality Management System (QMS)?
	How can we do so and increase its effectiveness?
Your own leadership	What am I doing to help resolve this outbreak?
	Are there ways I could improve?
	Are there ways my team could improve?
	What resources could I draw on to assist me and my team?

The outbreak was also managed in a manner consistent with the administrative functions outlined in Table I. Mission, leadership, governance, culture, mobilization of human resources, and the outbreak response activities, *i.e.*, products, services, and projects, have been discussed previously in this article. A coherent legal framework was instituted, including engaging the services of legal experts and police.

Information technology (IT) used during the outbreak was primarily off the shelf. However, the experience gained in the outbreak led in part to the development of the Canadian Network for Public Health Intelligence (CNPHI), which is a national IT platform for outbreak management (14). The lessons learned from Walkerton helped to inform what later became codified explicitly as the Pillars of Outbreak Response, Community Network Integration (CNI), and its Quality Management System (QMS) framework.

Canada (and the world) continues to experience outbreaks of infectious diseases (*e.g.*, COVID-19, avian influenza, African swine fever), chronic diseases (*e.g.*, diabetes, cancer, cardiovascular disease), and socio-economic outcomes (*e.g.*, poverty, addiction, homelessness). Each of these must be managed through the Pillars approach and CNI (or equivalents) under a Quality Management System in order to be resolved successfully.

Questions to assist the reader to reflect on the effectiveness of current and potential future outbreaks with which they may be familiar and how to improve the outbreak response, including their role in such a response, are listed in Table II.

Conclusions, recommendations, and next steps

The Walkerton outbreak offers a striking example of effective outbreak management that most Canadians, and many others around the world, are well acquainted with. It is a powerful example of how a community — and a community of practice — can come together to rapidly solve a pressing problem so everybody wins. As outbreaks of all kinds will be an ongoing problem, it is evident that a framework is needed to address them collaboratively. Using the Pillars framework addresses key technical and social aspects of outbreak response. This enables effective leadership and management of complex outbreak scenarios.

Community Network Integration (CNI) and Quality Management Systems (QMS) exemplify a model of rapid engagement and administrative roles. This ensures the actualization of the steps of the outbreak response. We therefore offer a protocol for outbreak response that can be applied at multiple levels. This can address issues in One Health, which enhances the optimization of collaborative action for positive outcomes.

High pathogenicity avian influenza (HPAI) constitutes a serious situation in Canada. With luck, it may blow over — for now. On the other hand, it has many of the hallmarks of an infection that could cause catastrophic human mortality across the country, well beyond what we experienced with COVID-19. The correct response is neither panic nor implementing half measures. There is only one effective response: immediate implementation of Outbreak Response Best Practices as defined in the Pillars of Outbreak Response, under a formal Quality Management System (QMS) approach. Implementing these strategies within the current Canadian environment requires a multifaceted approach, involving collaboration among government agencies, veterinary professionals, and industry stakeholders.

However, the Canadian poultry industry's lack of financial support for researching these protocols is one of the major obstacles. In order to overcome this financial obstacle, it will be necessary to promote more funding for research and provide further evidence of the long-term financial advantages of efficient control of outbreaks.

FOR PERSONAL USE ONLY

A more coordinated response can also be facilitated by using already existing infrastructure and resources, such as the Canadian Network for Public Health Intelligence (CNPHI). In order to ensure that these policies are implemented successfully, it is key to emphasize the significance of financial and resource allocation.

In 2023, the importance of a strong, independent national expert leadership team was demonstrated in addressing HPAI under the Pillars, leading to various collaborative projects that have since advanced this approach (15).

Implementing a similar strategy to tackle the homelessness epidemic in Guelph-Wellington, with the aim of scaling it nationally, displays the critical role such leadership plays. Many veterinarians are involved in both efforts, highlighting the unique opportunity for individuals in our profession to promote strategies for managing outbreaks of all kinds and to share valuable experiences with Canadians and the world. It is essential to support and encourage elected officials and institutional leaders in their efforts to convince national and global leaders to adopt effective outbreak response strategies.

References

1. Uyeki TM, Milton S, Abdul Hamid C, *et al.* Highly pathogenic avian influenza A(H5N1) virus infection in a dairy farm worker. New Engl J Med 2024;390:2028–2029. Available from: https://doi.org/10.1056/NEJMc2405371 Last accessed June 11, 2024.
2. Burrough ER, Magstadt DR, Petersen B, *et al.* Highly pathogenic avian influenza A(H5N1) Clade 2.3.4.4b virus infection in domestic dairy cattle and cats, United States, 2024. Emerg Infect Dis 2024;30:10.3201/eid3007.240508. Advance online publication available from: https://doi.org/10.3201/eid3007.240508 Last accessed June 11, 2024.
3. Boni MF, Nguyen TD, de Jong MD, van Doorn HR. Virulence attenuation during an influenza A/H5N1 pandemic. Philos Trans R Soc Lond B Biol Sci 2013;368:20120207. Available from: https://doi.org/10.1098/rstb.2012.0207 Last accessed June 11, 2024.
4. Renaud C, Osborn A, Parmley EJ, *et al.* Highly pathogenic avian influenza: Unprecedented outbreaks in Canadian wildlife and domestic poultry. J Assoc Med Microbiol Infect Dis Can 2023;8:187–191. Available from: https://doi.org/10.3138/jammi-2023-05-08 Last accessed June 12, 2024.
5. Wilson J, Rivers J, Anholt M, *et al.* Veterinary leadership: Time for us to step into our own power. Can Vet J 2022;63:647–648.
6. Ogden NH, Wilson JRU, Richardson DM, *et al.* Emerging infectious diseases and biological invasions: A call for a One Health collaboration in science and management. R Soc Open Sci 2019;6:181577. Available from: https://doi.org/10.1098/rsos.181577 Last accessed June 12, 2024.
7. Gregg M. Field Epidemiology. 3rd ed. New York, New York: Oxford University Press, 2008.
8. HakemZadeh F, Baba VV. Toward a theory of collaboration for evidence-based management. Management Decision 2016;54:2587–2616. Available from: https://doi.org/10.1108/MD-06-2015-0243 Last accessed June 12, 2024.
9. Häsler B, Bazeyo W, Byrne AW, *et al.* Reflecting on One Health in action during the COVID-19 response. Front Vet Sci 2020;7:578649. Available from: https://doi.org/10.3389/fvets.2020.578649 Last accessed June 12, 2024.
10. Agmon N, Kordova S, Shoval S. Global Quality Management System (G-QMS) in Systems of Systems (SoS) — Aspects of definition, structure and model. Systems 2022;10:99. Available from: https://doi.org/10.3390/systems10040099 Last accessed June 12, 2024.
11. Wilson J, Rivers J, Esfandiari N, Suganda E, Jauwena A, Chiumya K. Ontario Animal Health Network (OAHN) Poultry Expert Network Quarterly Veterinarian Report, National Poultry Network for Collaborative Solutions to 'Wicked' Problems. Report 34. 2023 Mar–May.
12. Wilson JB, Salman M, Janzen E, *et al.* Community Network Integration: An approach to alignment of One Health partners for solutions to 'Wicked' problems of antimicrobial resistance. Prev Vet Med 2020;175:104870.
13. Bruce-Grey-Owen Sound Health Unit. The investigative report on the Walkerton outbreak of waterborne gastroenteritis, May–June, 2000. 2000; 1 vol. in various pagings.
14. Public Health Agency of Canada. CNPHI: Canadian Network for Public Health Intelligence. HP60-12/2023E-PDF. 2022.
15. Vaillancourt JP. Canadian experiences with avian influenza: A look at regional disease control — past, present, and future. Poult Sci 2009;88:885–891. Available from: https://doi.org/10.3382/ps.2008-00334 Last accessed June 12, 2024.

Preventive Veterinary Medicine 175 (2020) 104870

Contents lists available at ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed

Community Network Integration: An approach to alignment of One Health partners for solutions to 'Wicked' problems of antimicrobial resistance

J.B. Wilson[a,*], M. Salman[b], E. Janzen[c], O. Sparagano[d], N. Speer[e], L. Pantaleon[f], C. La Jeunesse[g], B. Häsler[h], M. Wills[i], D. Rielander[j], R. Du Preez[k], T. Nguyen Thi Minh[l], H. Le Thanh[m], A. Guthrie[a], M. Wilson[l], F.J. Hayes[a], S. London[n], R. Churchyard[o], W. Gillam[a], S. Noor[p], C. Delaney[a], H. Briggs[q], K. Cook[a], J. Rivers[a,r]

[a] Novometrix Research Inc., 4564 Nassagaweya-Puslinch Townline, Moffat, ON, L0P 1J0, Canada
[b] Animal Population Health Institute, Department of Clinical Sciences, College of Veterinary Medicine and Sciences, Colorado State University, 1601 Campus Delivery, Fort Collins, CO, 80523-1601, United States
[c] Faculty of Veterinary Medicine University of Calgary, TRW 2D01, 3280 Hospital Drive NW, Calgary, AB, T2N 4Z6, Canada
[d] Department of Infectious Diseases and Public Health, Jockey Club College of Veterinary Medicine and Life Sciences, City University of Hong Kong, Hong Kong
[e] Turkey Track Consulting, 1080 Parkwood Court, Bowling Green, KY, 42103, United States
[f] Pantaleon PLLC, Versailles, KY, United States
[g] La Jeune Consulting, P.O. Box 224, Southworth, WA, 98386, United States
[h] Department of Pathobiology and Population Sciences, Veterinary Epidemiology, Economics and Public Health Group, The Royal Veterinary College, Royal College Street, London, NW1 0TU, United Kingdom
[i] G. Magnotta Lyme Disease Research Lab, Department of Molecular and Cellular Biology, University of Guelph, 50 Stone Road East, Guelph, ON, N1G 2W1, Canada
[j] Farmers Resource Animal Production, P.O. Box 61419, Pierre van Ryneveld, Gauteng, South Africa
[k] AfriVet, 195 Dawie Street, Newmark Estate and Office Park, Pretoria, Gauteng, South Africa
[l] Department of Husbandry and Veterinary Studies, School of Agriculture and Aquaculture, Tra Vinh University, Viet Nam
[m] Faculty of Animal Science and Veterinary Medicine, Nong Lam University, Ho Chi Minh City, Viet Nam
[n] Departments of Biology and Biochemistry, Memorial University of Newfoundland, St. John's, NL, A1C 5S7, Canada
[o] Factor-Inwentash Faculty of Social Work, University of Toronto, 246 Bloor St W, Toronto, ON, Canada
[p] College of Biological Science, University of Guelph, 50 Stone Road East, Guelph, ON, N1G 2W1, Canada
[q] Bracelet of Hope, 21 Yarmouth St, Guelph, ON, N1H 4G2, Canada
[r] Department of Population Medicine, Ontario Veterinary College, University of Guelph, 50 Stone Road East, Guelph, ON, N1G 2W1, Canada

ARTICLE INFO

Keywords:
One Health
Antimicrobial resistance
Community Network Integration
Health alignment

The concept of One Health has been used as a framework to understand 'wicked problems' for several years. A key feature of One Health involves ***multi-sector and inter-disciplinary collaborative approaches to create solutions*** to achieve shared outcomes (WHO, 2018). One area that has galvanized the focus of stakeholders from across multiple sectors (e.g. government, industry, NGOs, academia, the media, and the public at large) is antimicrobial resistance (AMR) (WHO, 2018).

AMR thus constitutes a prototypic 'wicked' One Health issue (Wagner et al., 2003). As a result of substantial global investment of time, resources and extensive research, stakeholders are becoming extremely adept at describing the depth of complexity around the issue (Sargeant et al., 2007). ***Solutions*** to AMR require a highly coordinated and carefully led process for change that everyone can accept.

Solving wicked problems almost invariably requires engagement of multiple network partners, not joined in a hierarchy or vertical organization, but in a distributed or horizontal network (Alford and Head, 2017; Rifkin, 2011; Tapscott and Williams, 2008). Network is a term that has many connotations; a simple definition is a group of people (i.e. a human network) coming together to manifest a shared task (van

* Corresponding author.
E-mail address: jbwilson@novometrix.com (J.B. Wilson).

https://doi.org/10.1016/j.prevetmed.2019.104870
Received 6 December 2019; Accepted 16 December 2019
0167-5877/ © 2019 Elsevier B.V. All rights reserved.

Wijngaarden et al., 2006). To solve wicked problems, however, such networks must be operational and effective.

The hierarchical networks consist of groups of people linked in enterprises (government, universities, businesses, etc.) where a small number of people at the 'top' use money, power, experience, culture and other levers to motivate others to manifest organizational goals through well-defined lines of authority. Hierarchical networks have, arguably, served us extremely well. Highly focused goals and management processes have created many successful outcomes, but have also created individual and separated compartments without optimal interconnection across industry or content areas. Some characteristics of hierarchical networks include unnecessary internal and external competition, duplication of effort between organizations and selective connectivity. At its core the hierarchical enterprise tends to function primarily as a self-serving entity (Trochim et al., 2006). Ironically, we find ourselves now at a point where the very prosperity they have created has in turn helped engender a series of what some call 'wicked problems' that hierarchies alone are unable to solve.

To address these 'wicked problems', we must then turn to the distributed networks: groups of stakeholders (often themselves organized as individual hierarchies) with an interest in a common issue, but often with highly divergent aims and perspectives related to it. **In a distributed network there is no single authority to determine appropriate solutions; rather the partners must work together to create solutions that everyone can accept and translate into action.** Indeed, given the diversity of interest (or, frequently, lack of trust) among at least some members of such networks, there is no opportunity to create such a hierarchy or authority structure. If any major player were to attempt it (e.g. government, business, etc.) at least one other key member would reject the process outright.

To facilitate an effective distributed network in solving wicked problems, the leadership should include a third party governance structure in which all stakeholders are authentically represented. The theoretical and practical process for doing so, referred to as Community Network Integration (CNI), has been developed by Wilson and Rivers (2019) and implemented globally in multiple contexts for various relevant One Health issues including AMR (Guthrie, 2018; Wilson et al., 2019).

The following are elements of effective enterprises for both hierarchical and distributed networks; the elements probably sound familiar, as they are similar to those used within hierarchical enterprises to optimize their effectiveness: *Vision; Leadership; Culture of high emotional energy (hi E); Human Resources; Network engagement; Projects, Products, Services; Resource acquisition, Marketing; and Administrative, Communications, Financial, IT, and other systems.* Applying these elements to a distributed network looks, broadly speaking, like the following. In addition to coherent ***coordination*** of the entire network enterprise, the network thrives under a *coherent vision* that allows all players to manifest their preferred future as they define it. It requires also conscious attention to creating a ***culture of high energy*** including appreciation of self and others, creativity and a focus on abundance and collaboration. It benefits from the equivalent of a ***human resources*** process: for example, to map, expand and engage the network - often through enhanced connectivity and effectiveness of existing network activities and ensuring that each participant is incentivized by ensuring that their needs are met. Forward momentum is created through practical joint ***pilot projects*** and a consistent means to ***resource*** collaborative activities. And it benefits from ***systems*** to support administrative functions, communications etc.

The approach involves applying well-documented principles of social psychology (Wilson, 2006; Wilson et al., 2017) to create this governance platform. Initial participants are identified who represent different sectors within a network concerned with a specific issue, have a degree of influence within it, and who demonstrate a high propensity for collaboration ("early adopter collaborators"). These individuals are then further engaged in individual dialogue to outline the benefits of greater collaboration, the nature of planned participants and those already involved, previous successes and the process to engage the network. Those interested are then asked to participate in an informal sector-based CNI leadership team.

With this, a cross-sectorial circle of trust is initiated. It is enhanced by bringing the leadership team together, face to face or by teleconference. During these facilitated sector-based CNI team meetings, members are introduced to a code of practice that includes an agreement to listen to others respectfully and to focus on creating solutions where everybody wins. They are also introduced to the single most important element of any creative endeavour: creating a culture of high emotional energy (e.g.: We can do this!). With this, authentic facilitated discussions ensue around the actual needs and perspectives of each participant, and initial low hanging fruit pilot projects that benefit each player (e.g. to identify technical, policy solutions, etc.) are identified.

The following will illustrate application of CNI to AMR including the nonlinear nature of the process and our approach to its management. As it consists of a strategy for operating within complex systems, the approach by its very nature is emergent. That is, although the goals are generally known (e.g. to optimize responses to AMR by alignment of network stakeholders in a manner in which everyone wins) the details of how that is to happen are not necessarily known at the outset. Indeed, they typically need to be developed collaboratively and innovated as the network moves towards the described objective. And, that goal itself may change as more information is gathered.

We began with a small local team of about 8–10 people having a high level of trust and an interest in improving outcomes for a wide range of One Health issues globally, and a suite of relevant technical, business and social science skills. Through informal discussion and reflection, we identified a number of issues that we were collectively passionate about. Initially these issues included things like AMR, pollinator sustainability, providing entrepreneurial skills to students, and a few others.

In the case of AMR we applied the Seven Step process for CNI described elsewhere (Wilson et al., 2019). Thus, we began initial mapping of the Canadian AMR network, identifying early adopter collaborators in the process who we knew were interested in the issue (Step 1). Over time, these individuals began inviting us to other geographies (USA, EU, SE Asia, southern, east, central and west Africa). As this ensued, we focused on engagement of key individuals across the network (Step 2). Critical to this was naming and creating a culture of high emotional energy. This, for example, allowed the team to be resilient to initial 'rejections' by late adopters. Also key was communicating a common narrative to the network that everyone could buy into and focusing authentically on the needs of each actor (Step 3). We created leadership teams consisting of about 8–12 engaged early adopters across the networks at various relevant levels of scale (e.g. local, national, multinational etc.). For each of these we explained and began co-implementing the business elements as described above. And we began connecting them to each other.

Various pilot projects were identified at various levels of scale and are currently at different stages (Step 6). Some are at the stage of developing a project level business process (again with the elements identified above). Others (for example national mapping and engagement of the Canadian beef network, implementation of a globally appropriate collaborative IT platform and comprehensive multispecies AI driven diagnostic algorithm) are at the data gathering and prototype phases. Others (generally smaller in scope) have been completed. Again, under the business elements identified above, we focused on reducing costs and sharing resources and expertise. A range of government and corporate partners provided required funding in the early stages. We also developed an initial intern program where students and recent graduates assist pro bono along with others on the team and then assist in identifying resources to support themselves with the help of appropriate mentors. Multiple highly skilled individuals in areas as diverse as microbiology, social media and graphic design have stepped

forward to fill these roles and others. As the process grew in complexity, the teams began to create systems (e.g. financial, project and outreach management etc.) to facilitate further growth and to connect network players regionally and globally under a common, fractal management framework (Step 7). All of this continues to be emergent with multiple additional players, networks and issues continually being added to the process (Wilson and Rivers, 2019).

You can think of CNI as a practical process to operationalize One Health within the emerging Collaborative Economy. We welcome your questions and comments and invite you to join us as we work together to turn these wicked problems into delightful solutions. For more information, please see: https://www.youtube.com/watch?v = bdgEpo8_JC8.

Acknowledgement

The authors would like to thank and acknowledge Mr. Daniel Beauchamp from Merck Animal Health, Canada for his conceptual and practical contributions to the development of CNI and this manuscript.

References

Alford, J., Head, B.W., 2017. Wicked and less wicked problems: a typology and a contingency framework. Policy Soc. 36 (3), 397–413.

Guthrie, A., 2018. Honey Bee Health and Productivity in Ontario, Canada: A Multifactorial Epidemiological Approach (Doctoral Dissertation). Retrieved from. http://hdl.handle.net/10214/14267.

Rifkin, J., 2011. The Third Industrial Revolution: How Lateral Power is Transforming Energy, the Economy and the World. Macmillan.

Sargeant, J.M., Ramsingh, B., Wilkins, A., Travis, R.G., Gavrus, D., Snelgrove, J.W., 2007. Constraints to microbial food safety policy: opinions from stakeholder groups along the farm to fork continuum. Zoonoses Public Health 54 (5), 177–184. https://doi.org/10.1111/j.1863-2378.2007.01042.x.

Tapscott, D., Williams, A.D., 2008. Wikinomics: How Mass Collaboration Changes Everything. Portfolio, New York.

Trochim, W.M., Cabrera, D.A., Milstein, B., Gallagher, R.S., Leischow, S.J., 2006. Practical challenges of systems thinking and modeling in public health. Am. J. Public Health 96 (3), 538–546. Retrieved from. http://sfx.scholarsportal.info/guelph/docview/215094269?accountid = 11233.

van Wijngaarden, J.D.H., de Bont, A.A., Huijsman, R., 2006. Learning to cross boundaries: the integration of a health network to deliver seamless care. Health Policy 79 (2–3), 203–213. https://doi.org/10.1016/j.healthpol.2006.01.002.

Wagner, B.A., Dargatz, D.A., Morley, P.S., Keefe, T.J., Salman, M.D., 2003. Analysis methods for evaluating bacterial antimicrobial resistance outcomes. Am. J. Vet. Res. 64 (12), 1570–1579.

WHO, 2018. Antimicrobial Resistance. February 15. Retrieved from. https://www.who.int/en/news-room/fact-sheets/detail/antimicrobial-resistance.

Wilson, J., Rivers, J., Noor, S., 2019. Community Network Integration for Local and Global Solutions. https://www.youtube.com/watch?v = bdgEpo8_JC8.

Wilson, J., Rivers, J., 2019. Community Network Integration: How to Join the Collaborative Economy, Save the World and Create Your Dream Job. Retrieved from. https://drive.google.com/file/d/0BygHqikqKeybQThQcl1d5bExobVhKT3JpTlJzTXp0ZGk0ZFhJ/view?usp = sharing.

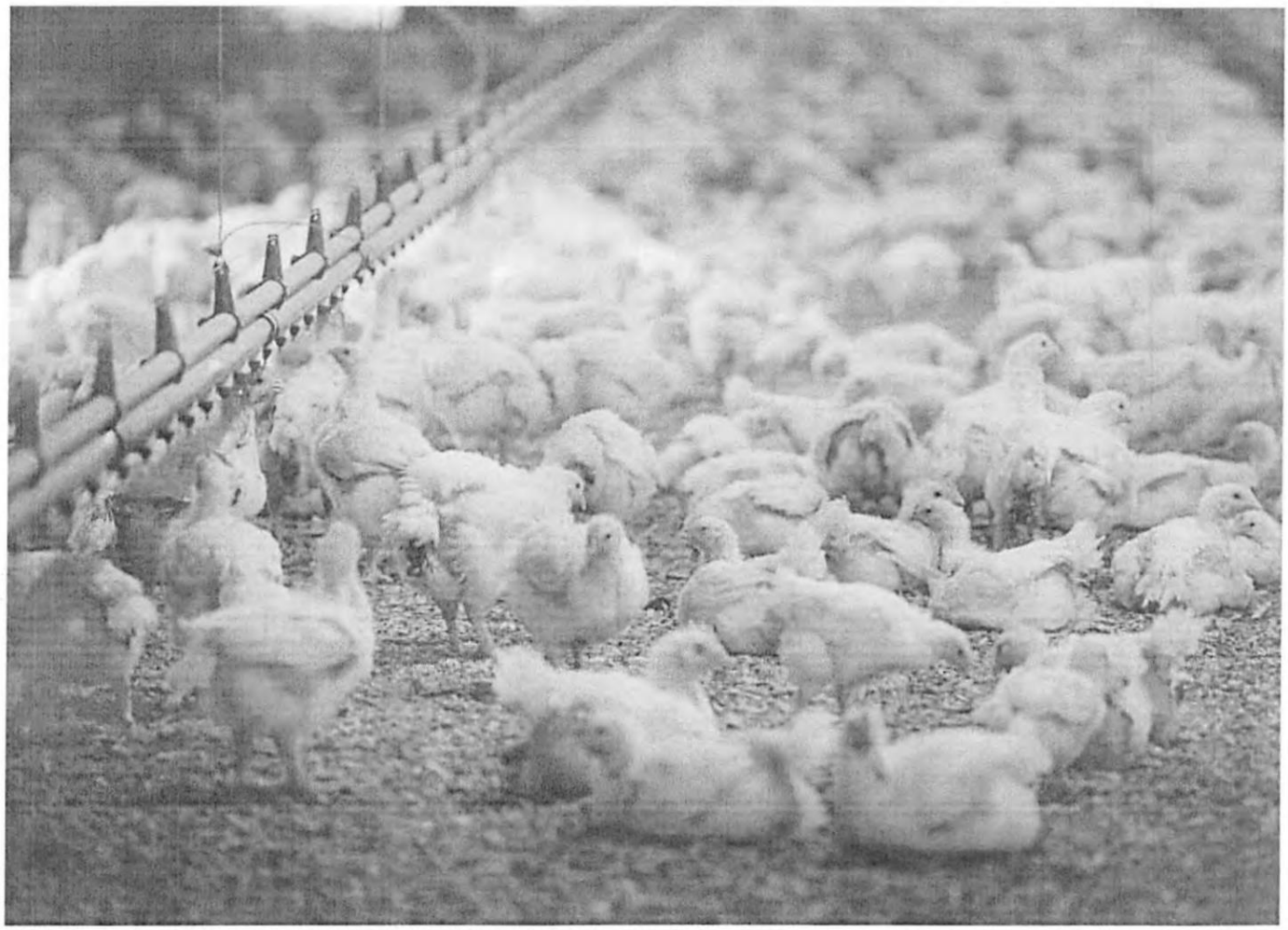
Wilson, J., 2006. Brain Shift: Transform Your Life by Understanding and Changing Beliefs. Moffat, Ontario, .

Wilson, J., Winckelmans, L., Roberts, T., Li-Byarlay, H., Guthrie, A., Wilson, M., Wilson, L., Delaney, C., Kasab-Bachi, H., Vonk, M., Rivers, J., 2017. A process for integration of global networks to achieve sustainability of aquaculture and aquatic ecosystems. Appl. Netw. Integr. 1, 1–6.

Inside Canada's chaotic response to avian flu

Story by Zak Vescera

• 2mo • 9 min read

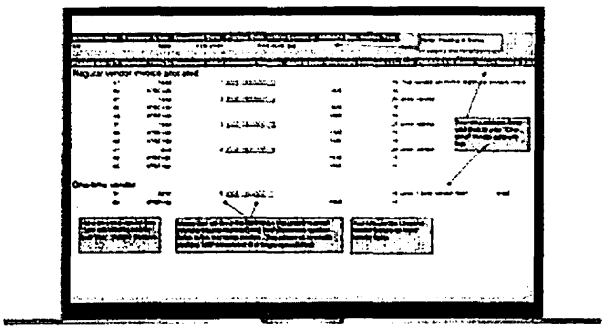


Chickens are seen at a poultry farm in Abbotsford, B.C., on November 10, 2022. The Canadian government estimates 11 million farm birds have died as a result of avian flu since late 2021. (Canadian Press/Darryl Dyck)

This story is a collaboration between the IJF and CTV National News.

Cora Scheele knew something was wrong with the chickens.

On a normal day, the barns on the Scheeles' farm in central Alberta pulse with life. But on a morning in April 2022, something was different. "The birds were kind of lame and had no energy," Scheele said.

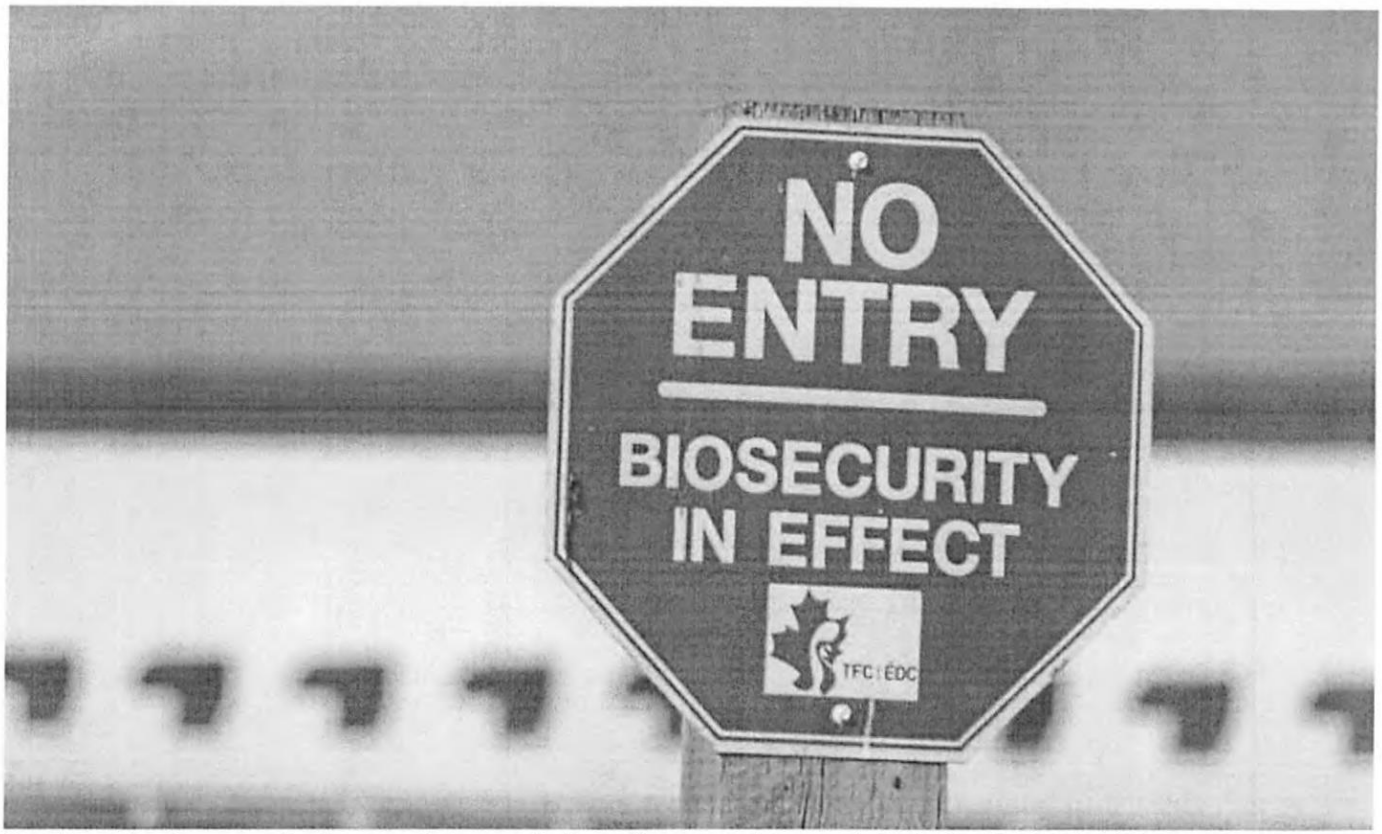


insightsoftware.com**Upload SAP Data to Excel - Start Your 14-Day Free Trial**

Ad

The IJF and CTV News have reviewed thousands of pages of CFIA documentation about their response to the current outbreak, including field reports, manuals on preferred killing methods, internal correspondence and dozens of invoices.

The records, which were obtained via access to information law by animal-rights group Animal Justice, paint a picture of the CFIA's struggle to contain a massive outbreak of avian flu in which more than 11 million Canadian farm birds were killed.



Canadian poultry farmers restricted access to their properties in an effort to control the spread of avian flu. (CTV National News)

Internally, top CFIA officials described the industry, and the agency, as being unprepared for such an outbreak. At times, inspectors described running out of carbon dioxide (CO_2) gas — the preferred tool for euthanizing large numbers of birds. CFIA employees sometimes arrived at farms where many birds were already dead.

They also relied heavily on private companies, the documents said, who sometimes failed to follow bio-security protocols meant to stop the spread of the virus.

"CFIA has taken the lead to date because industry was not prepared," wrote CFIA Atlantic regional veterinary officer Dr. Margaret McGeoghegan in an October 2022 email to colleagues.

"However, it is unreasonable to think that it is sustainable long-term," she continued. "And in reality it is all hands on deck. CFIA is leading but is leaning heavy on industry for help particularly with manpower .... I am sorry to deliver such a blunt message but it is the reality."

Scott Rattray, the CFIA's associate vice president of operations, said in an interview there were times during the outbreak when 20 to 25 new infected premises were being reported every week.

"It's been the largest animal health emergency that this country has ever had to face," Rattray said.

Stakeholders interviewed by the IJF and CTV News say the agency's challenges are not wholly unexpected given how contagious the latest strain of the flu is.

"There's not a country in the world that has the infrastructure, the veterinary power or the human resources and the funding to adequately face what we've been facing. There is none," said Dr. Jean-Pierre Vaillancourt, a professor of veterinary epidemiology at the University of Montreal.

But he and other experts interviewed for this story say the reports should raise alarm bells about Canada's preparedness for such epidemics.

"We make this mistake so many times," said Dr. Timothy Sly, an epidemiology professor at Toronto Metropolitan University. "We wait until the wolf is in the barn, and then we figure out how to get it out."

Toll of the outbreak

In October 2022, a farmer in the Ottawa Valley named Gerry Oleynik called the CFIA to his farm after a bird tested positive for avian flu.

Oleynik's farm was not typical: he raised a number of exotic birds like ornamental waterfowl, macaws and swans.

The CFIA's report from Oleynik's farm says they had to use bolt guns to kill birds. When Oleynik returned, he said the scene was terrifying.

"There was blood all over in all the pens, blood scattered on the walls, on the floor there were heads of animals and birds here and there. There were some live birds that they didn't destroy that we found that we had to destroy," Oleynik said. He said the experience was traumatizing for him, his wife and their son, who raised some of those birds as personal pets.

"It was either you let (the CFIA) come in and kill everything and we give you some compensation, or you stay under quarantine, and everything might die a horrible death and you get no compensation at all. So we didn't really have a choice but to let them do the right thing and come in and do this. It broke our hearts. We're still not over it. But it was the right thing to do," Oleynik said.

Across Canada, farmers like Oleynik were all facing similar heartbreak as the disease threatened their livelihoods.

And the CFIA was scrambling to be able to keep up with the volume of the work.

Since December 2021, the CFIA has recorded more than 400 outbreaks at poultry farms across all provinces and territories and destroyed more than 11 million birds.



This photo shows a turkey barn near Cudworth, SK. The CFIA's preferred method of killing infected birds is to fill such barns with CO_2 gas. (CTV National News)

That has taken a massive effort from CFIA staff. By March 2024, the agency estimated it had spent more than $94 million to respond to the avian flu.

Beyond the monetary expense, Rattray said that work took a serious mental-health toll on CFIA employees, contractors and farmers themselves.

Farmers, Rattray said, are compensated when the CFIA orders the destruction of their animals. But some farmers, like Oleynik, say the amount paid out by CFIA doesn't always cover the cost of replacing the birds or the subsequent disinfection that farms must perform.

"It can't be understated the impact that this can have on producers when you're affecting your livelihood. In some really unfortunate cases, we were dealing with backyard flocks. These were like pets to people. These were difficult emotional situations," Rattray said.

Contractor troubles

Since the start of the outbreak, the CFIA has paid more than $80 million to third-party contractors who perform work such as disposing of diseased bodies of birds and cleaning farms.

Those contractors did not always do their job correctly. In January 2023, a CFIA audit found "recurring issues" with a Chilliwack, B.C.-area company hired for "depopulation assistance."

The issues included donning and doffing protective equipment in the wrong places, not adequately disinfecting clothing and removing protective equipment while in the "hot zone" where the virus is most active.

Those measures are essential, Vaillancourt said, because the latest strain of avian flu spreads incredibly quickly and easily, including through trace amounts of blood or feces from infected birds. And farming contractors, Vaillancourt said, may visit multiple farms in a given week, meaning they could become vectors for spreading the virus.

The Scheeles said they also had frustrations with the contractor who disposed of bodies on their farm.

After the CFIA had finished euthanizing birds in their five barns, the Scheeles said they were told to wait for a team from a private company contracted by the CFIA.

But that team, Arjan Scheele said, did not arrive until almost two weeks after the outbreak began and more than a week after the CFIA had finished euthanizing the last of their birds.

The result was that tens of thousands of corpses were left to decompose in the Scheeles' barns.

"That was a big problem because now it was early April, so it was still cold, but the dead birds were all in the barn," Cora said. She tried to keep the barns as cold as she should. But the rotting continued.

"You can imagine, it was in there for 14 days, and you start smelling something that's not too nice," she said.

The CFIA's Rattray said in an interview that he was aware some contractors had violated bio-security rules.

"We were able to respond to those so that we were able to mitigate the risk before, you know, anything left the premises that could have spread it further," Rattray said.

"We take it very seriously, because we understand the risks."

Killing methods

Money and staffing were not the CFIA's only problems.

At one point, the CFIA's notes say it was having "significant difficulty" in obtaining key resources, including the CO2 gas it normally uses to euthanize birds in barns.

Rattray said part of that shortage was because the CFIA was competing for a limited supply of CO2 with the beverage industry.

Suffocation via CO2 gas, Vaillancourt said, is the preferred method of destroying birds because it is relatively quick and painless. The CFIA says using CO2 gas is ideal for "both efficiency and the physical and mental health of responders."

The shortages, though, forced the CFIA to sometimes use other methods, including shooting birds with bolt guns or a technique called "cervical dislocation."

Vaillancourt said such methods are more onerous for workers and potentially more uncomfortable for birds.

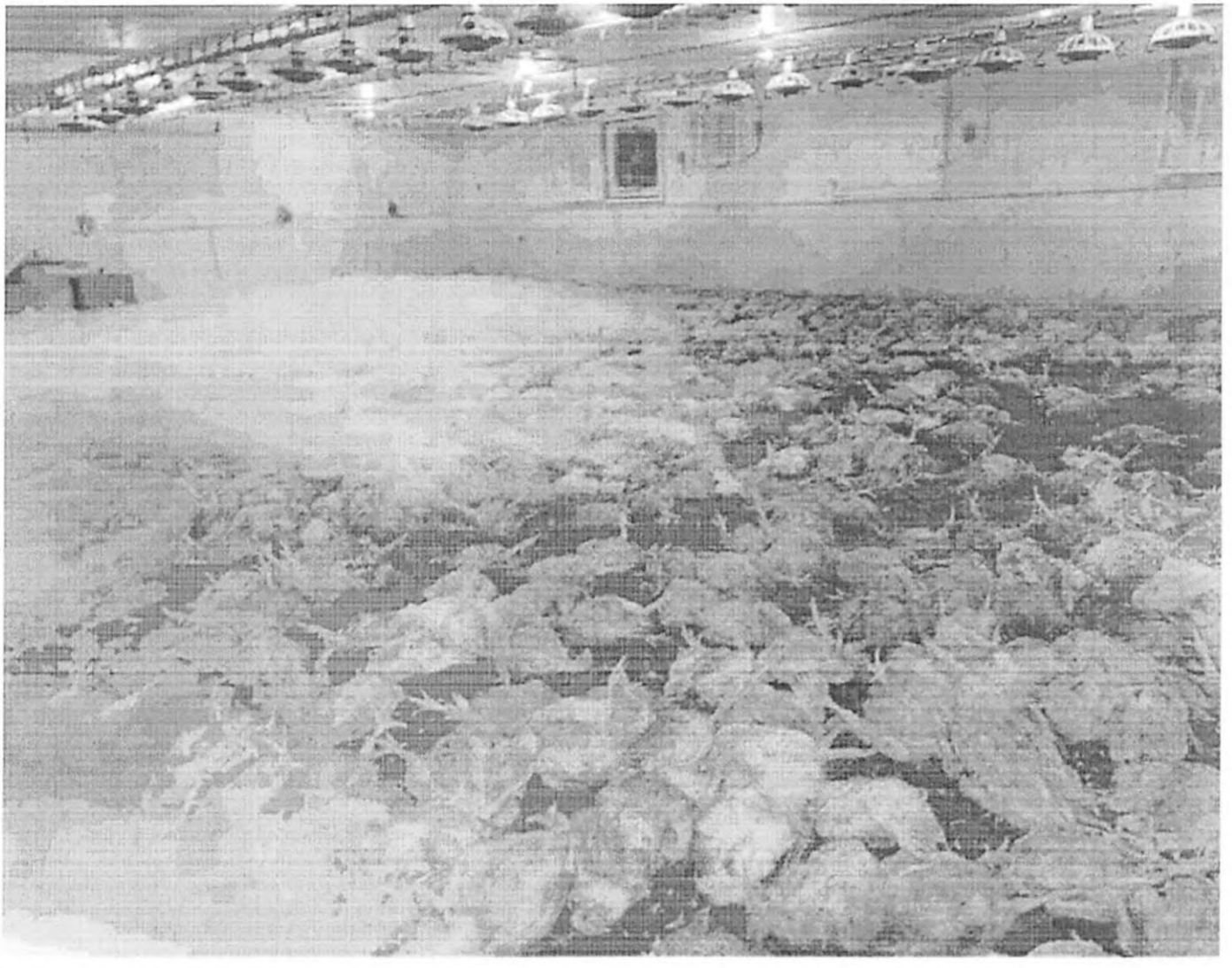
"You need a battalion. You need 25, 30 people. And that is a big bio-security challenge because they need to leave that place," Vaillancourt said.

Briefing notes reveal that problems with securing CO2 pushed the agency to consider other options for euthanizing birds.

Some of those were disastrous.

In October 2022, the CFIA retained a Virginia-based company to experiment with using nitrogen-based foam to suffocate birds as an alternative to CO2. They tested the foam on a barn full of birds that had been exposed to avian flu but had not yet tested positive.

The experiment, according to the CFIA, was a "complete failure." The foam failed to kill the birds instantly, instead causing them to "stampede" to one side of the barn. The CFIA team on site then had to "manually euthanize almost the entire barn" of the half-dead birds, something the agency said was exhausting for staff.



This image, included in a CFIA report, shows the aftermath of the failed foam experiment at an Ontario farm in October 2022. (CFIA)

The report pointed blame at the company saying the company "had never actually completed destruction on a full-sized poultry facility" using foam. "Companies completing Human Destruction need to be thoroughly audited," the report said.

Rattray said the foam experiment was a "valuable exercise" because it showed there could be "some promise" in such a technique.

"But, because it didn't meet our animal welfare standards, it wasn't something that we adopted," Rattray said.

Camille Labchuk, an animal-rights lawyer and the executive director of Animal Justice, the group that obtained the records, says she was disturbed by reading that report, which did not outline exactly how many birds had to be manually killed.

"It turns my stomach to learn what these birds endured during what was essentially a test kill," Labchuck said.

Foam was not the only option the agency seems to have explored. One package of documents suggests the CFIA was also discussing killing birds through "ventilation" — sealing off oxygen so that birds gradually suffocate.

That method is practised in the United States but is only used in "exceptional" circumstances in the European Union. It is controversial among animal-rights activists because of the pain it causes birds, which can take days to suffocate.

The CFIA eventually decided against endorsing that method.

Rattray said the CFIA was facing calls from some processors who wanted to explore ventilation during CFIA shortages, but said the agency opposed it.

"The only time that it would ever be considered to be used is if there was an established link and concern that this could become a human transmission issue," Rattray said.

Labchuck said she was alarmed to learn they even considered it.

"We urge them not to. We urge them to consult with animal welfare experts on the methods that are considered to cause the least suffering to birds regardless of the costs," Labchuck said.

Changing times

The devastation wreaked by avian flu has some calling for wholesale changes in how farmers and governments prepare.

Unlike France and other countries, Vaillancourt said, Canadian farmers generally don't vaccinate domestic livestock against avian flu. He says that is because Canada is considered too small a market for pharmaceutical companies to

conduct large-scale trials. And the CFIA, Vaillancourt said, doesn't accept vaccination test results from other countries.

Vaillancourt says it is time to rethink that logic, particularly in areas like B.C.'s Fraser Valley, where multiple converging flyways for migratory birds create a hotspot for infections.

"You have a valley there that is designed for epidemics," Vaillancourt said.

Rattray said the CFIA is looking at research on new avian flu vaccines in Europe. "These methods haven't haven't been approved. but it is it is something that perhaps one day in the future will be available to us," he said.

Avian flu is still present in Canada. As of Nov. 1, there were only 11 active infections in the country, almost all of them in B.C.

But rates have come down since the initial wave of infections in 2021 and 2022.

Farmers like Oleynik are hoping it stays that way.

"The fear is always there that avian flu is going to come back," Oleynik said. "We always think about it, that we're going to get hit."

— With CTV National News files from Allison Bamford

Industry: Improving outbreak response **p14**

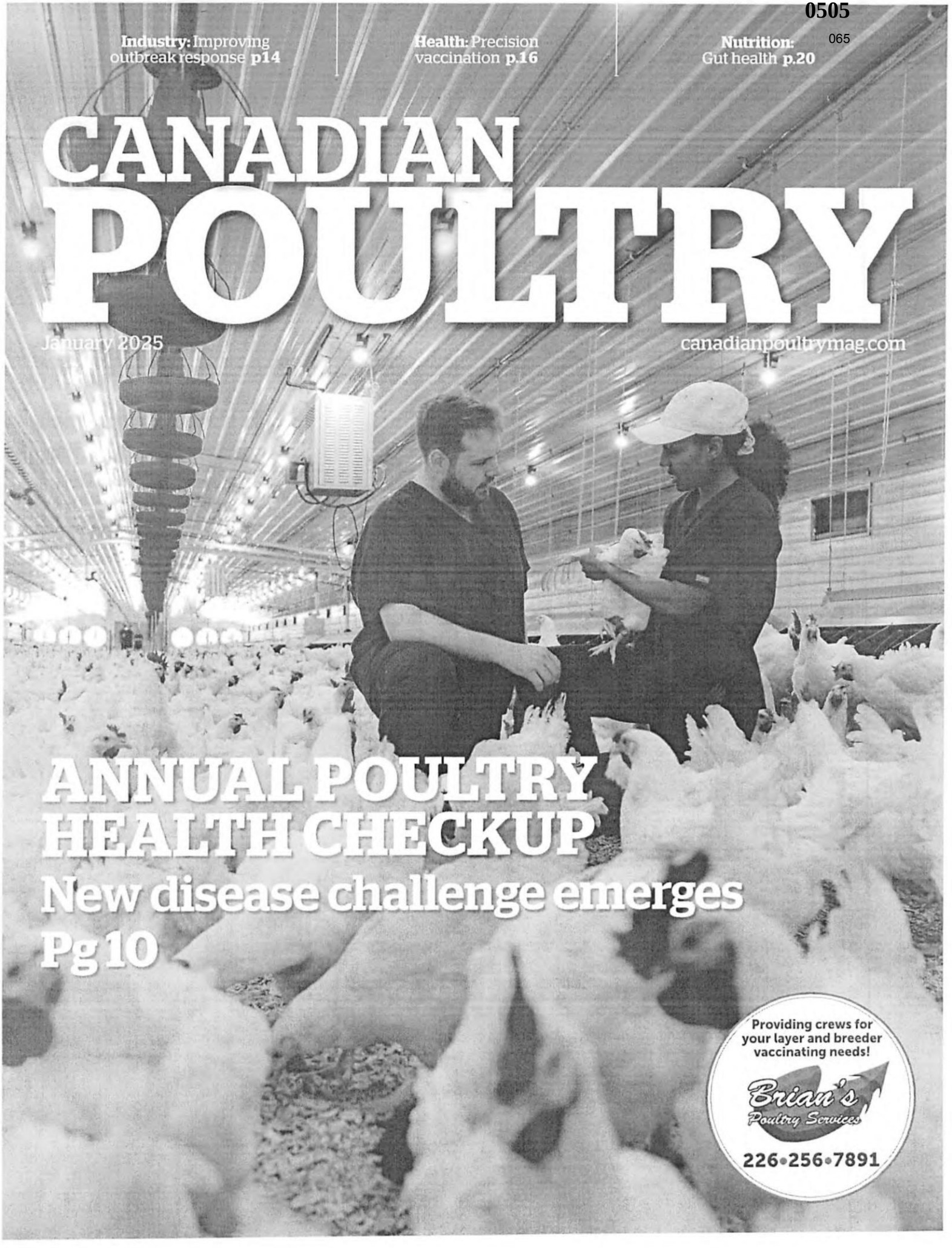
Health: Precision vaccination **p.16**

Nutrition: Gut health **p.20**

CANADIAN POULTRY

January 2025

canadianpoultrymag.com



ANNUAL POULTRY HEALTH CHECKUP

New disease challenge emerges

Pg 10

Providing crews for your layer and breeder vaccinating needs!

Brian's Poultry Services

226•256•7891

www.hellmannpoultry.com

HELLMANN
POULTRY EQUIPMENT

Eggcellence.
Made in Germany.

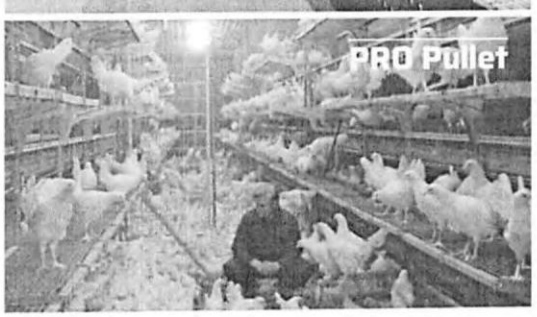
Hellmann Poultry's **solutions for cage-free egg production**

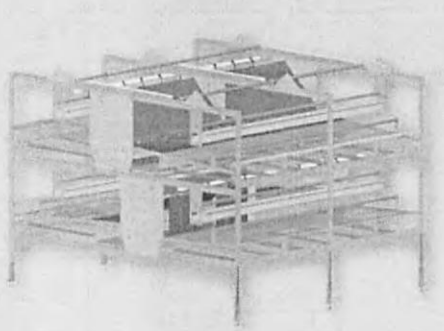
- ✓ **extensive experience** in cage-free and organic egg production
- ✓ **custom-made solutions** for your individual requirements
- ✓ outstanding Hellmann quality for **extended equipment longevity**
- ✓ **easy flock control**
- ✓ healthy hens and the absolute **highest egg quality** around

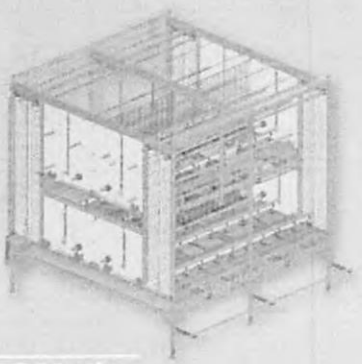






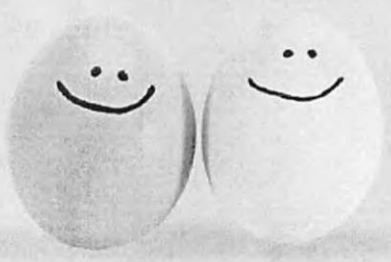






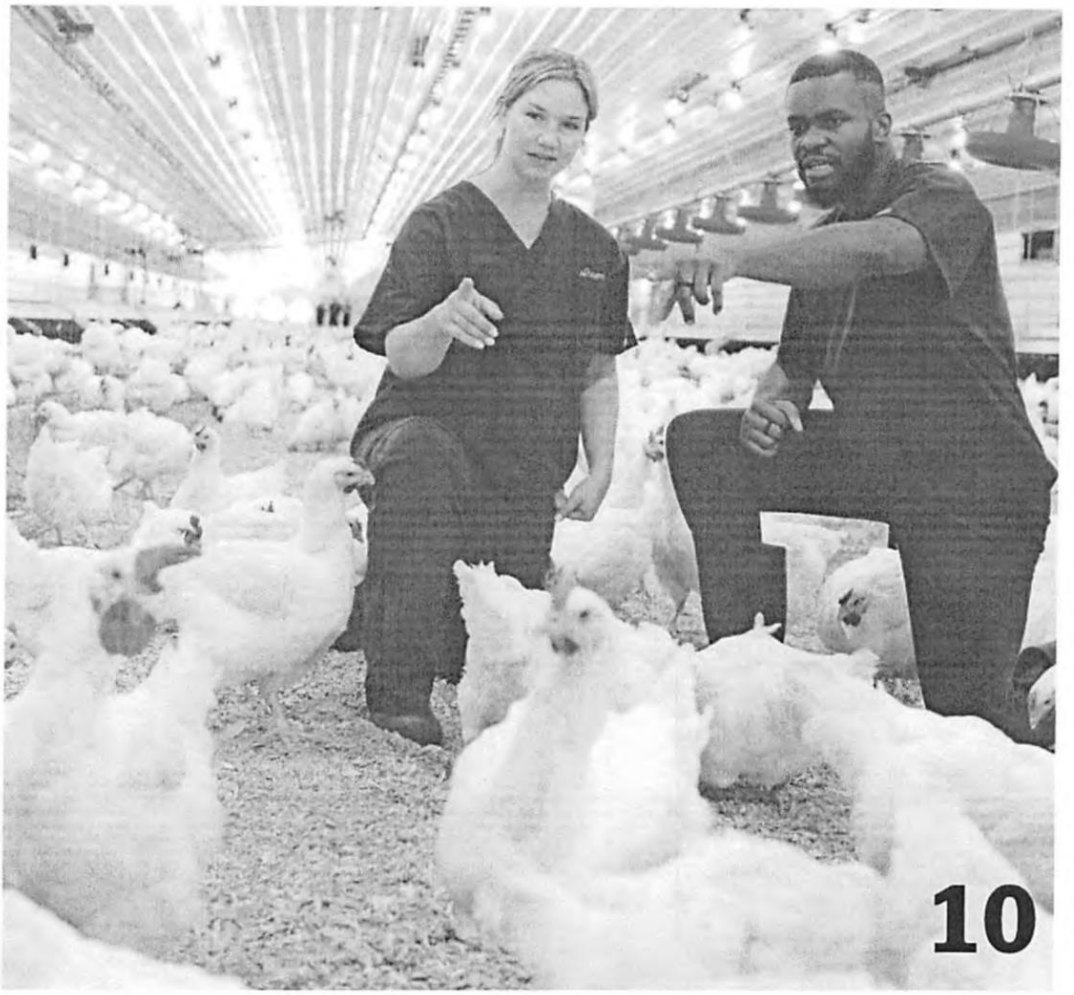
THE NATIONAL POULTRY SHOW:
BOOTH #721B

We are the experts in cage-free housing equipment!
Contact your local dealer or
CALL US TOLL FREE
1-800-894-4082



CONTENTS

January 2025
Vol. 112, No. 1
canadianpoultrymag.com







COLUMNS

08 | **Cracking Condemns**
Five keys to understanding condemnation reports

DEPARTMENTS

04 | **Editorial**
Poultry health reflections
06 | **What's Hatching**
CFO unveils new growth programs
29 | **Classifieds**
30 | **Barn Spotlight**
Dairy farmers open broiler barn

ON THE COVER Ongoing aMPV outbreaks and other poultry health challenges impacted flocks across Canada this past year. See our annual poultry health update on page 10. Photo courtesy of Aviagen.

FEATURES

10
COVER STORY
National poultry health update
New disease emerges in otherwise stable year for poultry health.

14
A planned response
Building a better outbreak management system.

16
Precise protection
Technology is improving *in ovo* vaccination options.

20
Gut health starts with nutrition
Optimizing ingredient quality, feed formulation, and additives.

23
Enriched welfare
Experts discuss the benefits, challenges, and future of enrichments in broiler barns.

ISSN 1703-2911. *Canadian Poultry* is published 10 times per year by Annex Business Media. Canada Post Publications Mail Agreement No. 40065710. Return undeliverable Canadian addresses to: Circulation Department, 111 Gordon Baker Rd., Suite 400, Toronto ON M2H 3R1. No part of the editorial content in this publication may be reprinted without the publisher's written permission. © 2025 Annex Business Media. All rights reserved. Opinions expressed in this magazine are not necessarily those of the editor or publisher. No liability is assumed for errors or omissions. All advertising is subject to the publisher's approval. Such approval does not imply any endorsement of the products or services advertised. Publisher reserves the right to refuse advertising that does not meet the standards of this publication. Printed in Canada.



From the Editor

by Brett Ruffell

Reflecting on a challenging year for poultry health

The January issue of *Canadian Poultry* magazine spotlights the disease challenges that defined the past year, with a detailed cover story found on page 10.

From the emergence of avian metapneumovirus (aMPV) to the persistence of *E. cecorum*, poultry health has been top of mind across the industry.

One of the year's most concerning developments for the poultry industry was aMPV, a new virus to Canada that hit commercial flocks in Ontario, Manitoba, and Quebec.

Turkeys were especially hard-hit, with secondary infections like *E. coli* driving mortality rates as high as 50 per cent.

"From the emergence of aMPV to the persistence of E. cecorum, *poultry health has been top of mind across the industry."*

Meanwhile, *E. cecorum* infections rose sharply, particularly in broilers, leading to substantial losses. We explore these and other challenges in depth in our cover story, offering an important review of what the industry faced in 2024.

Adding to these issues, avian influenza (HPAI) resurfaced late in the year after an eight-month hiatus. The outbreak began in British Columbia's Fraser Valley in October, with three confirmed cases in Abbotsford and Chilliwack.

By mid-November, 22 commercial poultry flocks in the province had been affected.

This resurgence underscores the need for ongoing biosecurity vigilance, as migratory wild birds remain a primary vector. With the outbreak affecting both commercial and non-commercial flocks, the risk of further spread has heightened, making it important that producers be more proactive than ever.

Looking ahead, *Canadian Poultry* invites readers to our February webinar series on disease threats. Expert presenters will discuss topics including avian influenza's resurgence, new research on *E. cecorum*, insights into aMPV's impact and more. Visit canadianpoultrymag.com to register and gain practical insights into what lies ahead.

As we reflect on the challenges of 2024, we also look forward with hope and resolve.

On behalf of the *Canadian Poultry* team, I wish you a happy and healthy new year.

canadianpoultrymag.com

Reader Service
Print and digital subscription inquiries or changes, please contact
Angelita Potal,
Customer Service Rep.
Tel: (416) 510-5113
Email: apotal@annexbusinessmedia.com
Mail: 111 Gordon Baker Rd., Suite 400,
Toronto, ON M2H 3R1

Editor
Brett Ruffell
bruffell@annexbusinessmedia.com
226-971-2133

Brand Sales Manager
Ross Anderson
randerson@annexbusinessmedia.com
Cell: 289-925-7565

Account Coordinator
Julie Montgomery
jmontgomery@annexbusinessmedia.com
416-510-5163

Media Designer
Brooke Shaw

Group Publisher
Michelle Bertholet
mbertholet@annexbusinessmedia.com

Audience Development Manager
Anita Madden
amadden@annexbusinessmedia.com
416-510-5183

CEO
Scott Jamieson
sjamieson@annexbusinessmedia.com

PUBLICATION MAIL AGREEMENT #40065710

Printed in Canada
ISSN 1703-2911

Subscription Rates
Canada - Single-copy $10.00
Canada - 1 Year $33.15
Canada - 2 years $56.61
Canada - 3 years $78.54
(plus applicable taxes)
USA - 1 Year $93.33 CDN
Foreign - 1 Year $105.57 CDN

GST - #867172652RT0001

Occasionally, Canadian Poultry Magazine will mail information on behalf of industry-related groups whose products and services we believe may be of interest to you. If you prefer not to receive this information, please contact our circulation department in any of the four ways listed above.

Annex Privacy Officer
privacy@annexbusinessmedia.com
Tel: 800-668-2374

No part of the editorial content of this publication may be reprinted without the publisher's written permission. ©2025Annex Business Media. All rights reserved. Opinions expressed in this magazine are not necessarily those of the editor or the publisher. No liability is assumed for errors or omissions. All advertising is subject to the publisher's approval. Such approval does not imply any endorsement of the products or services advertised. Publisher reserves the right to refuse advertising that does not meet the standards of the publication.

Funded by the Government of Canada | Canada



I have looked at many brands of drinkers and LUBING's EasyLine 2.0 turkey drinker was our choice, and they have helped our turkeys to perform to their highest potential.

Holly Coffman – Summit View Farms

LONGEST LASTING TURKEY NIPPLE DRINKING SYSTEM





As the birds drink from the cup, their heads move the patented pendulum from side-to-side, which triggers the nipples in a vertical action which eliminates wear on the nipple.

Glass-Pac Canada
St. Jacobs, Ontario
Tel: (519) 664-3811
Fax: (519) 664-3003

Carstairs, Alberta
Tel: (403) 337-3767
Fax: (403) 337-3590

Les Equipments Avipor
Cowansville, Quebec
Tel: (450) 263-6222
Fax: (450) 263-9021

Specht-Canada Inc.
Stony Plain, Alberta
Tel: (780) 963-4795
Fax: (780) 963-5034

WATCH THIS VIDEO TO LEARN MORE

LUBING
RELENTLESS QUALITY. EXCEPTIONAL SERVICE.

WWW.LUBINGUSA.COM | INFO@LUBINGUSA.COM | 423-709-1000

Avian influenza resurfaces in Quebec's poultry industry

Avian influenza has returned to Quebec after months of respite, with two new cases confirmed in commercial poultry flocks in the Les Maskoutains and La Vallée-du-Richelieu regions on November 17 and 18. These outbreaks mark the first in the province since February 2024, bringing the year's total to four affected flocks. Authorities have established control zones to prevent further spread.

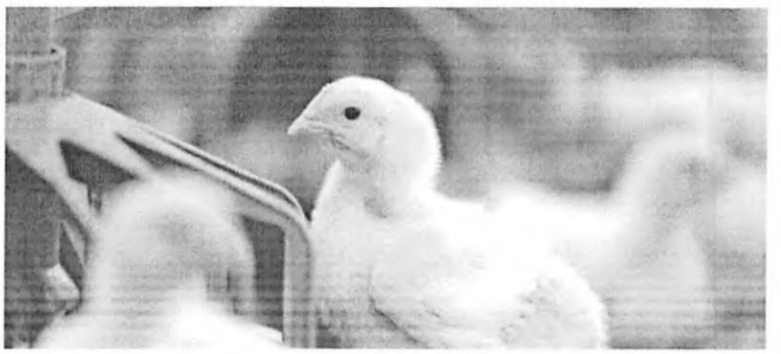
Wastewater testing for avian influenza to begin in Ontario communities

Ontario will soon launch wastewater testing for H5N1 avian influenza, led by Rob Delatolla's lab at the University of Ottawa in collaboration with the University of Guelph. The testing, which targets agricultural areas, is part of a larger research effort to detect avian flu early in high-risk communities. The program's urgency has grown after H5N1 spread to dairy herds and caused mild human infections in the U.S. Since COVID-19, wastewater monitoring has proven valuable for early pathogen detection.

PIC reflects on growth, welcomes new leadership at AGM

The Poultry Industry Council (PIC) celebrated a year of achievements at its Annual General Meeting on October 24 in Elora, highlighting membership growth, impactful educational events, and the ratification of new by-laws under the Ontario Not-for-Profit Corporations Act. Caroline Gonano continues as Board Chair, joined by returning executives and three new board members bringing diverse industry expertise.

CFO's new growth programs aim to drive sustainable expansion and meet evolving market demands in Ontario's chicken industry.



CFO unveils new growth programs for sustainable expansion

The Chicken Farmers of Ontario (CFO) has introduced a suite of growth programs to address the increasing demand in Ontario's chicken industry. These initiatives are designed to meet the needs of evolving markets while ensuring the sector's growth remains sustainable and well-distributed.

Murray Opsteen, Chair of CFO, says the programs reflect the board's commitment to preparing the industry for the future. "The chicken industry is fortunate to have experienced growth, and it is the Board's responsibility to ensure that growth gets distributed to existing, new, and emerging markets in a responsible and sustainable manner," he says.

Set to launch in 2025, the programs include targeted opportunities for both established and new participants in the Ontario chicken sector. A re-designed Market Opportunity Program will allow primary processors to access supply tailored to meet specific market needs.

To encourage new players, CFO has updated its New Entrant Chicken Processor Policy, enabling smaller processors to enter the market and expand their operations. Additionally, the Small Whole Bird Program has been revamped to meet niche demands, such as supplying restaurants specializing in Portuguese barbecue or small barbecue birds, focusing on birds in the 1.60-1.84 kg weight range.

Denise Hockaday, CEO of CFO, acknowledges the collaboration behind these initiatives. "The Association of Ontario Chicken Processors, independent processors, value chain stakeholders, and Ontario chicken farmers have all provided valuable input, and we're pleased to bring these solution-oriented programs to market in the coming months," she says.

Full details on eligibility, application processes, and program policies will be available on ontariochicken.ca as CFO prepares to roll out these initiatives aimed at fostering sustainable growth in Ontario's thriving chicken industry.



PIC hosted 30 events

with over 700 attendees in the past year, advancing its mission of industry success through education and collaboration.

Visit us online

Find the latest poultry-related news, stories, blogs and analysis from across Canada at:

canadianpoultrymag.com

PHOTO: ALLTECH

Event highlights vital role of poultry, egg, and dairy farmers

On October 3, Sparks Street in Ottawa came alive with the Downtown Diner pop-up, an event celebrating Canada's poultry, dairy, and egg farmers.

The pop-up diner drew over 1,000 attendees, including Parliamentarians and residents, who enjoyed dishes made with fresh, locally sourced ingredients. The event was designed to spotlight the contributions of Canadian farmers to the nation's food security.

Farmers from Egg Farmers of Canada, Chicken Farmers of Canada, Turkey Farmers of Canada, Canadian Hatching Egg Producers, and Dairy Farmers of Canada participated in the event.

They answered questions about farming practices and engaged in conversations about government policies that support the agricultural sector, such as Bill C-282, which ensures the continued strength of Canada's supply management system.

Through supply management, these farmers can provide Canadians with a reliable, year-round supply of poultry, egg, and dairy products. The system not only supports food security but also sustains rural economies and encourages young people to pursue careers in agriculture.

The Downtown Diner was more than just a celebration – it was an opportunity to educate the public on the importance of locally produced food and the critical role farmers play in ensuring a stable, high-quality food supply.

1,000
is how many attendees the pop-up diner drew, including Parliamentarians and residents.



PHOTO: EGG FARMERS OF CANADA

Canadian poultry, egg and dairy farmers at the Downtown Diner in Ottawa, celebrating made-in-Canada food.

Coming Events

JANUARY

JANUARY 8, 2025
PIP Innovation Showcase, Webinar
poultryinnovationpartnership.ca

JAN. 8, 2025
PIC Producer Update: Turkeys, Hybrid
Virtual and Woodstock, Ont.
poultryindustrycouncil.ca

JAN. 13, 2025
PIC Science in the Pub
Guelph, Ont.
poultryindustrycouncil.ca

JAN. 28-30, 2025
IPPE
Atlanta, Ga.
ippexpo.com

FEBRUARY

FEB. 5, 2025
Canadian Poultry Disease Webinar Series
canadianpoultrymag.com

FEB. 5, 2025
PIP Innovation Showcase, Webinar
poultryinnovationpartnership.ca

FEB. 5-6, 2025
National Poultry Show
London, Ont.
poultryindustrycouncil.ca

FEB. 11, 2025
Canada's Agriculture Day
Ottawa, Ont.
agriculturemorethanever.ca

FEB. 24, 2025
Western Poultry Conference
westernpoultryconference.ca

FEB. 24-25, 2025
Alberta Poultry Industry Trade Show & AGM
Red Deer, Alta
conventionall.swoogo.com/api25



Cracking Condemns

By Dr. Gigi Lin

Dr. Gigi Lin is a board-certified poultry veterinarian. She provides diagnostic, research, consultation, continuing education, and field services to all levels of the poultry industry in Western Canada. In this new column, she will help producers understand and prevent condemnations.

Five keys to understanding condemnation reports

Throughout the poultry production cycle, producers spend a lot of time and hard work focusing on areas such as modifying brooding practices, maximizing flock performance, and reducing disease pressures. However, we often overlook the importance of analyzing one final piece of information – the condemnation report. Reviewing these reports is essential for optimizing production and profit, maintaining high welfare standards, and, most importantly, identifying areas for improvement. That said, here are five keys to understanding these documents.



List of useful references

1. National Chicken Council Broiler Welfare Guidelines and Audit Checklists.
   source: nationalchickencouncil.org
2. CFIA Poultry Condemnation Report by Species for Federally Inspected Plants: This report displays poultry condemnations by province for a selected month or year.
   source: agriculture.canada.ca
3. Litter Quality and Broiler Performance: This article out of the University of Georgia addresses how litter quality impacts performance and welfare issues, which can lead to increased condemnations.
   source: extension.uga.edu

1 The condemn report is a supplement tool for disease surveillance: I encourage all poultry producers to monitor trends and pay close attention to each condemnation report. The report provides detailed information about the birds that were rejected, whether due to diseases or infections. It helps guide us in modifying management practices or disease management plans, such as vaccine programs or feed formulation.

2 It's not just about health monitoring: In addition to being a tool for disease detection, the report also serves as an important welfare indicator. It allows us to identify corrective actions on welfare issues such as poor housing conditions or management practices that cause injuries or stress in birds. The processing plant's operation is a crucial component in all well-recognized welfare programs and auditing tools. Refer to the first reference in the sidebar for essential guidelines and a handy auditing checklist.

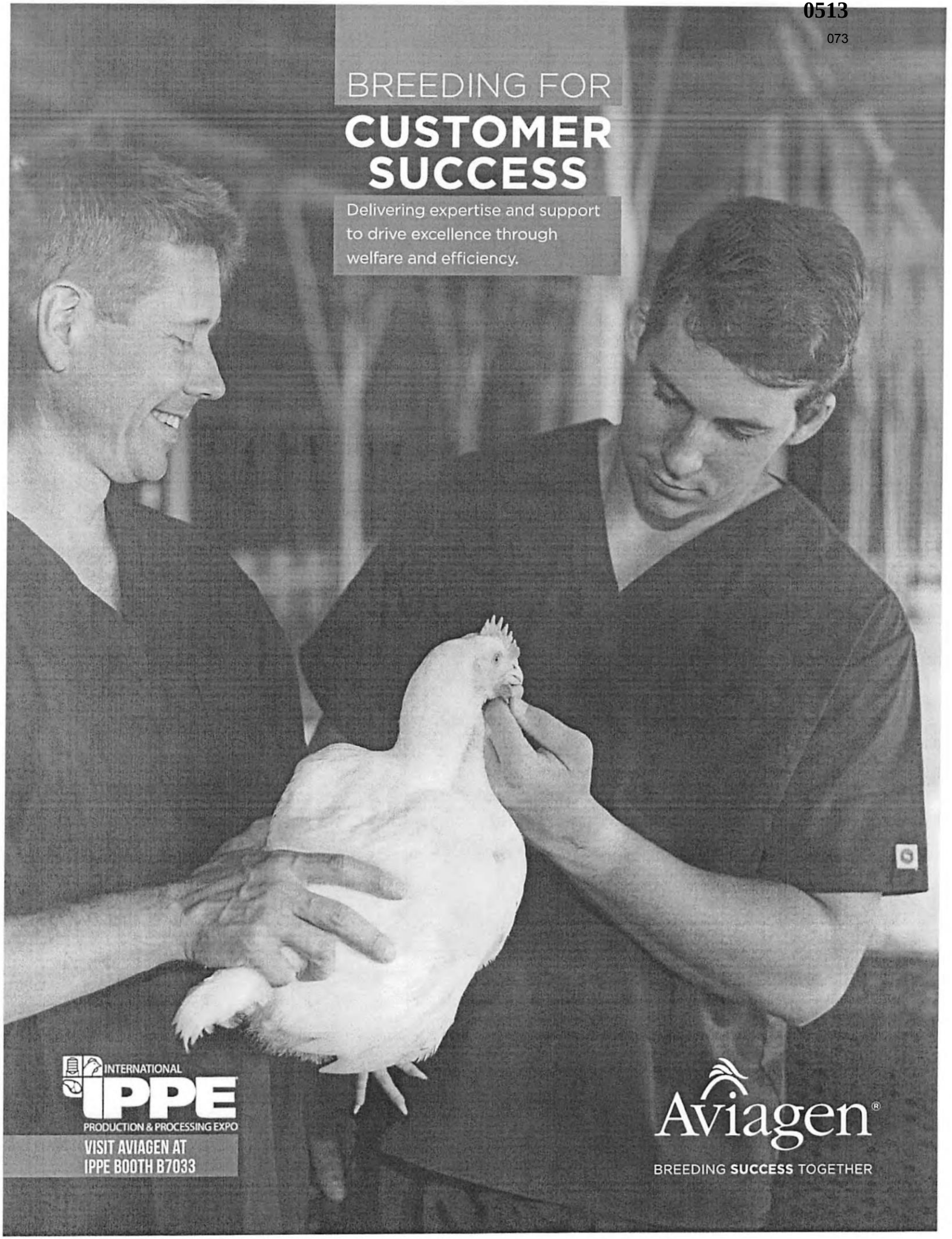
3 The top four causes of broiler condemnations: Subcutaneous conditions (cellulitis), liver conditions, abdominal edema (ascites), and respiratory conditions are the leading causes of broiler condemnations across Canada. Each of these issues has its own set of risk factors and control strategies, some of which are interconnected. This list may differ slightly across provinces, companies, or farms based on individual challenges.

The CFIA Poultry Condemnation Report by Species for Federally Inspected Plants, see the second reference in the sidebar, is a great starting point for exploring national or provincial trends. It helps producers forecast and prepare for seasonal or regional challenges. For more specific regional or corporate processing data, I encourage producers to discuss with their processors, veterinarians, marketing boards, and fellow producers.

4 Accurate diagnoses help pinpoint the problem and find solutions: "Liver condition" is a general term that describes abnormalities found in the liver. It isn't always caused by an infectious process, although bacterial hepatitis is very common. Chronic passive congestion, another frequent cause of liver rejection, can be attributed to factors such as exposure to cold temperatures, poor ventilation, high sodium intake, and lung or heart diseases. When in doubt, communicate with the quality assurance manager, collect samples, and work with your veterinarians to obtain an accurate diagnosis.

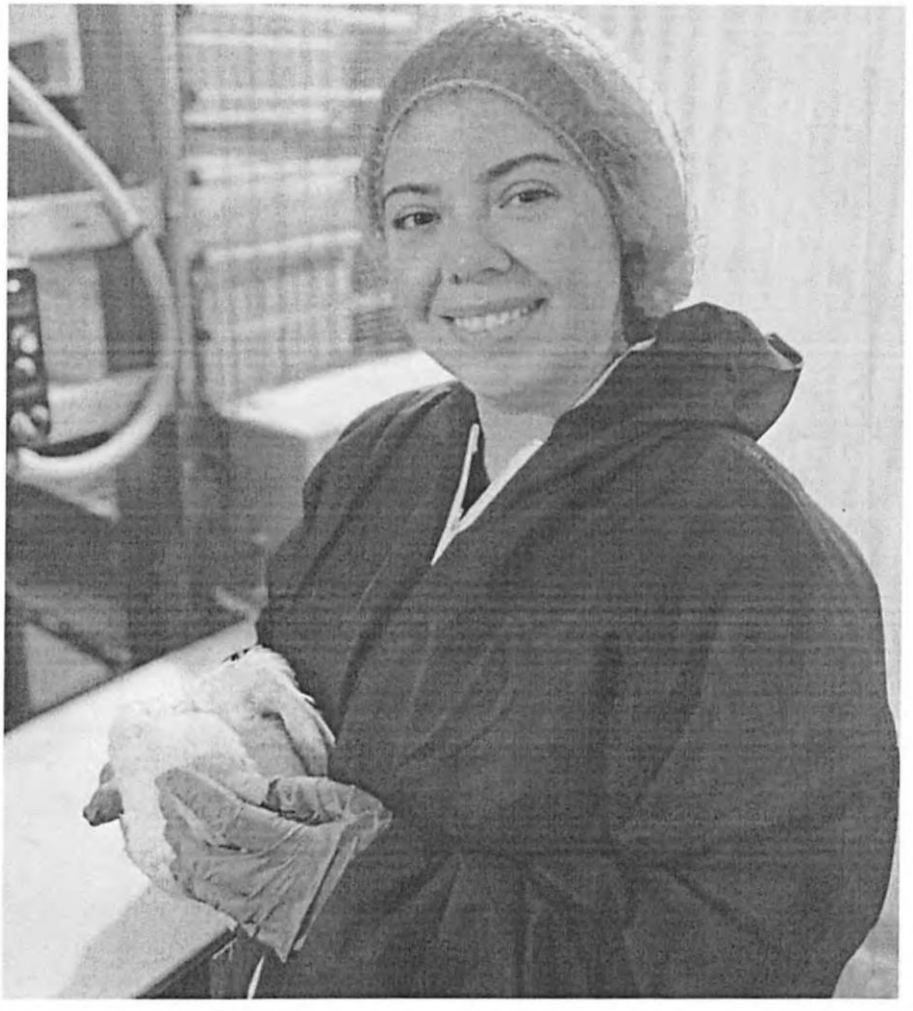
5 Collecting samples go a long way: It doesn't always have to follow a poor condemn result. Obtaining processing samples such as condemned whole birds, tissues, or more commonly blood samples, can provide insights into the flock's disease status. In particularly, blood samples can help screen for common infectious diseases, including infectious bursal disease and infectious bronchitis disease, which may go unnoticed on the farm.

PHOTO ADOBE STOCK


BREEDING FOR
CUSTOMER
SUCCESS
Delivering expertise and support to drive excellence through welfare and efficiency.
INTERNATIONAL
IPPE
PRODUCTION & PROCESSING EXPO
VISIT AVIAGEN AT
IPPE BOOTH B7033
Aviagen®
BREEDING SUCCESS TOGETHER

National poultry health update

New disease emerges in otherwise stable year for poultry health.
By Lilian Schaer



Dr. Anastasia Novy of Guelph Poultry Veterinary Service discusses the impact of avian metapneumovirus (aMPV) and other poultry health challenges during the Poultry Services Industry Workshop.

PHOTO: DR. ANASTASIA NOVY

Before avian influenza returned in the fall, it had been a fairly standard year for poultry diseases in Canada, according to two veterinarians who presented at the annual Poultry Services Industry Workshop. That is, with one exception.

That exception is avian metapneumovirus (aMPV), a new player in Canada's poultry disease field that was first discovered this past May in Ontario and Manitoba, and in Quebec in September.

"It's reasonably new but has been affecting the U.S. since the end of last year, so it was really just a matter of time until it came to Canada," says Dr. Anastasia Novy of Guelph Poultry Veterinary Service. "The virus spreads through aerosols, so air and wind, which means it can spready easily."

Turkeys are particularly susceptible and that's where producers in Ontario have seen the most mortality in the past year, although Novy notes most of those were indirectly caused by secondary infections like *E. coli*. That's because aMPV is immunosuppressive, leaving birds especially vulnerable to other pathogens.

According to Novy, turkey mortality from aMPV can range from five to 50 per cent with *E.coli* and gangrenous dermatitis as the most significant secondary infections.

"We also saw a lot of mortality issues and declines in egg production in broiler breeders, and drops in egg production in layers," Novy says.

Aviary-style layer barns faced more secondary infection problems from aMPV like *E.coli*, peritonitis and focal duodenal necrosis than enriched or conventional systems, in some cases causing drops in production of up to 15 percent.

Other than the detection of aMPV, the biggest change in Ontario over the past year has been the increased incidence of *E. cecorum* infections, which has also been the most significant issue for broilers in Quebec for several years. Infectious body hepatitis (IBH) had previously been the leading challenge in broiler production in Ontario.

In Western Canada, chick quality prob-

lems stemming from shortages caused by avian influenza continue to be one of the industry's most significant health challenges across all commercial poultry species. From a disease perspective, *E. coli* was the main concern across all poultry production sectors, followed by *Enterococcus spp.*

"The only big difference in Western Canada compared to last year was the emergence of aMPV, which we saw in Manitoba this spring," says Dr. Maral Rahmani, a fully licensed independent veterinarian.

Turkeys

Bacterial infections, especially *E. coli*, were the main issue in turkeys this past year, along with higher reports of necrotic enteritis.

"There isn't just one specific cause, but chick quality played a role," Rahmani explains.

Immunosuppressive diseases like hemorrhagic enteritis (HE) and any stress factors can make turkeys more vulnerable to secondary bacterial infections like *E. coli*. Since *E. coli* is a common bacterium in the gut, anything that affects gut microbiome balance can start to cause issues.

The only other notable change in turkey production in Western Canada, she adds, was the discovery of a few cases of aMPV in Manitoba in the spring.

The new virus was the dominant problem in turkeys in Eastern Canada; besides that, notes Novy, turkeys were generally otherwise healthy.

Broilers

The main bacterial infections in broiler production in Western Canada were *E. coli* and *E. cecorum*, as well as salmonella. These were challenges in all provinces and stem largely from variable or inconsistent chick quality.

IBH remains an ongoing problem in Western Canada, with aggressive immuno-suppressive strains breaking through despite broiler breeders being vaccinated for the virus. IBH is also very common in Ontario and some areas of Atlantic Canada, with elevated outbreaks elevated in Quebec between January and March.





Another change from the previous year in Western Canada was a higher level of broiler condemnations; a specific cause can't be pinpointed, notes Rahmani, but it is tied back to chick quality and resulting bacterial infections.

In Eastern Canada, a very humid summer led to a rise in fungal pneumonia in broilers; the higher moisture also contributed to bacterial infections and some botulism, according to Novy. Necrotic enteritis levels were elevated at the end of the summer particularly in broilers on raised without antibiotics programs.

Darkling beetles and flies, although always an issue, were particularly bad this year. Darkling beetles are the most common pest affecting Canadian poultry production and can be carriers of up to 60 poultry diseases.

Clostridial septicemia can occur as early as two to 12 days of age, with elevated mortality – four to five per cent of a flock in the first five days – of typically "good-looking" birds a being a common complaint. Unless there's a co-infection with E. coli, there is no major issue with birds looking sick before being found dead.

"It can lead to necrotic enteritis especially in raised without antibiotics flocks," says Novy. "If conventional birds get it, it will often resolve without treatment but without preventative antibiotics, it can turn into severe issues. There are aggressive strains that are also somewhat resistant antibiotics."

Broiler breeders

According to Rahmani, bacterial infections were also a major concern in broiler breeders in Western Canada, especially at peak production, combined with a noticeably poor response to antibiotic treatment.

"This makes it challenging to treat. It's not a new issue – we always see this – but we are seeing more and more of it, which is pretty alarming because it causes substantial losses and also animal welfare issues," she says.

Other issues were fairly sporadic and similar to the year before, although infectious laryngotracheitis (ILT) continues to be a problem in B.C., where it is considered endemic.

Bacterial lameness was elevated in both Ontario and Quebec, where it is very common, especially in the winter months and particularly in roosters. Poor ventilation and litter quality are contribution factors.

Layers

Layer health was fairly stable in Eastern Canada this past year, although higher worm levels were reported in aviary facilities in Ontario and Quebec, which could raise the possibility of roundworms being incorporated into eggs.

In Western Canada, bacterial infection, coccidiosis and Focal Duodenal Necrosis were the top three challenges across all three provinces. Marek's Disease, which can cause leg paralysis, weight loss and poor uniformity and is one of the most significant viral poultry diseases worldwide, was reported sporadically as an issue in British Columbia.

According to Rahmani, Alberta and Saskatchewan also each reported a few cases of infectious coryza, which were depopulated.

Noteworthy cases and preventative steps

Ontario reported two cases of fowl pox in turkeys, which is highly unusual and could be associated as a secondary issue stemming from aMPV infection. Eastern Canada also saw incidences of blackhead, with Atlantic Canada reporting cases in pullets and Ontario in turkeys and layers.

"We had warmer temperatures with less freezing of the ground last winter," says Novy. "We may see more of this in the future, so we may be experiencing more disease pressure in future as well. Winter is helpful in controlling diseases."

Overall, both veterinarians encourage producers to continue to pay attention to biosecurity on their farms and to make sure they're communicating with other farmers and with their veterinarians.

"Better communications across all stakeholders when there is a disease present is one of the things we have learned from avian influenza," says Rahmani. "We should also be raising awareness of antimicrobial resistance. It is a growing threat for human and animal health, and we need to have responsible use and lower misuse of antibiotics to control resistance."



Dr. Maral Rahmani, an independent veterinarian, discusses key poultry health challenges in Western Canada at the event.

PHOTO: DR MARAL RAHMANI

Key poultry health challenges in 2024

Avian Metapneumovirus (aMPV) emerged as a major new threat, first detected in Ontario and Manitoba in May and Quebec in September. Turkeys are particularly susceptible.

E. cecorum infections increased in broilers, causing significant losses in Ontario and Quebec.

Necrotic enteritis saw elevated levels in broilers, particularly in Raised Without Antibiotics programs, due to aggressive strains and lack of preventative treatments.

Infectious body hepatitis (IBH) remained a persistent issue, with aggressive strains affecting vaccinated flocks in Ontario, Quebec, and Western Canada.

KPS

KAISER POULTRY SYSTEMS

CANADIAN-MADE POULTRY SOLUTIONS

Designed, Assembled and Serviced in Canada



AVIARY SYSTEMS

- Fully modular
- Easy access
- Increase output - fewer unviable eggs
- Revolutionary feeding system



PULLET REARING SYSTEMS

- Grows with you
- Increase hen health and comfort
- Manure rollers = increased belt life



COLONY SYSTEMS

- Maximize hen comfort
- Gentle, innovative egg de-escalator design
- Meets all Canadian standards



VENTILATION SYSTEMS

- Roof, Cross, Length and Tunnel ventilation options
- Heating, cooling and ventilation
- Customized to your operation

A Division of Kaiser Ag

www.kaiserpoultry.com

KAISER AG



A planned response

Building a better outbreak management system.

By Jane Robinson

The National Poultry Network engages with poultry producers across the sector, including backyard operations, to find better ways to respond to issues like avian influenza.

When Jeff Wilson envisioned a National Poultry Network for Canada, he knew there was inherent value in bringing the sector together to tackles tough issues like antimicrobial resistance, avian influenza and overall profitability.

A born connector with a big world view, Wilson is a veterinarian, outbreak response veteran and president of Novometrix Research Inc, a Guelph-based business helping various sectors set up a new collaborative style of network. For the poultry industry, addressing the issue of avian influenza was a natural and needed place to start.

"The world is generally not well adapted to dealing with 'wicked' problems, and most of the problems we're facing are of the wicked variety," says Wilson, who played an active role on the outbreak response to the Walkerton water crisis.

Wilson believes we have systems in place that work well for smaller, focused outbreaks, but when it comes to complex outbreaks like highly pathogenic avian influenza (HPAI), "we don't have a coherent system to bring all the pieces and players together to plan and respond."

And in the absence of a cohesive system, panic and confusion often follow, in his experience.

Four best practice pillars

Wilson's desire to create greater collaboration within the poultry industry, in part to tackle issues like AI more effectively and efficiently, led to the development of three research papers he hopes will lead to a more effective response for AI.

The first paper that was just published – *It's time to apply outbreak best practices to avian influenza: a national call to action* – outlined what a proper outbreak response should look like.

"This first part of the AI project is pretty neutral," he says. "We provided a framework for how to run an outbreak properly and how to evaluate it – it's about how do you do this right."

Novometrix and its collaborators summarized the knowledge and expertise that exists on outbreak management and outlined four key pillars or best practices to an effective outbreak response, geared to help the industry align and organize to manage AI, or any other zoonotic disease or industry issue.

1. **Establish a leadership team.** An inclusive, collaborative group that includes people from across the industry with the right psychology for collaboration so they can work effectively together to fix a situation.
2. **Collect information and dat.** Build an information bank to collect the right data during an outbreak that might include water quality, wild bird activity, biosecurity, etc.
3. **Develop intervention strategie.** Based on the information gathered and in collaboration with farmers, these actions might include surveillance, diagnostics, setting up quarantine zones. "It's important to start with what we need right now, it doesn't have to be perfect," says Wilson.
4. **Communicate what's going on.** Let farmers and the industry know what happening. "It doesn't have to be sugar coated just let them know we've moving in the right direction and need their help to fix it."

Next steps

With this four-pillar framework, Wilson and his group conducted extensive interviews

PHOTO: JANE LEE

with poultry industry stakeholders to evaluate the current outbreak response to AI in Canada. These findings will be published in a second paper in early 2025 to provide an evaluation of how the HPAI outbreak has been handled to date in Canada.

Wilson acknowledges there are many good things happening to manage AI outbreaks in Canada, and many good people working very hard. "But there is no coherent, identifiable national leadership team that united all the requires players. We've escaped a national public health disaster but there are big gaps to address."

Those gaps will be the heart of the third paper on HPAI outbreak response project that Novometrix will produce, on behalf of the National Poultry Network. "This paper will focus on what we should do next to more effectively manage an AI outbreak in Canada," says Wilson. "We'll build off what we have learned in the grassroots input, but it won't be just one solution because it's a complex problem. I'm quite confident we're going to fix this, it's just going to take some coordinated steps."

What he knows works in any outbreak situation is the strength of the leadership. Outbreaks are rarely about money or the science, in his mind, but almost always about the ability of people to effectively work together.

"Unless you have a management leadership framework, and unless your response plan is written down and you have buy-in from key players at all levels, there's too much stress in the moment and too many opportunities for divisiveness."

As this project and the work of the National Poultry Network grows, Wilson really wants to continue to engage with poultry producers so they can see actual solutions for their operations.

"I know AI is a challenging issue but there is a way forward and we need producers to be involved in the solutions."

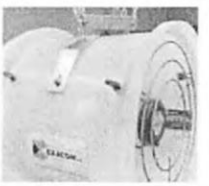
Novometrix is looking for producers and other poultry industry stakeholders who may want to join the network to benefit from upcoming pilot projects. Anyone interested can reach out directly to Wilson at jbwilson@novometrix.com.

THE BEST BRANDS IN THE INDUSTRY

Agri-fan



- Agri-fan- Exacon's brand name since 1987!
- Flush Mount Direct Drive and Belt Drive Exhaust Fans
- Energy Efficient Multifan Motors



NEW SWIVEL BRACKET FOR 18" CIRCULATING FAN

- Canadian made with 14 gauge stainless steel
- Allows direction of airflow into corners and dead spots



MULTIHEAT HOT WATER HEATER

- No CO_2 production and reduction of ammonia
- Nonhazardous with no open flame



TPI WALL AND CEILING INLETS

- Specialized polyurethane formula
- For exceptional insulation properties



MULTIFAN VERTICAL VFLO FANS

- Creates a uniform climate
- Controls humidity at animal level



GENIUS ITOUCH CONTROLS

- Generates real time data
- FarmQuest Online Farm Management allows
- Access to data 24/7

EXACON INC.

Contact your local dealer or call us for a dealer near you

254 Thames Road E., Exeter, Ontario N0M 1S3

1-866-335-1431 Tel: (519) 235-1431 Fax: (519) 235-2852
e-mail: sales@exacon.ca • www.exaconinc.ca

Precise protection

Technology is improving *in ovo* vaccination options.

By Lilian Schaer

It's been several decades since scientists developed the ability to administer vaccine protection to chicken embryos before hatching (*in ovo*). The first poultry vaccine available for *in ovo* administration around the world, including Canada, was for Marek's disease in the early 1990s. The process is gaining increasing interest and use as the equipment required to deliver vaccines via this route advances, along with the number of vaccines available.

"*in ovo* vaccination is the procedure to deliver vaccine inside the egg targeting specific sites where the vaccine is capable of stimulating an immune response," says Lívia Soares. "To reach the correct sites and ensure the embryo isn't harmed, vaccines must be delivered when the embryo is at a specific stage of development, between day 18 and 19 of incubation, and in specific parts of the egg."

Soares is in charge of global hatchery services for HIPRA – a multinational pharmaceutical company that's a relative newcomer on the Canadian poultry health market. She estimates adoption rates for *in ovo* vaccination use for broiler vaccines to be more than 90 per cent in the U.S., about 80 per cent in Canada, Spain and Brazil, and lower rates but rising in Asia, parts of Europe and some parts of Africa.



SmartVac's double needle system and soft touch technology carefully and precisely places vaccine in the amniotic fluid.

Timed prevention

From a bird health, welfare and labour perspective, delivering disease protection *in ovo* is a good fit, especially for short-lived birds like broilers.

"*in ovo* vaccination administration is a very popular technique with broiler production because it automates the process at hatcheries, so broiler chicks arrive on farm properly vaccinated, simplifying the process for everyone," says Joan Molist, global product manager for poultry with HIPRA, based in Spain.

Automating the vaccination process also helps address the ongoing challenges of on-farm labour. And it's part of a changing mindset about switching to individual administration of vaccines *in ovo* to ensure every chick embryo receives the proper dose for the intended protection development.

"There's a huge benefit in terms of reliability and accurate dosing," says Carol Jakel, technical services manager for HIPRA in Canada. "Every embryo gets the specific dose, every time. With on-farm administration or already hatched birds at hatchery we might be spraying the vaccine on the chicks or putting it in the water where we might not get full coverage. With *in ovo* administration at hatcheries we know every egg gets their dose."

From a welfare standpoint, *in ovo* brings benefits too, reducing the management required on chicks and removing some of the stressors for day-old broiler chicks.

New in ovo *coccidiosis vaccine*

Poultry producers have access to several *in ovo* vaccine options in Canada and Jakel estimates nearly all broiler hatcheries in the country have *in ovo* capabilities.

The newest option is Evanovo – HIPRA's new *in ovo* and attenuated vaccine for coccidiosis in poultry, the first of its kind in the world. The vaccine was introduced in the EU in 2022 and is now available in Canada, and provides a duration of immunity of at least 63 days.

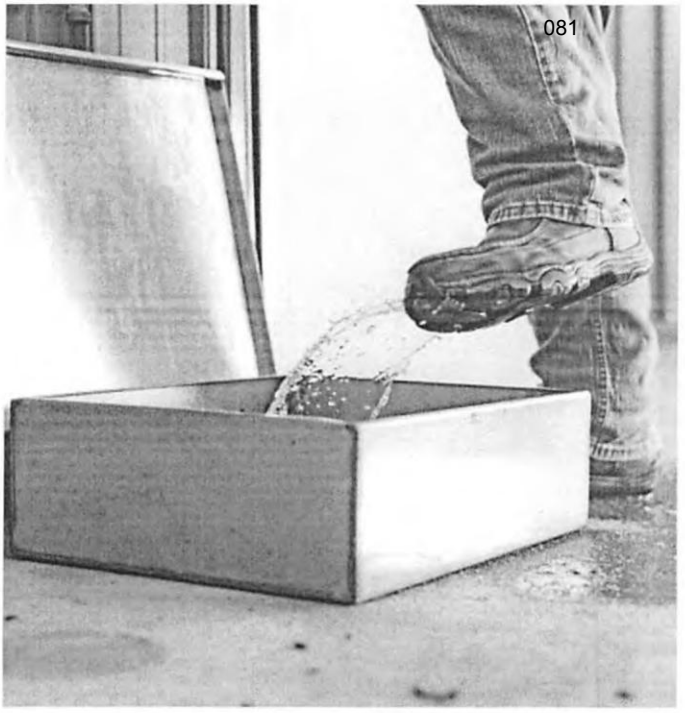
"The technology in this new vaccine provides good immune response without gut damage that can occur with more traditional,

PHOTO: PAS REFORM

Avian Reovirus: A Threat to Poultry Farming

Authors:
Raphael Bampi, DVM, Health and Quality Assurance, Cobb LatCan
Eder Barbon, Quality Processing Specialist, Cobb LatCan

Avian Reovirus is a significant concern in commercial poultry farming. Although most strains are non-pathogenic, the emergence of new variants in the past decade has led to substantial losses globally.



A strict biosecurity program can reduce the risk of introducing Reovirus to the flock.

Key Facts:

- Genetic Diversity: New strains arise from genetic rearrangement, leading to mutations.
- Infection and Dissemination: Affects various avian species, with meat-producing birds more susceptible. Transmission is both horizontal and vertical.
- Arthritis and Tenosynovitis: Mainly affects broilers, causing joint swelling and lameness. Younger birds are more susceptible.
- Immune Response: Neutralizing antibodies usually appear 7-10 days post-infection. Maternal antibodies typically aid early immunity.

Prevention and Control:

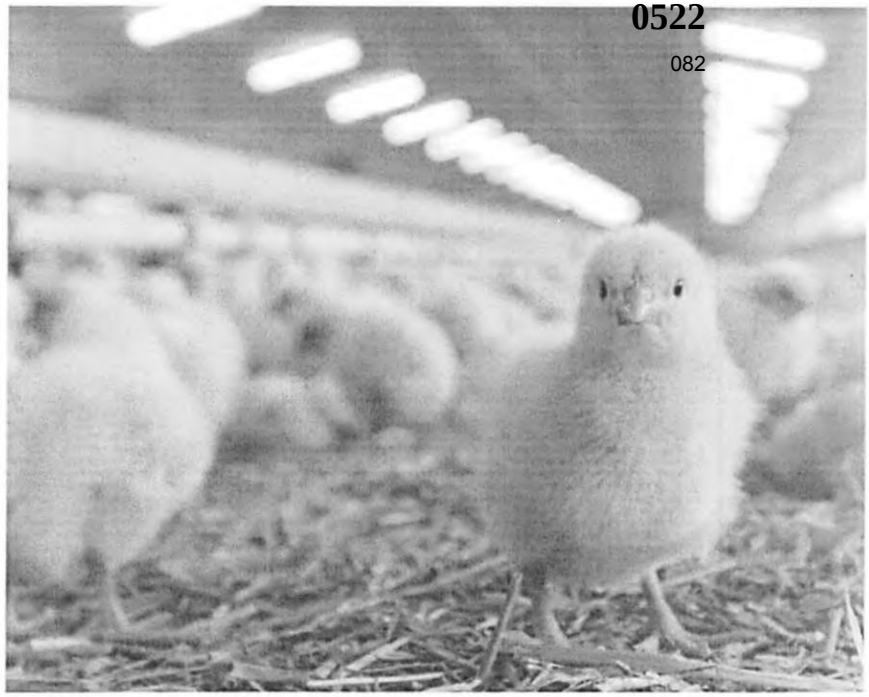
- Biosecurity: Strict measures and good sanitation are crucial.
- Vaccination: Programs aim to produce high levels of neutralizing antibodies.
- Diagnosis: Viral isolation, RT-PCR, and molecular sequencing can be used for diagnosis.

Economic Impact:

Lesions at processing plants can lead to significant losses, which requires reduced processing speeds to remove affected carcasses.

To read the full article and learn more about Avian Reovirus and effective control measures, scan the QR code above or visit: www.cobbgenetics.com/biosecurity

Copyright ©2024 Cobb-Vantress, LLC. All Rights Reserved.



HIPRA's new coccidiosis vaccine is administered *in ovo* a few days before hatch so the vaccine starts working once chicks are hatched.

non-attenuated coccidiosis vaccines," says Jakel. Parasite vaccines administered *in ovo* need to be delivered into the amniotic fluid (amnion) to be ingested by the growing embryo. When given a few days before hatch, the vaccine starts working once chicks are hatched.

"What we have seen in the first few years with this vaccine in Europe is that broiler chicks are able to develop proper levels of immunity so they can handle the challenge of coccidiosis on farm with better gut health and better performance improvements for body weight gain, feed conversion and fewer mortalities, among others," says Molist.

Upping the precision

Precise placement is a big factor behind the partnership and collaboration HIPRA have with *in ovo* equipment manufacturer Pas Reform.

The Dutch-based company has released its newest technology for *in ovo* vaccination (SmartVac) in 2022 in several countries around the world and expects to launch in Canada and U.S. within a year or so.

SmartVac is changing the safety and precision of *in ovo* vaccination technology. The system uses adjustable injectors to accommodate different egg sizes. The inoculation needle has sensors to detect the embryo inside the egg and also avoid wasting vaccines on empty spaces in the egg tray. And there are micro peristaltic pumps for dosing so the dose volume can be adjusted directly, without reducing speed or accuracy.

Steve Warren and Erwin Prinzen were part of the commercial development of the SmartVac project with Pas Reform, a global company that's existed for more than 100 years.

"This new device has a more careful injection procedure for gentler handling of the embryo, which in many cases results in better hatchability than older technology," says Prinzen, global commercial director for Royal Pas Reform. "And the soft touch technology with a double needle system greatly improves vaccine delivery in the amnion."

That precision makes the new system a good fit for HIPRA's new coccidiosis vaccine to deliver a higher percentage of *in ovo* injection into the amnion, compared to other devices, according to Prinzen. "What's really different about SmartVac is not only the device, but that it was developed from an incubation and embryology point of view."



There are vaccines currently registered in Canada for *in ovo* administration to protect birds against Marek's disease, Infectious bursal disease, infectious laryngotracheitis, Newcastle disease and now coccidiosis.

"Every embryo gets the specific dose, every time."

For Jakel, what's exciting about the new technology is the possibilities for reducing more post-hatch in the hatchery and on-farm vaccination. "The more times we can give early and long-lasting protection, we can take away some of the boosters we've been giving on the farm for certain diseases," she says.

What comes next?

Most *in ovo* machines in Canada today deliver a set dose. As newer technology like SmartVac makes its way into Canadian hatcheries, the ability for flexible dosing will open new opportunities for delivering vaccines and nutrients.

"If we can deliver early nutrition *in ovo*, we may be able to have birds that are healthier and growing quickly, so we are looking at sugar and other nutrients but there are no commercial products available at the moment," Jakel explains.

For Pas Reform, the principle of the technology is well suited to deliver nutrition, prebiotics or probiotics when that's available. "The needle on our device doesn't inject to a set depth but senses the embryo which allows us to target the amnion," says Warren, sales manager for North America with Pas Reform.

And while the focus on *in ovo* vaccination is on broiler production, the advances of *in ovo* sexing would open the options for the layer production in the future.

The prospect for an avian influenza (AI) *in ovo* vaccine is a tougher topic. There are AI vaccines registered for *in ovo* (not in Canada) so the technology could work if there's the right strain for the right country, but the real challenge is *in ovo* vaccines may be too weak against certain strains of AI to be effective, according to Soares.

PHOTO HIPRA

Meller Poultry Equipment Inc.
826 Nanticoke Creek Parkway, Jarvis, Ontario, N0A 1J0
Call us on: 519-587-2667
Or visit our website: www.mellerpoultry.ca

Authorized dealer
VDL Jansen
VDL Agrotech



Give your poultry farm a clean start with Neogen's family of HPAI solutions



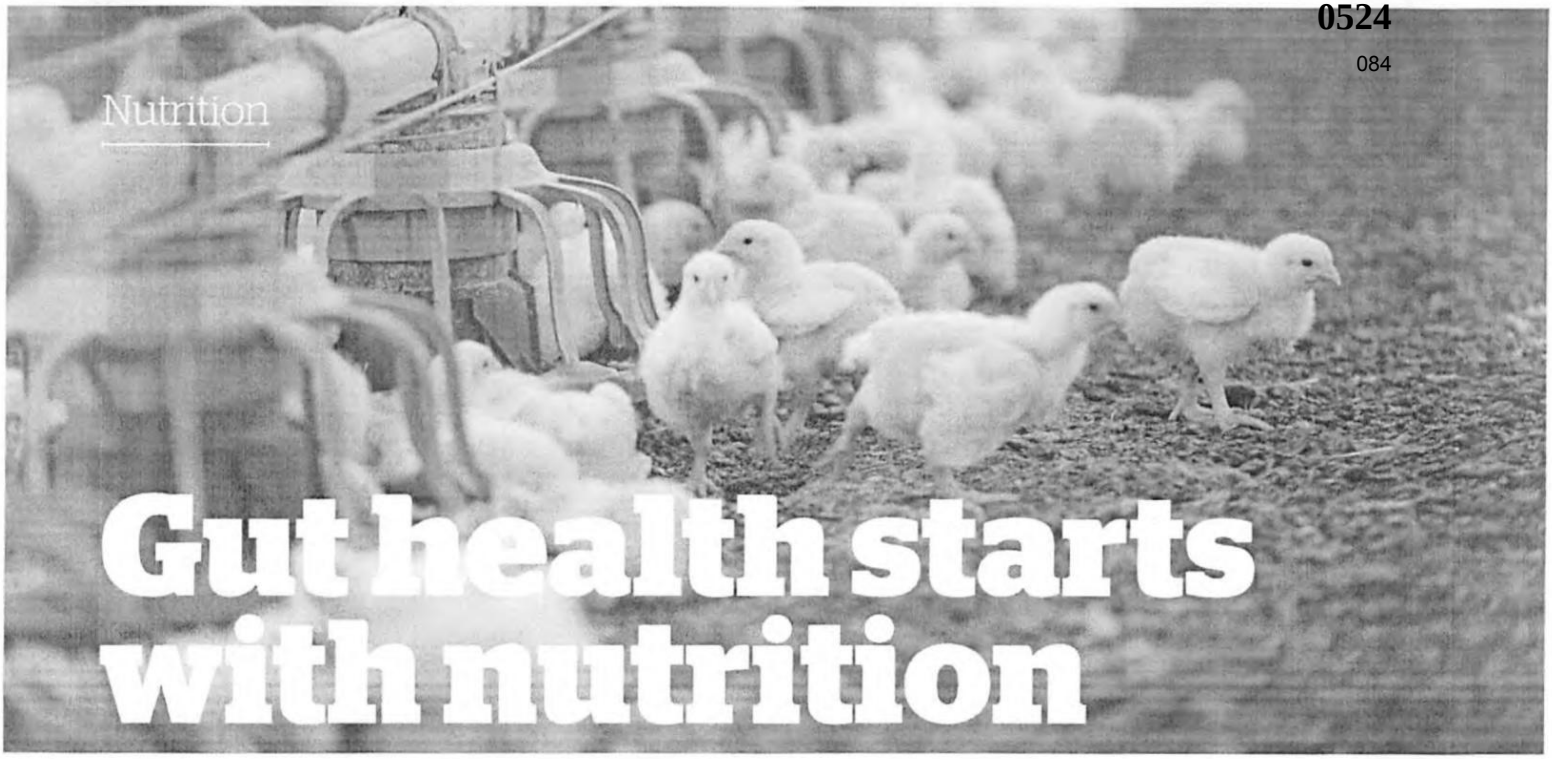
Now more than ever, with diseases like Avian Influenza challenging your birds at every turn, your ability to prevent disease has never been more critical ... *and Neogen® can help!*

Neogen provides a full range of disinfectants to help in your prevention efforts. From quaternary ammonium/glutaraldehyde combinations like our industry standard Synergize® to oxidizers like Neogen Viroxide Super™. From phenols like BioSentry® BioPhene™ to quaternary ammoniums like BioSentry® 904 to disinfectant wipes like COMPANION™, Neogen has a chemistry to fit your specific needs.

Call your local animal health provider or visit neogen.com today to find out which HPAI solution is right for you.

NEOGEN

© Neogen Corporation, 2023. Neogen and Synergize are registered trademarks and BioPhene, COMPANION, and Viroxide Super are trademarks of Neogen Corporation. BioSentry is a registered trademark of BioSentry, Inc. All rights reserved. All other trademarks are property of their respective companies.



Gut health starts with nutrition

Feed additives can be used to improve gut health by promoting digestion and selectively enriching beneficial bacteria in the gut.

Optimizing ingredients, feed, and additives boosts digestion and bird performance.
By Suttisak Boonyoung, Cobb-Vantress

Gut health influences nutrient digestion, immune regulation, and microbiota balance. Supporting it requires optimized feed and nutrition to enhance digestion, reduce oxidative stress, and build a strong nutritional foundation from ingredient selection to feed production.

The basics of digestion

After the feed passes through the oral cavity and esophagus, it enters to crop and is temporarily stored in this organ. It is also moisturized, acidified and partially fermented. The feed then moves to the proventriculus and gizzard where digestion continues chemically, with acids and enzymes, and mechanically, by muscular contractions. Next, the feed passes to the small intestine where enzymes and bile continue the chemical breakdown.

Most of the nutrient absorption has occurred by the time the feed reaches the end of the small intestines. Carbohydrates, fats and proteins are absorbed, leaving the non-digestible components, which move into the large intestines.

The non-digestible components are the substrate for bacterial fermentation in the caeca. These are blind pouches at the end of the large intestiness, where true fermentation occurs, producing short-chain fatty acids, organic acids and vitamins.

Ingredients and feed formulation

It is important to consider the quality of ingredients for gut health. Some plant ingredients, like wheat and barley, contain highly soluble fiber that can increase the viscosity of intestinal contents, that, in turn, slows feed passage rates. Slower feed passage can create a low-oxygen environment favoring pathogenic bacteria and disrupt the microbiota balance.

Poor protein sources often contain anti-nutritional factors (ANF), compounds that inhibit digestive enzymes, which reduces protein digestion and absorption. The undigested protein passes to the large intestine where it becomes a substrate for bacteria, selectively enriching opportunistic pathogens such as *Clostridium perfringens*.

Mycotoxins in the feed can directly damage to the physical barriers in the gut. Tight junctions, the structural seals between epithelial cells, can be damaged by mycotoxins causing leaky gut allowing toxins and bacteria to pass between cells and enter the blood stream. Mycotoxins can also induce inflammation leading to microbiota imbalance and dysbiosis. Because molds produce mycotoxins, storage areas for ingredients and feed should not support mold growth. Likewise, a testing and monitoring program helps mitigate mycotoxin issues.

Feed processing and pellet quality

Coarse corn and wheat can enhance gizzard function. The coarse grain along with good pellet quality can slow down the feed passage rate in the gizzard. More time in the gizzard strengthens the muscles and reduces the particle size. Because small particles have more surface area for enzyme and acids act upon, they are digested more easily than larger particles.

Ultimately, nutrients are absorbed more efficiency when derived from coarse grains. Conversely, fine particles and poor pellet quality usually pass quickly through the gizzard with little time being ground.

During the conditioning process, heat treatment can enhance pellet quality and promote carbohydrate absorption through the gelatinization process. The heat treatment also reduces the risk of harmful microbial contamination. To ensure good pellet quality, it is important to regularly monitor the retention time, temperature, and moisture in the conditioning process.

PHOTO: COBB-VANTRESS

THE NATIONAL POULTRY SHOW

FEB 5-6, 2025

WED 9AM–5PM | THUR 9AM–4PM





Get Your Ticket Today! Use Code CdnPoultry25 for 25% Off

Visit NationalPoultryShow.com

Why Attend?

- Discover the latest in technology, equipment, & feed
- Gain insights from top industry experts
- Connect with leaders in poultry—All in one place!

Education Stage Hours:

February 5th & 6th, | 10am - Noon, 1 pm - 3 pm

The Poultry Education Stage 2025 is now on the show floor—your go-to spot for expert insights, cutting-edge technology, and essential industry updates. Don't miss it!

New! Family Zone - Fun for All Ages

THE LARGEST POULTRY SHOW IN CANADA—SEE YOU THERE!

The Agriplex at Western Fair District, 845 Florence St, London, ON

BROUGHT TO YOU BY: Poultry Industry Council | WESTERN FAIR district

0526
086



In the feed mill, ensure good pellet quality by monitoring the retention time, temperature, and moisture in the conditioning process.

Nutrients

Protein and amino acids are very important for bird growth. Crude protein and amino acid amounts in the feed that are higher than the bird's requirement, may pass to the large intestines undigested and used as a substrate for harmful bacteria. Likewise, unbalanced amino acid profiles can have the same detrimental effects as overinclusion.

Fiber plays important roles in gut health. There are two main types of fiber, classified by their water solubility, insoluble and soluble. Like coarse grains, insoluble fiber improves the muscular strength of the gizzard and increases the chemical and physical digestion time which allows the feed to be broken down into small particles. The indigestible component of insoluble fiber can be fermented by bacteria to produce organic acids and short-chain fatty acids.

Soluble fiber should not be included in the diet because the intestinal contents can become viscous. Digested insoluble fibers tend to become loosely flowing intestinal contents, while soluble fibers create viscous intestinal contents that move slowly through the intestines and remain congealed. Therefore, the viscous contents have less contact with intestinal surface leading to less nutrient absorption. The unabsorbed nutrients are then available to opportunistic and pathogenic bacteria.

It is important to consider the inclusion level of fiber. Although insoluble fiber can be beneficial, overinclusion can irritate the gut lining leading to inflammation. Too much insoluble fiber can also interfere with fat and protein digestion by speeding the rate of nutrients through the intestinal tract.

Feed additives

Feed additives can enhance gut health by increasing nutrient usage, enriching beneficial microflora, reducing oxidative stress and inflammation, and providing an antimicrobial effect. Although there are many commercial feed additives available, it is important to carefully evaluate and select the appropriate products. When evaluating feed additives, consider factors such as formula structure, production cost, biosecurity, and flock health status.

Enzymes help enhance nutrient usage and reduce undigested components in feed. Non-starch polysaccharides (NSP) enzymes are commonly used in broiler feed to breakdown soluble fiber and reduce digesta viscosity, while protease enzymes increase protein availability for digestion. It's important to select enzymes that are suitable for the specific feed substrate. Additionally, monitoring enzyme stability during feed processing is crucial to ensure optimal enzyme efficiency.

Probiotics are live beneficial bacteria that can enhance gut health. They can be applied in the feed or water, depending on the manufacturer. Probiotics can benefit the gut by increasing beneficial bacterial populations, reducing inflammation, stimulating development of the immune system, and enhancing nutrient digestion. Prebiotics are fermentation substrates and nutrients that are used to selectively enrich beneficial bacterial population.

Antioxidants, essential oils, and phytogenic compounds are feed additives that help reduce oxidative stress and inflammation, mitigating free radicals from oxidized feed fat or environmental stressors.

Organic acids are produced by the fermentation process of microorganisms. They can be produced by microorganism in the gastrointestinal tract as well as supplemented in the diet or water. Organic acids are antimicrobial, can selectively enhance beneficial bacteria and some can be used as energy sources by intestinal cells.

PHOTO: COBB-VANTRESS



Enriched welfare

Experts discuss the benefits, challenges, and future of enrichments in broiler barns. **By Treena Hein**



Broilers explore an enrichment hut, designed to provide shelter and encourage natural behaviors like perching and dustbathing.

Enrichments can be defined as sensory stimuli that provide choices in the environment for an animal. Ideally, an enrichment should promote wellness, stimulate desirable behaviors and reduce stereotypic behaviors.

For most animals, placing specific objects in the environment achieves specific changes in behavior/activity from stimulation of the brain through physical (and potentially also social) interactions. Appropriate enrichments can vary by animal age, species, and environment, which means in the case of poultry farming, the enrichments used and needed by a broiler and laying hen may be different.

With broilers, exactly which enrichments are best are being worked out, but farmers in Canada and beyond should expect to be involved in more conversations about enrichments in the near future. It's uncertain how many broiler barns in North America or globally have enrichments, but Dr. Chanelle Taylor of Cargill Canada notes that all of her firm's broiler contract farmers who supply its London, Ont. processing plant now have enrichments in place in their barns.

Dr. Kate Barger-Weathers of KB Welfare Consulting in the United States collaborates with various U.S. broiler and broiler breeder companies that are implementing floor-based enrichments and lighting enrichments in a significant portion of their barns. These two poultry veterinarians recently hosted a *Canadian Poultry* magazine Broiler School webinar on the topic.

They both agree that retailers, restaurants and the general public expect that chicken farming is actively moving towards enrichments becoming standard. As Barger-Weathers explains, "it's acceptable that we as an industry may still be figuring out what birds want and need, what works best at the farm level, how to best measure the associated welfare outcomes; however, the supply chain expectation is that enrichments will be part how we raise and care for chickens in the future."

Taylor adds, "I believe eventually the codes of practice will address required and recommended enrichments. It's best for the birds and the right thing to do."

Questions and answers

As mentioned, while an enrichment is defined as something that provides an animal with choices that lead to positive welfare outcomes, it is important to be sure that the animals actually use the added object or stimuli. Nailing that down can be complex.

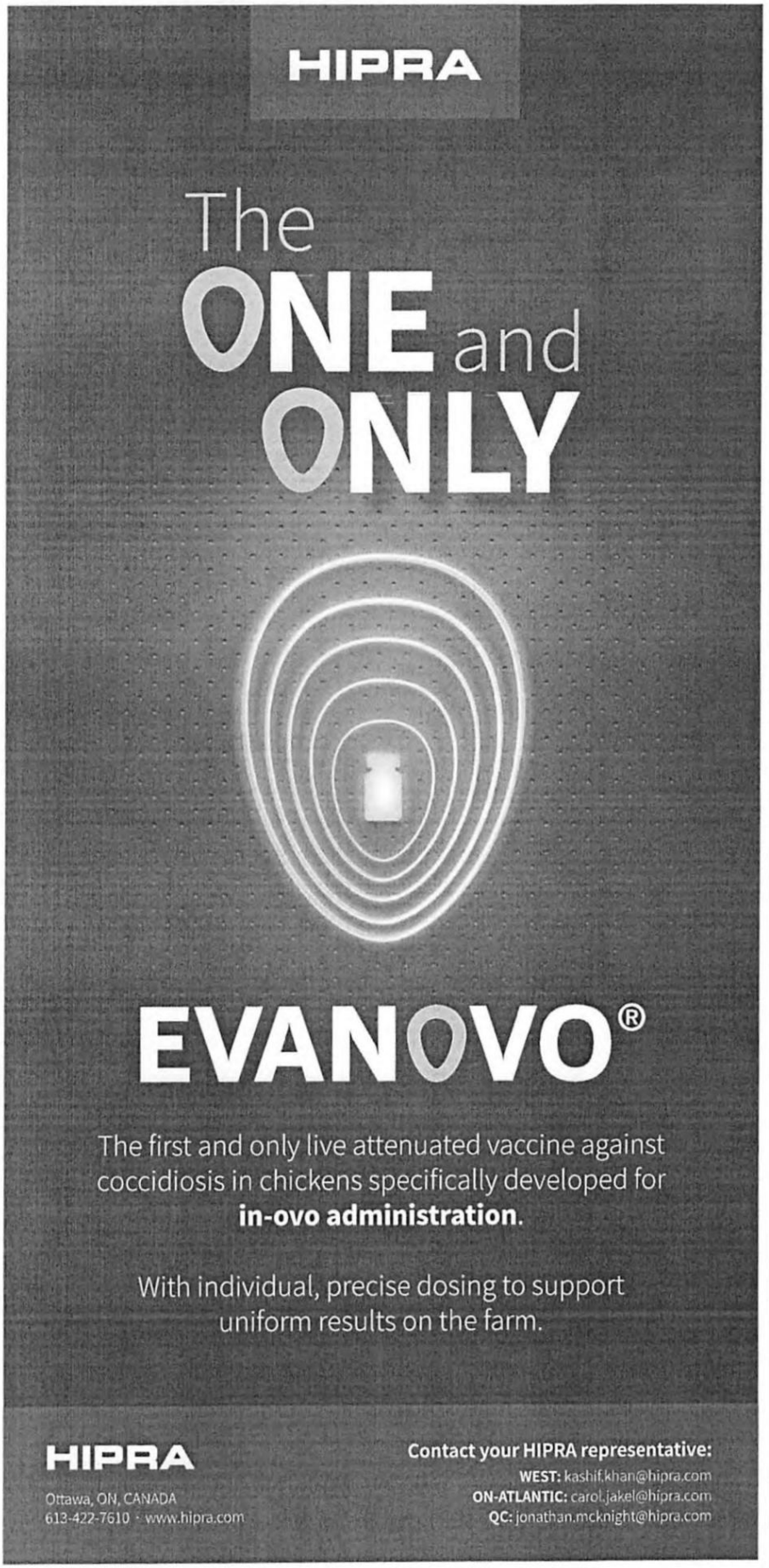
"Ideally, when evaluating enrichments to see what chickens use and prefer, we should measure how many birds are using it and how they are using it," explains Barger-Weathers. "For example, do all the birds or just a subset of the same, dominant birds use the enrichment? We also have to look at whether they use it once and then ignore it, if they quickly return to use it after being disturbed, and if they use it throughout their time in the barn.

Since our goal is to improve welfare outcomes, we also have to evaluate what birds gain by using a particular enrichment. If they peck at an enrichment rather than pecking at another bird (injurious pecking), that's huge benefit for other birds.

For the bird pecking at the enrichment, it might be more active than it would be otherwise, but maybe there are other benefits too." (For example, with layer or breeder hens, pecking stones may reduce stereotypic pecking [abnormal pecking that may be due to boredom] and may have the added benefit of helping refine the beak shape.)

Taylor also points out that it very much matters which enrichments make sense for farmers. "We have to look at biosecurity of the object, for example whether it has to be replaced every flock

PHOTO DR. KATE BARGER-WEATHERS



because it could harbour pathogens," she explains. "How often is replacement required because it's worn out? Is the cost acceptable and can it be sourced on an ongoing basis at the same quality? If it's difficult to clean, heavy, cumbersome etc., the farmer won't use it. There won't be buy-in."

However, when farmers see that they're participating in a process where care has been taken to ensure enrichments are going to work for them and the birds, success is achieved. Considering the sustainability, safety and animal welfare benefits of an enrichment are key to achieving trust.

"When you see the birds using the enrichments, that birds are happier and seem to enjoy them, it makes you feel good," says Taylor. "Farmers want to be able to say to the public 'we are doing this now, and it works.'"

Specific broiler enrichments

Floor-based enrichments like platforms, huts and bales are most actively being examined for broilers. Platforms can provide options for perching and allow poultry to shelter underneath, whereas hut-type enrichments allow the birds to sit under or next to the object for cover. Bales, both straw and shavings, provide shelter and encourage broilers to peck at and pull apart the bale.

Looking at platforms, there is some university data on how much broiler chickens use platforms with various ramp heights and shapes. However, more data from industry or academia is needed regarding optimal height, construction and use of the platform for broilers.

Lighting intensity continues to be a highly debatable topic for broilers. Gradient lighting (variable intensity in different areas of the barn) provides broilers with a choice within the barn and studies have shown positive welfare outcomes and broiler preferences for the gradient lighting system. Gradient lighting enhances specific behaviors, for example eating and drinking in bright areas, resting and dustbathing in dimmer areas.

Suspended enrichments are often considered for broilers but can be a challenge



REACH YOUR PEAK

Where North American Poultry Connects!

PEAK 2025 | Minneapolis | April 8-10

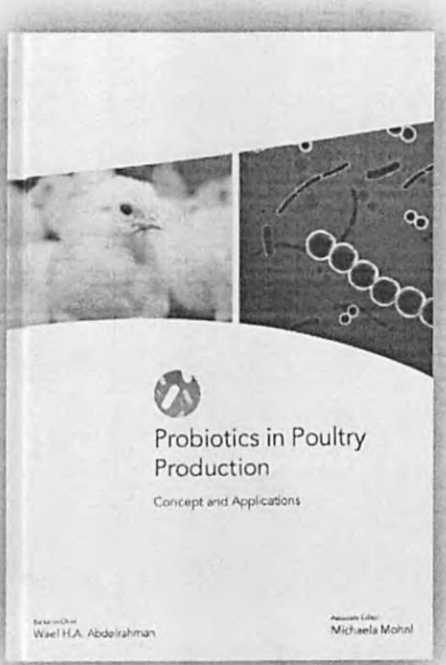
Trade show, education, and networking at the show that's 100% focused on POULTRY.

PEAK

Registration Open Now!

www.MidwestPoultry.com

PROBIOTICS IN POULTRY PRODUCTION



This book gives a comprehensive overview of the mode of action of probiotics and the theories behind it.

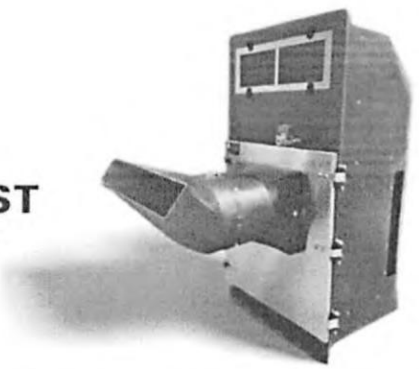
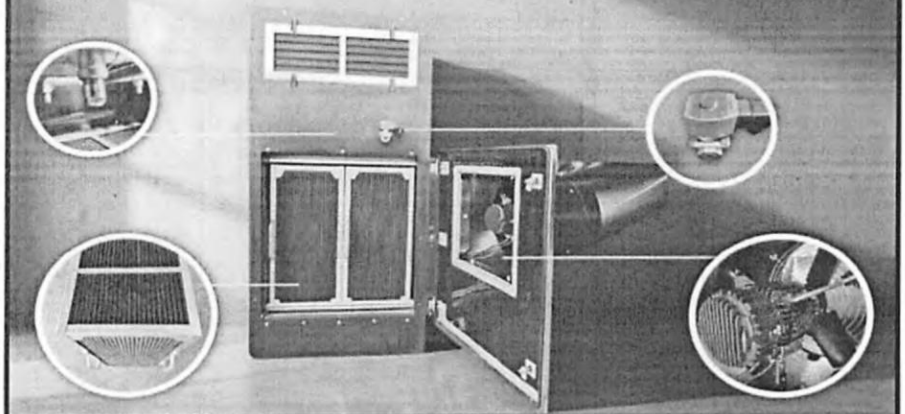
In addition, it highlights the main benefits of using probiotics in poultry production, such as maintaining gut health and integrity, reducing gut inflammation, modulating the immune system, preventing bacterial lameness, preventing reproductive tract infections, combating various enteric pathogens and improving performance. The chapters of this book illustrate various studies, which show the efficacy of probiotics in reducing livestock and poultry diseases, potentially reducing the need for antibiotic intervention, in addition to improving production performance.

Scan code to buy this book

ⓘ $74.40 | Item#0955501180

ANNEX BOOKSTORE

Educational Resources for Industry Professionals | 877-267-3473 | annexbookstore.com

AVI AIR
Heat Exchangers
Avi35
AVI AIR
CUT HEATING COST WITH AVI35 HEAT EXCHANGER

Improve your bird performance with Avi-Air.
✓ Stainless steel washing system
✓ 0-10v communication
✓ Efficient and durable double heat exchange cores

www.exaconinc.ca
Contact your local dealer or call us for a dealer near you
EXACON INC.
Exeter, ON 1 866-335-1431 sales@exacon.ca

due to lack of interest and biosecurity concerns. For example, metal washers on a rope have been studied as a pecking enrichment. Research shows that using two washers provide a clicking sound, which prompts repeated use, whereas a single washer on a string is typically ignored by birds.

Different types of hanging enrichments, specifically suspended pecking blocks and nets with hay, are also being evaluated by some farmers and broiler companies.

Moving forward

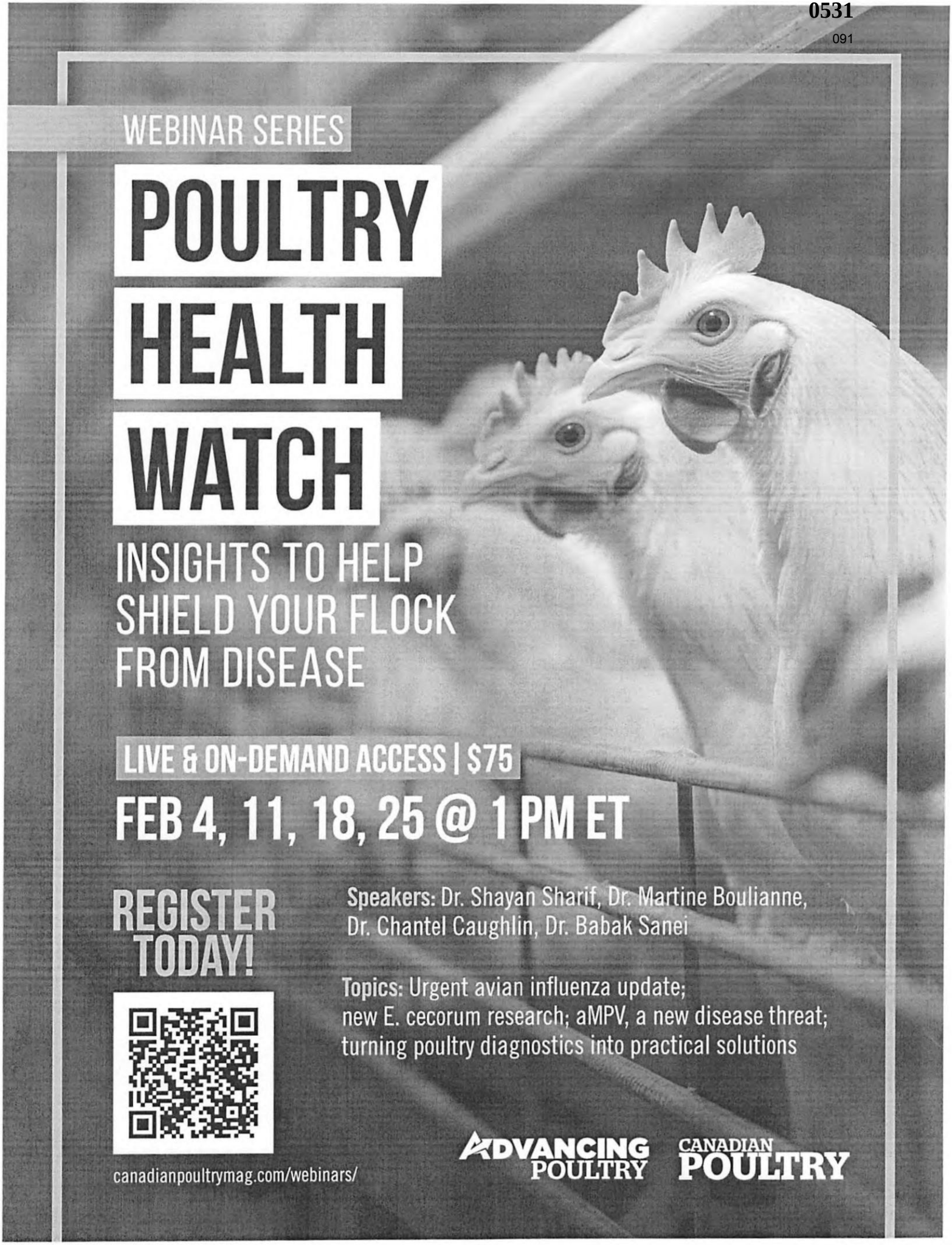
When you trial and implement these or other enrichments, Barger-Weathers says it's useful to consider what behavior(s) you want to enhance or reduce in the flock so that the correct enrichment(s) are chosen. "For example, if the goal is to encourage both resting and increased activity, a combination of gradient lighting and the use of huts or platforms may be good to test," she says.

"The gradient lighting allows birds to be active in the bright areas and to rest in the darker areas of the barn. The hut or platform allows birds to choose to walk to be near the enrichment and then to dustbathe, shelter or perch."

With an enrichment in place, she stresses that everyone who works in the barn can be involved in observing the resulting behaviour details in the flock. (Also consider that on-farm trial of an enrichment may be an excellent science fair, 4H or personal interest project for a budding young scientist in the family.)

Barger-Weathers says those who work in the barn on a daily basis can evaluate behaviours such as how many birds are using the enrichment, can try and determine if its different birds or always a specific group, is there repeated use, etc.

Those in the barn daily can also evaluate if flock distribution within the barn is different now that the enrichment is present. As farmers walk through the flock, they can also evaluate whether the flock is calmer or more flighty compared to flocks in the past. "With many of the floor-based enrichments like huts and platforms, farmers can evaluate how quickly birds return to the enrich-


WEBINAR SERIES
POULTRY HEALTH WATCH
INSIGHTS TO HELP SHIELD YOUR FLOCK FROM DISEASE
LIVE & ON-DEMAND ACCESS | $75
FEB 4, 11, 18, 25 @ 1 PM ET
REGISTER TODAY!
Speakers: Dr. Shayan Sharif, Dr. Martine Boulianne, Dr. Chantel Caughlin, Dr. Babak Sanei
Topics: Urgent avian influenza update; new E. cecorum research; aMPV, a new disease threat; turning poultry diagnostics into practical solutions
canadianpoultrymag.com/webinars/
ADVANCING POULTRY
CANADIAN POULTRY

ment after they are disturbed," says Barger-Weathers.

"Service technicians, production managers and poultry veterinarians who visit the farms on a routine basis can also evaluate flock behavior, enrichment use and bird health outcomes. While the goal of enrichments is to positively motivate and reinforce specific behaviors and to allow the chickens to better cope with challenges, we also want to enhance poultry welfare and health outcomes."

Overall, focus on the big picture. As mentioned, beyond bird behaviour, assessment of an enrichment should also include biosecurity and performance benefits (feed conversion, mortality/culling, weight gain, hock condition, skin lesions, gait, etc.) along with 'farmer factors' (cost, ease of installation, etc.). Farmers interested in trialing enrichments should talk to their supply chain associate (i.e., processor, production supervisor, etc.) to obtain information and to understand their plan for implementing enrichments.

Both Barger-Weathers and Taylor remind us that animal welfare is a journey, and that expectations and assessments will continue to evolve since welfare is complex, multi-faceted and has many stakeholders. Standards will continue to change and advance, they note, along with advances in technology, scientific knowledge and equipment.

EXAMPLE OF BASIC DECISION TREE WHEN CONSIDERING AN ENRICHMENT TO TRIAL:

Which behaviours do you want to enhance or reduce in the flock?

E.g., enhance cover & shelter

Consider floor-based enrichments such as platforms and huts

E.g., enhance dustbathing

Consider adding dry, friable litter material in the barn, especially in areas with dimmer lighting

Ensure chosen enrichment is safe and biosecure. Install.

Create a data-gathering chart to easily evaluate use. Evaluate quantity of birds using the enrichment, how the birds use it and frequency of use. Evaluate enrichment use throughout the life of the flock.

For single-use and floor-based enrichments, evaluate wear and tear at the end of the flock.

Interview farmers to understand any changes in flock behaviour and any concerns with implementation and/or operation of the enrichment.

Summarize data and make conclusions about what to try again or what to change in the next trial.

Innovative Poultry Products, LLC

DEADSTOCK MANAGEMENT with Poultry Hawk

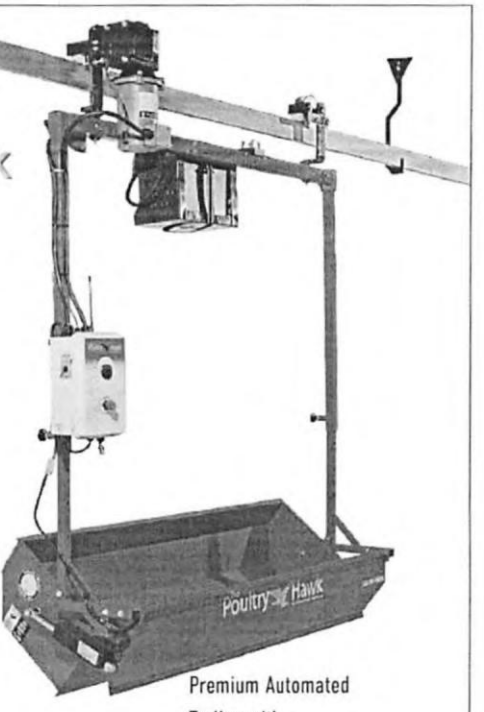
Versatile. Automated. User-Friendly.

Remove birds | Tote feed | Carry eggs | Maintenance cart

The original Premium Series was created for poultry farmers to have "A better way" to carry out daily tasks in the barn. The trolley system rolls along a heavy duty track to save lugging pails of dead and culls down the length of the barn making chores easier and more enjoyable. The system is available with a host of options that can be added right away or down the road.

Designed by a farmer for farmers:
>Powered by deep cycle 12V battery
>Dock charger option for auto charge
>High quality swagged rail system is quick and easy to install
>Powder-coated construction
>450 lb basket capacity
>Manual or automated options

Ask us about the E-series options:
>Can use 20V Dewalt, Milwaukee or Makita battery
>Galvalume construction



Premium Automated Trolley with Auto Dump

CountyLine

Contact
sales@county-line.ca
519-291-5012 (Hickson ext 4)
www.county-line.ca

Listowel
8582 Hwy 23 N., Listowel ON
Hickson
596202 Highway 59, Woodstock, ON

To see a system in action visit
innovativepoultryproducts.com

CANADIAN POULTRY CLASSIFIEDS
Phone (519) 428-3471
Fax (519) 429-3094

BARN WASHING

Jeni Mobile Wash LTD.
BARN WASHING AND DISINFECTING
1-800-361-3637

BARN DISINFECTING

NewTech FOGGING
DISINFECTION AND INSECTICIDE SERVICES

- Top of the line technology delivering superior results
- 100% coverage guaranteed

Chris Streutker - 519-952-0209
John Woestenenk - 519-292-0343

EQUIPMENT FOR SALE

224 6th St.
PO Box 16
Fairbury, NE 68352

FPM METALS Custom Fabrication

FPMNE.com
Sales@FPMNE.com
402.729.2264

POULTRY MOVING EQUIPMENT



Complete Trailer Units
Pullet Transport Carts
Rhino Rail Lift Gates
Chick Dolly - Standard & Custom Sizes

OMNIVORE COMPOSTER



18' CONTINUOUS COMPOSTER

- 120 Volts drive unit • Self latching loading door
- Polyurethane insulated drum
- Low design for easy loading
- End of drum unloading for easy removal of composted material
- SOLAR PACKAGE OPTION AVAILABLE

CountyLine
Eastern Canada:
sales@county-line.ca
519-291-5012
www.omnivorecomposter.com

AGPRO WEST SUPPLY LTD
Western Canada:
info@agprowest.ca
604-746-5376
www.agprowest.ca

EQUIPMENT FOR SALE

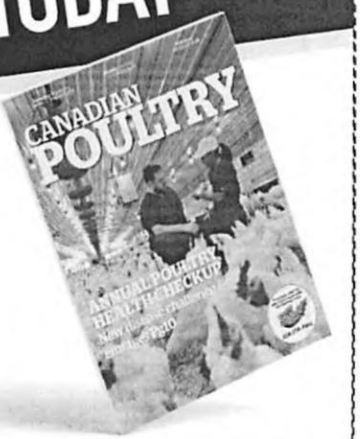
CompostDrum.com
Easy, Effective, Economical



ACTIUM COMPOSTING
519-527-2525 John@ActiumComposting.com

Our BC Reps
NEWLEAF EQUIPMENT SOLUTIONS
778-548-7968 SamGabara@NewLeafequipment.ca

SUBSCRIBE TODAY



ONE YEAR
ONLY
$32.50
(Plus applicable taxes)
US $91.50 (USD) • Foreign $103.50 (USD)

Name: _____
Business Name: _____
Title: _____
Address: _____
_____
Prov.: _____ Postal: _____
Phone: _____
Email: _____

◯ Payment Enclosed
(Payable to Annex Publishing & Printing Inc.)
Charge to: ◯ Visa ◯ MasterCard ◯ AMEX
Card # _____
Credit Card Expiry Date (mm/yy): _____
CVV (3 digits on back of card): _____

Occasionally, Canadian Poultry magazine will mail information on behalf of industry-related groups. If you prefer not to receive this information, please indicate so by checking here ( ). We do not share our mailing list (print or digital). Publisher reserves the right to determine qualification.

To subscribe mail to: Canadian Poultry Magazine
PO. Box 530, 105 Donly Dr. S., Simcoe, ON N3Y 4N5
Ph: (866) 790-6070 Fax: (877) 624-1940
email: subscribe@canadianpoultrymag.com

CANADIAN POULTRY
canadianpoultrymag.com

Poultry Spaces

Poultry Spaces highlights new and renovated poultry facilities. Do you know of a good candidate to be featured? Let us know at poultry@annexweb.com.

Rickeen Farms

Location
Wallenstein, Ont.

Sector
Broilers

The business
Rickeen Farms, located in Wallenstein, Ont., has been in the Shantz family since 1912. Today, Brett and Jocelyn Shantz, along with Brett's parents, Rick and Doreen, manage this fifth-generation farm. Long-time dairy farmers, the family recently diversified into broiler production. "Dairy is stable but slow to grow, so we saw broilers as a good fit for our business," says Brett.

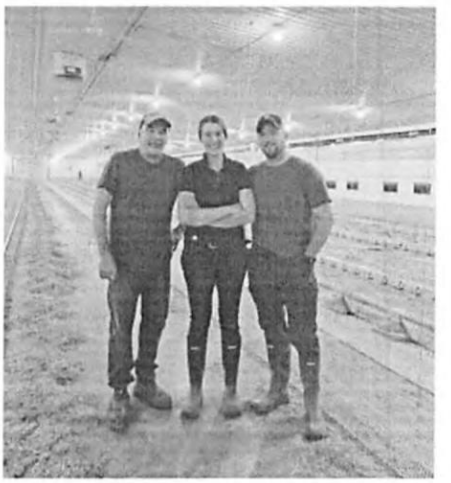
The need
Expanding into poultry allowed Rickeen Farms to grow without relying on rare local land sales. Their interest was bolstered by support from Jocelyn's family, who are experienced in broiler farming. Brett explains, "Having my father-in-law and brother-in-law as mentors gave us the confidence to get started. Their insights helped us make informed decisions."

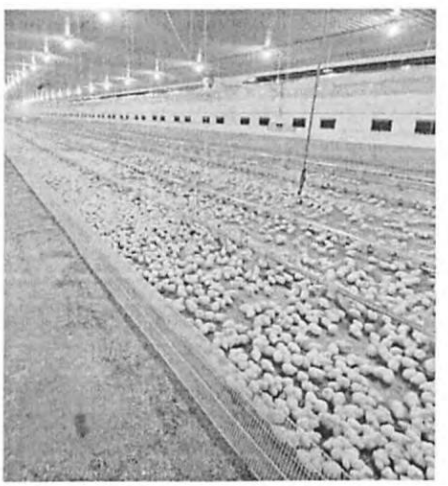
The barn
Rickeen Farms' new broiler barn, built in partnership with CountyLine, measures 72 by 250 feet and features advanced equipment, including Lubing high-flow drinkers, a SKOV ventilation system, and bird-weighing scales. "We also included migration fences to optimize brooding," Brett notes. Designed with future expansion in mind, the barn currently operates at 70 per cent capacity but could double its size with minimal adjustments. "Getting into broilers has been a great learning experience," says Brett. "We've had excellent support from my father-in-law, the local feed mill, and others in the industry."

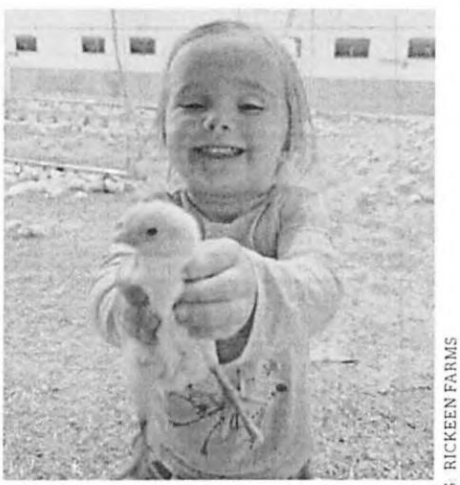
View more photos at
canadianpoultrymag.com


The new broiler barn at Rickeen Farms was designed with scalability and modern ventilation systems in mind.

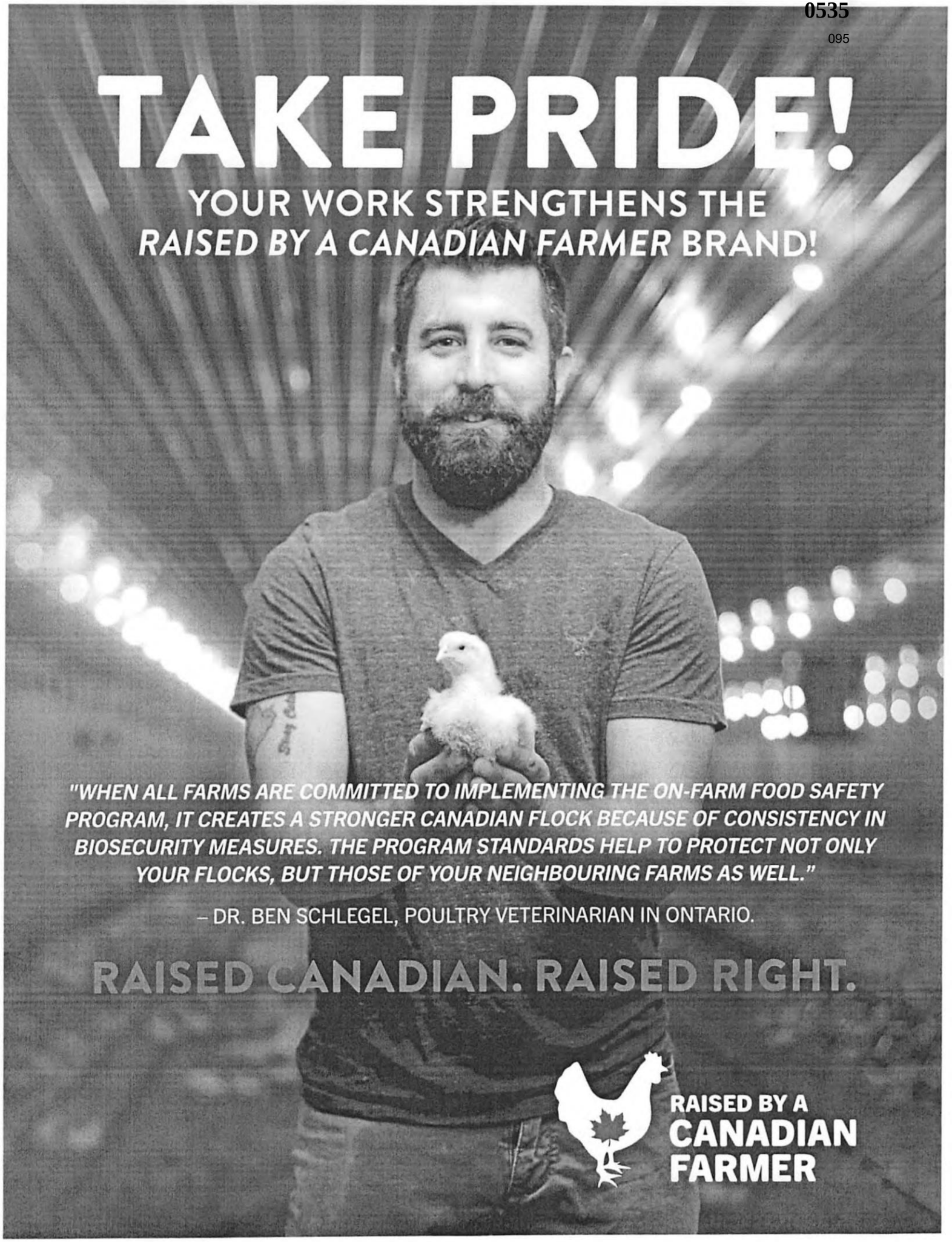

Brett and Jocelyn Shantz place the first chicks in their newly built broiler barn.


Brett Shantz, his wife Jocelyn, and his father Rick stand inside the family's newly constructed barn.


Migration fences in the Shantz family's broiler barn help manage chick movement during brooding.


Shantz's daughter Anna gently holds a chick. They also have a son, Caleb.

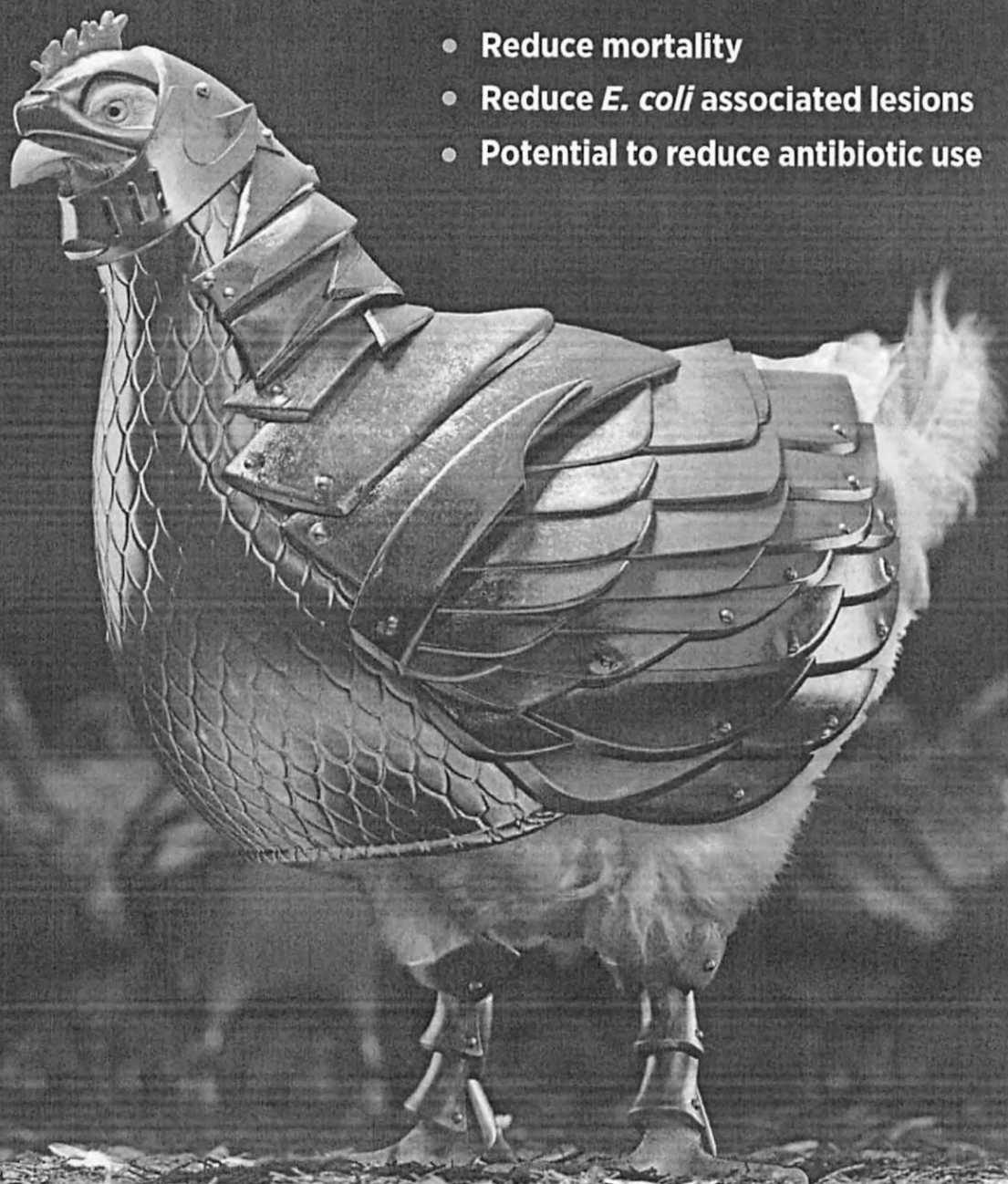
PHOTOS: RICKEEN FARMS


TAKE PRIDE!
YOUR WORK STRENGTHENS THE
RAISED BY A CANADIAN FARMER BRAND!
"WHEN ALL FARMS ARE COMMITTED TO IMPLEMENTING THE ON-FARM FOOD SAFETY PROGRAM, IT CREATES A STRONGER CANADIAN FLOCK BECAUSE OF CONSISTENCY IN BIOSECURITY MEASURES. THE PROGRAM STANDARDS HELP TO PROTECT NOT ONLY YOUR FLOCKS, BUT THOSE OF YOUR NEIGHBOURING FARMS AS WELL."
– DR. BEN SCHLEGEL, POULTRY VETERINARIAN IN ONTARIO.
RAISED CANADIAN. RAISED RIGHT.
RAISED BY A
CANADIAN
FARMER

POULVAC®
E. coli

STRENGTHEN YOUR BROILER FLOCK

- Reduce mortality
- Reduce *E. coli* associated lesions
- Potential to reduce antibiotic use



Contact your Zoetis representative today to find out more about how Poulvac® E. coli can benefit you.

Zoetis® and Poulvac are trademarks of Zoetis or its licensors. ©2023 Zoetis Services LLC. All rights reserved.

zoetis

Affidavit 1 of Cathy Furness
affirmed January 30, 2025

Court File Number: _____

BETWEEN:

UNIVERSAL OSTRICH FARMS LTD.

Applicant

and

CANADIAN FOOD INSPECTION AGENCY

Respondent

AFFIDAVIT OF CATHY FURNESS

I, CATHY FURNESS of the County of Wellington, in the Province of Ontario, AFFIRM THAT:

1. I am the Deputy Chief Veterinary Officer for Canada, Office of the Chief Veterinary Officer, Policy and Programs Branch at the Canadian Food Inspection Agency (**CFIA**). I have held this position since 2022. Prior to this, I was the Chief Veterinary Officer for the Province of Ontario from 2019 to 2022. Concurrently, I was a Manager of the Veterinary Science Unit, in the Animal Health and Welfare Branch, with the Ontario Ministry of Agriculture, Food and Rural Affairs from 2017 to 2022. From 2013 to 2017, I was the Lead Veterinarian for Planning and Preparedness within the Animal Health and Welfare Branch of the Ontario Ministry of Agriculture, Food and Rural Affairs. I have been a licensed veterinarian since 2000. I am also an American College of Veterinary Internal Medicine board certified Internal Medicine Specialist.

2. In my role as the Deputy Chief Veterinary Officer, I am responsible for providing professional expertise and leadership related to numerous animal health and public health efforts. I contribute to national efforts to ensure that Canada's animal health community and veterinary infrastructure have the capacity to effectively respond to foreign, reportable, emerging and re-emerging animal and zoonotic diseases.

3. I have served as the National Incident Manager for the CFIA outbreak response to highly pathogenic avian influenza from October 2023 until March 2024 and then again from November 2024 to present. In this role, I provide leadership and disease management expertise and support communication between industry and government partners.

4. I have personal knowledge of the contents of the matters described in this affidavit by virtue of my role and experience with CFIA, except those stated to be on information and belief. I believe that all of the information in this affidavit is true.

CFIA's Mandate

5. CFIA is dedicated to safeguarding food, animals and plants, which enhances the health and well-being of Canada's people, environment and economy. The health and safety of Canadians is the driving force behind the design and development of CFIA's programs. One of CFIA's primary objectives is to protect Canadians from preventable health risks related to food and zoonotic diseases (i.e. diseases that can spread from animals to humans).

6. Canada is a member of the World Organisation for Animal Health (**WOAH**). WOAH is a science-based global authority on animal and veterinary public health. As an inter-governmental organisation, WOAH focuses on collecting, analyzing, and transparently disseminating scientific veterinary information on animal diseases and zoonosis situation. WOAH works to improve animal health

and animal welfare worldwide. WOAH's standards inform the measures that CFIA implements to achieve its objectives.

7. Among other things, CFIA is responsible for administering and enforcing the *Health of Animals Act* (***HAA***) and Regulations. The purpose of the *HAA* is to protect the health of animals and humans, as noted by its long title "An Act respecting diseases and toxic substances that may affect animals or that may be transmitted by animals to persons, and respecting the protection of animals". The purpose of the *HAA* is, in part, to prevent or control the spread of the diseases that may affect animals and to prevent or control the spread of diseases that may be spread by animals to humans.

8. The *HAA* defines a "disease" as including "a reportable disease and any other disease that may affect an animal or that may be transmitted by an animal to a person". The *HAA* imposes reporting obligations on "reportable diseases". Veterinarians, and others who analyze animals, and those who own or possess, care or control an animal must immediately notify the nearest veterinary inspector if they become aware of the presence of avian influenza in or around the animal.

9. Section 48 of the *HAA* provides for the treatment or disposition of animals or things that are, or are suspected of being affected or contaminated by disease. The *HAA* and the *Compensation for Destroyed Animals and Things Regulations* allow that compensation may be payable to the owners of animals or things ordered destroyed to prevent the spread of disease.

Background on Avian Influenza

10. Avian influenza (**AI**) is a disease caused by influenza Type A viruses, which occur naturally in wild aquatic bird populations, like dabbling ducks and shore birds, but can spread to domestic poultry, other birds and mammals, and, less commonly, people.

11. AI is highly infectious and may be transmitted from wild birds to domestic birds through direct and indirect contact. Birds infected with AI may not show clinical symptoms of infection. However, the current strain of AI has presented with a higher rate of clinical symptoms and deaths. Birds without signs of infection can still actively transmit the virus and facilitate its mutation.

12. AI is a disease of significant human health concern due to the virus ability to reassort and mutate. Certain mutations can cause the virus to become more likely to infect people and sustain human-to-human transmission. Approximately half of the over 900 human cases reported around the world since 1997 have been fatal. The Public Health Agency of Canada currently deems the risk to humans as low but are continuously monitoring the ongoing outbreak for changes in the virus.

13. Clinical signs of AI in birds vary from mild respiratory disease to acute disease with high mortality. The severity of disease varies depending on the strain of virus and species affected. An outbreak of AI can result in significant die-off events in bird populations.

14. AI variants are categorized into highly pathogenic avian influenza strains (**HPAI**) and low pathogenicity avian influenza strains (**LPAI**). The *Reportable Diseases Regulations* to the *HAA*, which lists reportable diseases, includes LPAI and HPAI – subtypes H5 and H7.

15. AI is diagnosed through laboratory testing. HPAI has been detected in Canada in domestic poultry on numerous occasions. Since 2021, the predominant subtype of AI found in domestic and wild birds in Canada has been HPAI H5N1. Another highly pathogenic variant, HPAI H5N2, was detected for the first time in Canada in November 2024 in domestic poultry in British Columbia.

16. Although rare, transmission of HPAI to humans can occur, most commonly when people have had close contact with infected birds. In rare cases, infection

may lead to severe illness or death. Notably, in the Fall of 2024, a teenager in British Columbia became critically ill from HPAI.

The CFIA's Response to HPAI

17. CFIA plays an important role in furthering the Government of Canada's broader efforts to help prevent the introduction and spread of HPAI in Canada. CFIA's efforts to control HPA1 are aimed at mitigating risks that include:

    a. health impacts on domestic birds;

    b. health impact on humans, including that AI infection in birds could serve as a precursor to a human flu pandemic; and

    c. economic repercussions of an outbreak of AI.

18. CFIA's response strategy to an outbreak of HPAI in poultry is to eradicate detected disease and re-establish Canada's disease-free status as quickly as possible. This is referred to by CFIA and others as a "stamping out" strategy or policy. Stamping out includes ensuring that poultry flocks infected with or exposed to HPAI on an infected premises are humanely destroyed. The Stamping out policy is applied for all detections of AI subtype H5 in domestic poultry, regardless of within flock mortality and evidence of clinical symptoms. This includes situations where birds appear healthy. The stamping out policy mitigates the risk of further spread of the virus, opportunity for virus mutation and risk of transmission to humans.

19. CFIA's implementation of stamping out aligns with WOAH's standards. Without stamping out, a country cannot be considered free from HPAI until at least 12 months from an infection in poultry, as opposed 28 days where stamping out is implemented. Attached to my affidavit as **Exhibit A** is an excerpt from the *Terrestrial Animal Health Code*, Chapter 10.4, "Infection with High Pathogenicity Avian Influenza Viruses", which refers to stamping out and its impacts on a country's disease status.

20. Although my role with CFIA is focused on animal health, my understanding is that losing disease-free status by not implementing stamping out could have adverse impacts on Canada's trade relationships, in particular trading partners could stop importing Canadian poultry including poultry products (meat and eggs) and poultry genetics.

HPAI Response Measures Apply to Ostriches

21. Ostriches are susceptible to infection with AI. Similar to many birds, ostriches typically do not show clinical signs of infection of AI but can nonetheless continue to replicate, mutate, and shed the virus. It is also possible for ostriches to be infected with more than one subtype of influenza virus. This may allow HPAI variants to mix with other circulating influenzas creating new combinations with potentially different behaviors. Additionally, ostriches have potential to contribute genetic mutations to avian influenza viruses that may increase viral adaptability to mammalian hosts.

22. CFIA applies the WOAH's definition of "poultry" when implementing HPAI response measures, including stamping out. Ostriches that are kept in captivity for the production of any commercial animal products or for breeding are considered poultry. Attached to my affidavit as **Exhibit B** is an excerpt from the Glossary to the *Terrestrial Animal Health Code* that includes this definition.

CFIA's Response to HPAI at Universal Ostrich Farms

23. On December 31, 2024, CFIA ordered Universal Ostrich Farms Inc. (**Universal**) to dispose of all ostriches located at 301 Langille Road, Edgewood, British Columbia, by February 1, 2025, upon CFIA's determination that the ostriches were affected or contaminated by AI (the "**Order**"). Attached as **Exhibit C** is a true copy of the Order.

24. Prior to the Order, on December 28, 2024, CFIA was alerted that Universal's ostriches were sick by an anonymous individual not associated with Universal that left CFIA a voicemail. CFIA then contacted Universal. I understand that

Universal reported to CFIA officials that around 25 ostriches died in the previous 3 week period. I understand that Universal had roughly 450 ostriches. CFIA requested that Universal have a veterinarian assess the ostriches for AI.

25. On December 29, 2024, Universal informed CFIA that their private veterinarian was unavailable and they requested that a CFIA veterinarian assess the ostriches for AI. I understand that an additional 4 ostriches died on the same day.

26. On December 30, 2024, CFIA veterinarian, Vaughn Dykstra, went to Universal's premises to collect samples.

27. On December 31, 2024, CFIA received the results from the samples, which confirmed that the ostriches tested were positive for HPAI.

Universal Failed to Qualify for an Exemption

28. I understand Universal requested that CFIA not order disposal of the ostriches. In order to avoid disposing of the ostriches, Universal needed to apply for an exemption from the Order.

29. On January 10, 2025, after considering submissions from Universal, CFIA determined that Universal did not meet the criteria for an exemption from the Order. Attached to my affidavit at **Exhibit D** is a true copy of the January 10, 2025 letter from Troy Bourque, Planning Chief, to Universal communicating this decision.

30. In order to qualify for an exemption, Universal needed to demonstrate that the ostriches: (a) were a distinct epidemiological unit; and (b) possessed rare and valuable poultry genetics.

31. In order for CFIA to recognize a distinct epidemiological unit, Universal was required to demonstrate that a subset of the ostriches existed as a distinct unit with no exposure to AI. In other words, the ostriches needed to be protected from the outside environment where AI was currently known to exist.

32. Universal provided no evidence to support a finding that its ostriches were a distinct unit. To the contrary, the ostriches are housed outdoors in several large pens, with shared personnel and farm management practices exhibited between all groups of birds onsite. There is also a large pond between two of the outdoor bird pens with significant wild bird activity.

33. In order for CFIA to consider its ostriches to possess rare and valuable poultry genetics, Universal was required to demonstrate the high economic value the flock provides to the broader Canadian poultry industry. There must be in place a robust process to actively select and breed for specific desirable traits and evidence that this genetic value is critical to the Canadian poultry industry.

34. Universal provided no evidence that the ostriches possesses rare and valuable poultry genetics.

Consequences of Failing to Follow the Order

35. If Universal fails to dispose of the infected ostriches by February 1, 2025, I understand that CFIA may proceed with humanely disposing of the infected ostriches.

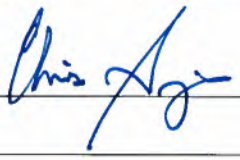
AFFIRMED BEFORE me at the City of Guelph, in the Province of Ontario, this 30 day of January 2025.

A Commissioner for Oaths in and for the Province of Ontario

CHRIS ARANJO

CATHY FURNESS

This is **Exhibit "A"** referred to in the Affidavit of **CATHY FURNESS** affirmed before me at Guelph, Ontario, this 30 day of January, 2025.



CHAPTER 10.4.

INFECTION WITH HIGH PATHOGENICITY AVIAN INFLUENZA VIRUSES

Article 10.4.1.

General provisions

1) This chapter deals with the *listed disease*, *infection* with high pathogenicity avian influenza viruses.

2) For the purposes of the *Terrestrial Code*:

   a) High pathogenicity avian influenza means an *infection* of *poultry* by any influenza A virus that has been determined as high pathogenicity in accordance with the *Terrestrial Manual*.

   b) An occurrence of *infection* with a high pathogenicity avian influenza virus is defined by the isolation and identification of the virus or the detection of specific viral ribonucleic acid, in one or more samples from *poultry*.

   c) The *incubation period* at the *flock*-level for high pathogenicity avian influenza is 14 days.

3) Although the objective of this chapter is to mitigate animal and public health risks posed by *infection* with high pathogenicity avian influenza viruses, other influenza A viruses of avian host origin (i.e. low pathogenicity avian influenza viruses) may have the potential to exert a negative impact on animal and public health. A sudden and unexpected increase in virulence of low pathogenicity avian influenza viruses in *poultry* is notifiable as an *emerging disease* in accordance with Article 1.1.4. *Infection* of domestic and *captive wild* birds with low pathogenicity avian influenza viruses having proven natural transmission to humans associated with severe consequences, and *infection* of birds other than *poultry*, including *wild* birds, with influenza A viruses of high pathogenicity, are notifiable in accordance with Article 1.3.3.

4) A *notification* of *infection* of birds other than *poultry*, including *wild* birds, with influenza A viruses of high pathogenicity, or of *infection* of domestic or *captive wild* birds with low pathogenicity avian influenza viruses does not affect the high pathogenicity avian influenza status of the country or *zone*. A Member Country should not impose bans on the international trade of *poultry commodities* in response to such *notifications*, or to other information on the presence of any non-notifiable influenza A virus in birds.

5) This chapter includes *monitoring* considerations for low pathogenicity avian influenza viruses because some, especially H5 and H7 subtypes, have the potential to mutate into high pathogenicity avian influenza viruses.

6) The use of *vaccination* against avian influenza may be recommended under specific conditions. Any vaccine used should comply with the standards described in the *Terrestrial Manual*. *Vaccination* will not affect the high pathogenicity avian influenza status of a free country or *zone* if *surveillance* supports the absence of *infection*, in accordance with Article 10.4.28., in particular point 2. *Vaccination* can be used as an effective complementary control tool when a *stamping-out policy* alone is not sufficient. Whether to vaccinate or not should be decided by the *Veterinary Authority* on the basis of the avian influenza situation as well as the ability of the *Veterinary Services* to implement the *vaccination* strategy, as described in Chapter 4.18.

7) Standards for diagnostic tests and vaccines, including pathogenicity testing, are described in the *Terrestrial Manual*.

Article 10.4.2.

Safe commodities

When authorising importation or transit of the following *commodities*, *Veterinary Authorities* should not require any conditions related to high pathogenicity avian influenza, regardless of the high pathogenicity avian influenza status of the *exporting country* or *zone*:

1) heat-treated *poultry meat products* in a hermetically sealed container with an F_0 value of 3 or above;

2) extruded dry pet food and coated ingredients after extrusion;

3) rendered *protein meal*, blood meal, feather meal, and *poultry* oil;

4) washed and steam-dried feathers and down from *poultry* and other birds.

Other *commodities* of *poultry* and other birds can be traded safely if in accordance with the relevant articles of this chapter.

Article 10.4.3.

Country or zone free from high pathogenicity avian influenza

A country or *zone* may be considered free from high pathogenicity avian influenza when:

- *infection* with high pathogenicity avian influenza viruses is a *notifiable disease* in the entire country;
- an ongoing awareness programme is in place to encourage reporting of suspicions of high pathogenicity avian influenza;
- absence of *infection* with high pathogenicity avian influenza viruses, based on *surveillance*, in accordance with Chapter 1.4. and Articles 10.4.26. to 10.4.30., has been demonstrated in the country or *zone* for the past 12 months;
- an awareness programme is in place related to avian influenza viruses *risks* and the specific *biosecurity* and management measures to address them;
- *commodities* are imported in accordance with Articles 10.4.7. to 10.4.22.

Surveillance should be adapted to parts of the country or existing *zones* depending on historical or geographical factors, industry structure, population data and proximity to recent *outbreaks* or the use of *vaccination*.

Article 10.4.4.

Compartment free from high pathogenicity avian influenza

The establishment of a *compartment* free from high pathogenicity avian influenza should be in accordance with relevant requirements of this chapter and the principles described in Chapters 4.4. and 4.5.

Article 10.4.5.

Establishment of a containment zone within a country or zone free from high pathogenicity avian influenza

In the event of *outbreaks* of high pathogenicity avian influenza within a previously free country or *zone*, a *containment zone*, which includes all epidemiologically linked *outbreaks*, may be established for the purpose of minimising the impact on the rest of the country or *zone*.

In addition to the requirements for the establishment of a *containment zone* outlined in Article 4.4.7., the *surveillance* programme should take into account the density of *poultry* production, types of *poultry*, local management practices (including inter-premises movement patterns of *poultry*, people and equipment), relevant *biosecurity*, the presence and potential role of birds other than *poultry*, including *wild* birds, and the proximity of *poultry establishments* to permanent and seasonal water bodies.

The free status of the areas outside the *containment zone* is suspended while the *containment zone* is being established. It may be reinstated, irrespective of the provisions of Article 10.4.6., once the *containment zone* is established. It should be demonstrated that *commodities* for *international trade* have originated from outside the *containment zone* or comply with the relevant articles of this chapter.

Article 10.4.6.

Recovery of free status

If *infection* with high pathogenicity avian influenza virus has occurred in *poultry* in a previously free country or *zone*, the free status may be regained after a minimum period of 28 days (i.e. two *flock*-level *incubation periods*) after a *stamping-out policy* has been completed (i.e. after the *disinfection* of the last affected *establishment*), provided that *surveillance* in accordance with Articles 10.4.26. to 10.4.30., in particular point 3 of Article 10.4.28., has been carried out during that period and has demonstrated the absence of *infection*.

If a *stamping-out policy* is not implemented, Article 10.4.3. applies.

Article 10.4.7.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For live poultry (other than day-old poultry)

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that:

1) the *poultry* showed no clinical signs of avian influenza on the day of shipment;
2) the *poultry* originated from a country, *zone* or *compartment* free from high pathogenicity avian influenza;
3) the *poultry* originated from a *flock* that was monitored for avian influenza viruses and was found to be negative;
4) the *poultry* are transported in new or appropriately sanitised *containers*.

If the *poultry* have been vaccinated against avian influenza viruses, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.8.

Recommendations for the importation of live birds other than poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) on the day of shipment, the birds showed no clinical signs of avian influenza;
2) the birds had been kept in isolation facilities approved by the *Veterinary Services* since they were hatched or for at least 28 days (i.e. two *flock*-level *incubation periods*) prior to shipment and showed no clinical signs of avian influenza during the isolation period;
3) a statistically appropriate sample of the birds was subjected, with negative results, to a diagnostic test for avian influenza within 14 days prior to shipment;
4) the birds are transported in new or appropriately sanitised *containers*.

If the birds have been vaccinated against avian influenza, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.9.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For day-old live poultry

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that:

1) the day-old live *poultry* had been kept in a country, *zone* or *compartment* free from high pathogenicity avian influenza since they were hatched;

   and

   a) the day-old live *poultry* were derived from parent *flocks* that were monitored for avian influenza viruses and were found to be negative at the time of collection of the eggs from which the day-old *poultry* hatched; or

   b) the day-old live *poultry* that hatched from eggs that had had their surfaces sanitised in accordance with point 4 d) of Article 6.5.5.;

AND

2) the day-old live *poultry* were transported in new or appropriately sanitised *containers*.

If the day-old live *poultry* or the parent *flocks* have been vaccinated against avian influenza, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.10.

Recommendations for the importation of day-old live birds other than poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) on the day of shipment, the birds showed no clinical signs of avian influenza;
2) the birds were hatched and kept in isolation facilities approved by the *Veterinary Services*;
3) a statistically appropriate sample of the parent *flock* birds were subjected, with negative results, to a diagnostic test for avian influenza at the time of collection of the eggs;
4) the birds were transported in new or appropriately sanitised *containers*.

If the birds or parent *flocks* have been vaccinated against avian influenza, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.11.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For hatching eggs of poultry

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that:

1) the hatching eggs came from a country, *zone* or *compartment* free from high pathogenicity avian influenza;
2)
   a) the hatching eggs were derived from parent *flocks* that were monitored for avian influenza viruses and were found to be negative at the time of collection of the hatching eggs; or
   b) the hatching eggs have had their surfaces sanitised in accordance with point 4 d) of Article 6.5.5.;
3) the hatching eggs are transported in new or appropriately sanitised packaging materials and *containers*.

If the parent *flocks* have been vaccinated against avian influenza, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.12.

Recommendations for the importation of hatching eggs from birds other than poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) a statistically appropriate sample of the parent *flock* birds was subjected, with negative results, to a diagnostic test for avian influenza 14 days prior to and at the time of collection of the hatching eggs;
2) the hatching eggs have had their surfaces sanitised in accordance with point 4 d) of Article 6.5.5.;
3) the hatching eggs are transported in new or appropriately sanitised packaging materials and *containers*.

If the parent *flocks* have been vaccinated against avian influenza, the nature of the vaccine used and the date of *vaccination* should be stated in the *international veterinary certificate*.

Article 10.4.13.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For poultry semen

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that the donor *poultry*:

1) showed no clinical signs of avian influenza on the day of semen collection;

2) were kept in a country, *zone* or *compartment* free from high pathogenicity avian influenza.

Article 10.4.14.

Recommendations for the importation of semen from birds other than poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that the donor birds:

1) were kept in isolation facilities approved by the *Veterinary Services* for at least 28 days (i.e. two *flock*-level *incubation periods*) prior to semen collection;
2) showed no clinical signs of avian influenza during the isolation period;
3) were subjected, with negative results, to a diagnostic test for avian influenza within 14 days prior to semen collection.

Article 10.4.15.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For eggs for human consumption

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that:

1) the eggs for human consumption were produced and packed in a country, *zone* or *compartment* free from high pathogenicity avian influenza;
2) the eggs for human consumption were transported in new or appropriately sanitised packaging materials and *containers*.

Article 10.4.16.

Recommendations for the importation of egg products from poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) the egg products are derived from eggs which meet the requirements of Article 10.4.15.; or
2) the egg products have been processed to ensure the inactivation of high pathogenicity avian influenza viruses, in accordance with Article 10.4.23.;

AND

3) the necessary precautions were taken to avoid contact of the egg products with any source of high pathogenicity avian influenza viruses.

Article 10.4.17.

Recommendations for importation from a country, zone or compartment free from high pathogenicity avian influenza

For fresh meat of poultry

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that the entire consignment of *fresh meat* comes from *poultry*:

1) which originated from a country, *zone* or *compartment* free from high pathogenicity avian influenza;
2) which were slaughtered in an approved *slaughterhouse/abattoir* in a country, *zone* or *compartment* free from high pathogenicity avian influenza and were subjected to ante- and post-mortem inspections in accordance with Chapter 6.3., with favourable results.

Article 10.4.18.

Recommendations for the importation of meat products from poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) the *meat products* from *poultry* are derived from *fresh meat* which meets the requirements of Article 10.4.17.; or

2) the *meat products* from *poultry* have been processed to ensure the inactivation of high pathogenicity avian influenza viruses in accordance with Article 10.4.24.;

AND

3) the necessary precautions were taken to avoid contact of the *meat products* from *poultry* with any source of high pathogenicity avian influenza viruses.

Article 10.4.19.

Recommendations for the importation of poultry products not listed in Article 10.4.2. and intended for use in animal feeding, or for agricultural or industrial use

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) these *commodities* were obtained from *poultry* which originated in a country, *zone* or *compartment* free from high pathogenicity avian influenza and that the necessary precautions were taken to avoid contamination during processing with any source of high pathogenicity avian influenza viruses;

OR

2) these *commodities* have been processed to ensure the inactivation of high pathogenicity avian influenza viruses using:

   a) moist heat treatment for 30 minutes at 56°C; or

   b) heat treatment where the internal temperature throughout the product reached at least 74°C; or

   c) any equivalent treatment that has been demonstrated to inactivate avian influenza viruses;

AND

3) the necessary precautions were taken to avoid contact of the *commodity* with any source of high pathogenicity avian influenza viruses.

Article 10.4.20.

Recommendations for the importation of feathers and down from poultry not listed in Article 10.4.2.

Veterinary Authorities should require the presentation of an *international veterinary certificate* attesting that:

1) these *commodities* originated from *poultry* as described in Article 10.4.17. and were processed in a country, *zone* or *compartment* free from high pathogenicity avian influenza; or

2) these *commodities* have been processed to ensure the inactivation of high pathogenicity avian influenza viruses using one of the following:

   a) fumigation with formalin (10% formaldehyde) for 8 hours;

   b) irradiation with a dose of 20 kGy;

   c) any equivalent treatment which has been demonstrated to inactivate avian influenza viruses;

AND

3) the necessary precautions were taken to avoid contact of the *commodity* with any source of high pathogenicity avian influenza viruses.

Article 10.4.21.

Recommendations for the importation of feathers and down of birds other than poultry not listed in Article 10.4.2.

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) these *commodities* have been processed to ensure the inactivation of high pathogenicity avian influenza viruses using one of the following:
   a) fumigation with formalin (10% formaldehyde) for 8 hours;
   b) irradiation with a dose of 20 kGy;
   c) any equivalent treatment which has been demonstrated to inactivate avian influenza viruses;
2) the necessary precautions were taken to avoid contact of the *commodity* with any source of high pathogenicity avian influenza viruses.

Article 10.4.22.

Recommendations for the importation of collection specimens, skins and trophies of birds other than poultry

Regardless of the high pathogenicity avian influenza status of the country of origin, *Veterinary Authorities* should require the presentation of an *international veterinary certificate* attesting that:

1) these *commodities* have been processed to ensure the inactivation of high pathogenicity avian influenza viruses in accordance with Article 10.4.25.;

AND

2) the necessary precautions were taken to avoid contact of the *commodity* with any source of high pathogenicity avian influenza viruses.

Article 10.4.23.

Procedures for the inactivation of high pathogenicity avian influenza viruses in egg products from poultry

The following time/temperature combinations are suitable for the inactivation of high pathogenicity avian influenza viruses present in egg products:

	Core temperature (°C)	Time
Whole egg	60	188 seconds
Whole egg blends	60	188 seconds
Whole egg blends	61.1	94 seconds
Liquid egg white	55.6	870 seconds
Liquid egg white	56.7	232 seconds
Plain or pure egg yolk	60	288 seconds
10% salted yolk	62.2	138 seconds
Dried egg white	67	20 hours
Dried egg white	54.4	50.4 hours
Dried egg white	51.7	73.2 hours

These time/temperature combinations are indicative of a range that achieves a 7-$\log_{10}$ reduction of avian influenza virus infectivity. These are examples for a variety of egg products but, when supported by scientific evidence, variations of these time/temperature combinations may be used, and they may be used for other egg products, if they achieve equivalent inactivation of the virus.

Article 10.4.24.

Procedures for the inactivation of high pathogenicity avian influenza viruses in meat products from poultry

The following time/temperature combinations are suitable for the inactivation of high pathogenicity avian influenza viruses in *meat products*.

	Core temperature (°C)	Time
Meat products from poultry	60.0	507 seconds
	65.0	42 seconds
	70.0	3.5 seconds
	73.9	0.51 second

These time/temperature combinations are indicative of a range that achieves a 7-$\log_{10}$ reduction of avian influenza virus infectivity. When supported by scientific evidence, variations of these time/temperature combinations may be used if they achieve equivalent inactivation of the virus.

Article 10.4.25.

Procedures for the inactivation of high pathogenicity avian influenza viruses in collection specimens and in skins and trophies

For the inactivation of high pathogenicity avian influenza viruses in collection specimens and in skins and trophies, one of the following procedures should be used:

1) boiling in water for an appropriate time to ensure that any material other than bone, claws or beaks is removed; or
2) soaking, with agitation, in a 4% (w/v) solution of washing soda (sodium carbonate-Na_2CO_3) maintained at pH 11.5 or above for at least 48 hours; or
3) soaking, with agitation, in a formic acid solution (100 kg salt [NaCl] and 12 kg formic acid per 1,000 litres water) maintained below pH 3.0 for at least 48 hours; wetting and dressing agents may be added; or
4) in the case of raw hides, treatment for at least 28 days with salt (NaCl) containing 2% washing soda (sodium carbonate-Na_2CO_3); or
5) treatment with 1% formalin for a minimum of six days; or
6) any equivalent treatment which has been demonstrated to inactivate the virus.

Article 10.4.26.

Principles of surveillance for avian influenza

The following are complementary to Chapter 1.4. and should be applied by Member Countries seeking to determine their high pathogenicity avian influenza status.

These principles are also necessary to support *vaccination* programmes, to monitor low pathogenicity avian influenza viruses, especially H5 and H7, in *poultry* and to detect high pathogenicity avian influenza in *wild* birds.

The impact and epidemiology of avian influenza differ widely among different regions of the world and therefore it is impossible to provide detailed recommendations for all situations. Variables such as the frequency of contacts between *poultry* and *wild* birds, different *biosecurity* levels and production systems, and the commingling of different susceptible species including domestic waterfowl, may require different *surveillance* strategies to address each situation. Furthermore, domestic waterfowl typically do not show clinical signs and have longer infective periods than gallinaceous *poultry*. It is therefore incumbent upon the Member Country to provide scientific data that explain the epidemiology of avian influenza in the region of concern and also to demonstrate how all the risk factors have been taken into account. Member Countries have flexibility to provide a science-based approach to demonstrate absence of *infection* with high pathogenicity avian influenza viruses at an appropriate level of confidence, as described in Chapter 1.4.

There is an increased recognition of the value of the application of sequencing technologies and phylogenetic analyses to determine routes of introduction, transmission pathways and epidemiological patterns of *infection*. When avian influenza viruses are detected, Member Countries should apply these technologies, when possible, to enhance the evidence used to develop specific *surveillance* strategies and control activities.

A *monitoring* system for low pathogenicity avian influenza viruses in *poultry* should be in place for the following reasons:

1) H5 and H7 low pathogenicity avian influenza viruses have the potential to mutate into high pathogenicity avian influenza viruses, but it is not possible to predict which viruses will mutate or when these mutations will occur.
2) The detection of sudden and unexpected increases in virulence of low pathogenicity avian influenza viruses in *poultry* is notifiable as an *emerging disease* in accordance with Article 1.1.4.
3) The detection, in domestic or *captive wild* birds, of low pathogenicity avian influenza viruses that have been proven to be transmitted naturally to humans with severe consequences is notifiable in accordance with Article 1.1.3.

Article 10.4.27.

Surveillance for early warning of high pathogenicity avian influenza

1) An ongoing *surveillance* programme for avian influenza should be in place and be designed to detect the presence of *infection* with high pathogenicity avian influenza viruses in the country or *zone* in a timely manner.
2) The high pathogenicity avian influenza *surveillance* programme should include the following.
   a) An *early warning system* for reporting suspected *cases*, in accordance with Article 1.4.5. throughout the production, marketing and processing chain. Farmers and workers who have day-to-day contact with *poultry*, as well as diagnosticians, should report promptly any suspicion of avian influenza to the *Veterinary Services*. All suspected *cases* of high pathogenicity avian influenza should be investigated immediately and samples should be collected and submitted to a *laboratory* for appropriate tests.
   b) Implementation, as relevant, of regular and frequent clinical inspection, or serological and virological testing of high-risk groups of *animals*, such as those adjacent to a country or *zone* infected with high pathogenicity avian influenza, places where birds and *poultry* of different origins are mixed, such as live bird markets, and *poultry* in close proximity to waterfowl or other potential sources of influenza A viruses. This activity is particularly applicable to domestic waterfowl, where detection of high pathogenicity avian influenza via clinical suspicion can be of low sensitivity.
   c) Immediate investigation of the presence of antibodies against influenza A viruses that have been detected in *poultry* and are not a consequence of *vaccination*. In the case of single or isolated serological positive results, *infection* with high pathogenicity avian influenza viruses may be ruled out on the basis of a thorough epidemiological and *laboratory* investigation that does not demonstrate further evidence of such an *infection*.

Article 10.4.28.

Surveillance for demonstrating freedom from infection with high pathogenicity avian influenza

1) A Member Country declaring freedom of the entire country, a *zone* or a *compartment* from high pathogenicity avian influenza in *poultry* should provide evidence of an effective *surveillance* programme.

   Transparency in the application of different methodologies is essential to ensure consistency in decision-making, ease of understanding, fairness and rationality. The assumptions made, the uncertainties, and the effect of these on the interpretation of the results, should be documented.

   The design of the *surveillance* programme will depend on the epidemiological circumstances and it should be planned and implemented in accordance with this chapter and Article 1.4.6.This requires the availability of demographic data on the *poultry* population and the support of a *laboratory* able to undertake identification of *infection* with avian influenza viruses through virus detection and antibody tests.

   The *surveillance* programme should demonstrate absence of *infection* with high pathogenicity avian influenza viruses during the preceding 12 months in susceptible *poultry* populations (vaccinated and non-vaccinated).

   The design of the sampling strategy should include an epidemiologically appropriate design prevalence. The design prevalence and desired level of confidence in the results will determine the sample size. The Member Country should justify the choice of design prevalence and confidence level used on the basis of the stated objectives of the *surveillance* and the epidemiological situation.

   The sampling strategy may be risk-based if scientific evidence is available, and provided, for the quantification of risk factors. Specific risks could include those linked to the types of production, possible direct or indirect contact

with *wild* birds, multi-age *flocks*, local trade patterns including live bird markets, use of possibly contaminated surface water, the presence of more than one species at the *establishment* and poor *biosecurity* in place.

Data from different *surveillance* activities can be included to increase the sensitivity of the *surveillance* system. If this is to be done, data from structured (e.g. surveys and active *surveillance*) and non-structured (e.g. passive *surveillance*) sources should be combined and the sensitivity of each activity should be quantified in order to be able to quantify the sensitivity of the overall *surveillance* system.

The *surveillance* programme should include *surveillance* for high pathogenicity avian influenza viruses in birds other than *poultry*, including *wild* birds, and *monitoring* of low pathogenicity avian influenza viruses in *poultry*, in order to ensure that *biosecurity* and control measures are fit for purpose.

Documentation of freedom from *infection* with high pathogenicity avian influenza should provide details of the *poultry* population, the occurrence of suspected *cases* and how they were investigated and dealt with. This should include the results of *laboratory* testing and the *biosecurity* and control measures to which the animals concerned were subjected during the investigation.

2. Additional requirements for countries, zones or compartments that practise vaccination

Vaccination to prevent the transmission of high pathogenicity avian influenza virus may be part of a disease control programme. The level of *flock* immunity required to prevent transmission depends on the *flock* size, composition (e.g. species) and density of the susceptible *poultry* population. Based on the epidemiology of avian influenza in the country, *zone* or *compartment*, a decision may be reached to vaccinate only certain species or other *poultry subpopulations*.

In all vaccinated *flocks* tests should be performed to ensure the absence of virus circulation. The tests should be repeated at a frequency that is proportionate to the *risk* in the country, *zone* or *compartment*. The use of sentinel *poultry* may provide further confidence in the absence of virus circulation.

Member Countries seeking the demonstration of freedom from high pathogenicity avian influenza in vaccinated population should refer to the chapter on avian influenza (*infection* with avian influenza viruses) in the *Terrestrial Manual*.

Evidence to show the effectiveness of the *vaccination* programme should also be provided.

3. Additional requirements for recovery of free status

In addition to the conditions described in the point above, a Member Country declaring that it has regained country, *zone* or *compartment* freedom after an *outbreak* of high pathogenicity avian influenza in *poultry* should show evidence of an active *surveillance* programme, depending on the epidemiological circumstances of the *outbreak*, to demonstrate the absence of the *infection*. This will require *surveillance* incorporating virus detection and antibody tests. The Member Country should report the results of an active *surveillance* programme in which the susceptible *poultry* population undergoes regular clinical examination and active *surveillance* planned and implemented according to the general conditions and methods described in these recommendations. The *surveillance* samples should be representative of *poultry populations* at risk. The use of sentinel birds may facilitate the interpretation of *surveillance* results.

Populations under this *surveillance* programme should include:

a) *establishments* in the proximity of the *outbreaks*;

b) *establishments* epidemiologically linked to the *outbreaks*;

c) *poultry* used to re-populate affected *establishments*;

d) any *establishments* where preventive depopulation has been carried out.

Article 10.4.29.

Surveillance of wild bird populations

Passive *surveillance*, i.e. sampling of birds found dead, is an appropriate method of *surveillance* in *wild* birds because *infection* with high pathogenicity avian influenza can be associated with mortality in some species. Mortality events, or clusters of birds found dead should be reported to the *Veterinary Services* and investigated, including through the collection and submission of samples to a *laboratory* for appropriate tests.

Active *surveillance*, i.e. sampling of live *wild* birds, may be necessary for detection of some strains of high pathogenicity avian influenza viruses that produce *infection* without mortality in *wild* birds. Furthermore, it increases knowledge of the ecology and evolution of avian influenza viruses.

Surveillance in *wild* birds should be targeted towards times of year, species and locations in which *infection* is more likely.

Surveillance in *wild* birds should be enhanced by raising awareness, and by active searching and *monitoring* for dead or moribund *wild* birds when high pathogenicity avian influenza has been detected in the region. The movements of migratory water birds, in particular ducks, geese and swans, should be taken into account as a potential pathway for introduction of virus to uninfected areas.

Article 10.4.30.

Monitoring of low pathogenicity avian influenza in poultry populations

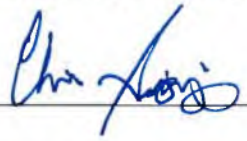
Outbreaks of low pathogenicity avian influenza viruses can be managed at the *establishment* level; however, spread to other *poultry establishments* increases the risk of virus mutation, particularly if it is not detected and managed. Therefore, a *monitoring* system should be in place.

Monitoring the presence and types of low pathogenicity avian influenza viruses can be achieved through a combination of clinical investigation when *infection* is suspected because of changes in production parameters, such as reductions in egg production or *feed* and water intake, and active serological and virological *surveillance*, which can be supported by the information obtained by the *surveillance* system for high pathogenicity avian influenza.

Serological and virological *monitoring* should aim at detecting clusters of infected *flocks* to identify spread between *establishments*. Epidemiological follow-up (tracing forward and back) of serologically positive *flocks* should be carried out to determine whether there is clustering of infected *flocks* regardless of whether the seropositive birds are still present at the *establishment* or whether active virus *infection* has been detected. Hence, *monitoring* of low pathogenicity avian influenza will also enhance early detection of high pathogenicity avian influenza.

NB: FIRST ADOPTED IN 1998; MOST RECENT UPDATE ADOPTED IN 2024.

This is **Exhibit "B"** referred to in the Affidavit of **CATHY FURNESS** affirmed before me at Guelph, Ontario, this 30 day of January, 2025.



GLOSSARY

For the purposes of the *Terrestrial Code*:

ANIMAL

means a mammal, reptile, bird or bee.

ANIMAL FOR BREEDING OR REARING

means a domesticated or confined *animal* which is not intended for *slaughter* within a short time.

ANIMAL FOR SLAUGHTER

means an *animal* intended for *slaughter* within a short time, under the control of the relevant *Competent Authority*.

ANIMAL HANDLER

means a person with a knowledge of the behaviour and needs of *animals* who, with appropriate experience and a professional and positive response to an *animal*'s needs, can achieve effective management and good *welfare*. Competence should be gained through formal training or practical experience.

ANIMAL HEALTH MANAGEMENT

means a system designed to optimise the physical and behavioural health and welfare of *animals*. It includes the prevention, treatment and control of diseases and conditions affecting the individual *animal* and *herd* or *flock*, including the recording of illness, injuries, mortalities and medical treatments where appropriate.

ANIMAL HEALTH STATUS

means the status of a country, *zone* or *compartment* with respect to an animal disease in accordance with the criteria listed in the relevant disease-specific chapter or Chapter 1.4. of the *Terrestrial Code*.

ANIMAL IDENTIFICATION

means the combination of the identification and *registration* of an *animal* individually, with a unique identifier, or collectively by its *epidemiological unit* or group, with a unique group identifier.

ANIMAL IDENTIFICATION SYSTEM

means the inclusion and linking of components such as identification of *establishments* or owners, the persons responsible for the *animals*, movements and other records with *animal identification*.

ANIMAL PRODUCT

means any part of an *animal*, or a raw or manufactured product containing any material derived from *animals*, excluding *germinal products*, *biological products* and *pathological material*.

ANIMAL TRACEABILITY

means the ability to follow an *animal* or group of *animals* during all stages of its life.

ANIMAL WELFARE

means the physical and mental state of an *animal* in relation to the conditions in which it lives and dies.

ANTIMICROBIAL AGENT

means a naturally occurring, semi-synthetic or synthetic substance that exhibits antimicrobial activity (kill or inhibit the growth of micro-organisms) at concentrations attainable *in vivo*. Anthelmintics and substances classed as disinfectants or antiseptics are excluded from this definition.

APIARY

means a *beehive* or group of *beehives* whose management allows them to be considered as a single *epidemiological unit*.

APPROVED

means officially approved, accredited or registered by the *Veterinary Authority*.

BEEHIVE

means a structure for the keeping of honey bee colonies that is being used for that purpose, including frameless hives, fixed frame hives and all designs of moveable frame hives (including nucleus hives), but not including packages or cages used to confine bees for the purposes of transport or isolation.

BIOLOGICAL PRODUCT

means a product of animal or microorganism origin, used in the diagnosis of diseases, for treatment, control and prevention of diseases, or in the collection and processing of *germinal products*.

BIOSECURITY

means a set of management and physical measures designed to reduce the *risk* of introduction, establishment and spread of animal diseases, *infections* or *infestations* to, from and within an animal population.

BIOSECURITY PLAN

means a plan that identifies potential pathways for the introduction and spread of disease in a *zone* or *compartment*, and describes the measures which are being or will be applied to mitigate the disease *risks*, if applicable, in accordance with the recommendations in the *Terrestrial Code*.

BORDER POST

means any airport, or any port, railway station or road check-point open to *international trade* of *commodities*, where import veterinary inspections can be performed.

CAPTIVE WILD [ANIMAL]

means an *animal* that has a phenotype not significantly affected by human selection but that is captive or otherwise lives under or requires human supervision or control.

CASE

means an individual *animal* infected by a pathogenic agent, with or without clinical signs.

CASINGS

means intestines and bladders that, after cleaning, have been processed by tissue scraping, defatting and washing, and have been treated with salt.

COLLECTION CENTRE

means a facility approved by the *Veterinary Authority* for the collection of oocytes or embryos and used exclusively for donor animals which meet the conditions of the *Terrestrial Code*.

COMMODITY

means a live *animal*, an *animal product*, *germinal products*, a *biological product* or *pathological material*.

COMPARTMENT

means an animal *subpopulation* contained in one or more *establishments*, separated from other susceptible *populations* by a common *biosecurity* management system, and with a specific *animal health status* with respect to one or more *infections* or *infestations* for which the necessary *surveillance*, *biosecurity* and control measures have been applied for the purposes of *international trade* or disease prevention and control in a country or *zone*.

COMPETENT AUTHORITY

means a Governmental Authority of a Member Country having the responsibility in the whole or part of the territory for the implementation of certain standards of the *Terrestrial Code*.

CONTAINER

means a non-self-propelled receptacle or other rigid structure for holding *animals* during a *journey* by one or several means of transport.

CONTAINMENT ZONE

means an *infected zone* defined within a previously free country or *zone*, which includes all suspected or confirmed *cases* that are epidemiologically linked and where movement control, *biosecurity* and *sanitary measures* are applied to prevent the spread of, and to eradicate, the *infection* or *infestation*.

DAY-OLD BIRDS

means birds aged not more than 72 hours after hatching.

DISINFECTION

means the application, after thorough cleansing, of procedures intended to destroy the infectious or parasitic agents of animal diseases, including zoonoses; this applies to premises, *vehicles* and different objects which may have been directly or indirectly contaminated.

DISINFESTATION

means the application of procedures intended to eliminate *infestation*.

DISTRESS

means the state of an animal, that has been unable to adapt to stressors, and that manifests as abnormal physiological or behavioural responses. It can be acute or chronic and may result in pathological conditions.

EARLY WARNING SYSTEM

means a system for the timely detection, reporting and communication of occurrence, incursion or emergence of diseases, *infections* or *infestations* in a country, *zone* or *compartment*.

EMERGING DISEASE

means a new occurrence in an *animal* of a disease, *infection* or *infestation*, causing a significant impact on animal or public health resulting from:

a) a change of a known pathogenic agent or its spread to a new geographic area or species; or

b) a previously unrecognised pathogenic agent or disease diagnosed for the first time.

EPIDEMIOLOGICAL UNIT

means a group of *animals* with the same likelihood of exposure to a pathogenic agent. In certain circumstances, the epidemiological unit may be a single *animal*.

ERADICATION

means the elimination of a pathogenic agent from a country or *zone*.

ESTABLISHMENT

means the premises in which *animals* are kept.

EUTHANASIA

means the *killing* of an *animal* using a method that causes a rapid and irreversible loss of consciousness with minimum *pain* and *distress*.

EXPORTING COUNTRY

means a country from which *commodities* are sent to another country.

FEED

means any material (single or multiple), whether processed, semi-processed or raw, which is intended to be fed directly to terrestrial *animals* (except bees).

FEED INGREDIENT

means a component part or constituent of any combination or mixture making up a *feed*, whether or not it has a nutritional value in the *animal*'s diet, including feed additives. Ingredients are of plant (including aquatic plants) or terrestrial or aquatic animal origin, or other organic or inorganic substances.

FERAL [ANIMAL]

means an *animal* of a domesticated species that lives without requiring human supervision or control.

FLOCK

means a number of *animals* of one kind kept together under human control or a congregation of gregarious *wild animals*. A *flock* is usually regarded as an *epidemiological unit*.

FREE COMPARTMENT

means a *compartment* in which the absence of the animal pathogenic agent causing the disease under consideration has been demonstrated by all requirements specified in the *Terrestrial Code* for free status being met.

FREE-ROAMING DOG

means any *owned dog* or unowned dog that is without direct human supervision or control, including *feral* dogs.

FREE ZONE

means a *zone* in which the absence of a specific *infection* or *infestation* in an animal *population* has been demonstrated in accordance with the relevant requirements of the *Terrestrial Code*.

FRESH MEAT

means *meat* that has not been subjected to any treatment irreversibly modifying its organoleptic and physicochemical characteristics. This includes frozen *meat*, chilled *meat*, minced *meat* and mechanically recovered *meat*.

GERMINAL PRODUCTS

means animal semen, oocytes, embryos or *hatching eggs*.

GOOD MANUFACTURING PRACTICE

means a production and testing practice recognised by the *Competent Authority* to ensure the quality of a product.

HATCHING EGGS

means fertilised bird eggs, suitable for incubation and hatching.

HAZARD

means a biological, chemical or physical agent in, or a condition of, an *animal* or animal product with the potential to cause an adverse health effect.

HEADQUARTERS

means the Permanent Secretariat of the World Organisation for Animal Health located at:

12, rue de Prony, 75017 Paris, FRANCE
Telephone: 33-(0)1 44 15 18 88
Fax: 33-(0)1 42 67 09 87
Electronic mail: woah@woah.org
WWW: http://www.woah.org

HERD

means a number of *animals* of one kind kept together under human control or a congregation of gregarious *wild animals*. A *herd* is usually regarded as an *epidemiological unit*.

IMPORTING COUNTRY

means a country that is the final destination to which *commodities* are sent.

INCIDENCE

means the number of new *cases* or *outbreaks* of a disease that occur in a population at risk in a particular geographical area within a defined time interval.

INCUBATION PERIOD

means the longest period that elapses between the introduction of the pathogenic agent into the *animal* and the occurrence of the first clinical signs of the disease.

INFECTED ZONE

means a *zone* either in which an *infection* or *infestation* has been confirmed, or one that is defined as such in the relevant chapters of the *Terrestrial Code*.

INFECTION

means the entry and development or multiplication of a pathogenic agent in the body of humans or *animals*.

INFECTIVE PERIOD

means the longest period during which an affected *animal* can be a source of *infection*.

INFESTATION

means the external invasion or colonisation of *animals* or their immediate surroundings by arthropods, which may cause clinical signs or are potential *vectors* of pathogenic agents.

INTERNATIONAL TRADE

means importation, exportation and transit of *commodities*.

INTERNATIONAL VETERINARY CERTIFICATE

means a certificate, issued in accordance with Chapter 5.2., describing the animal health and public health requirements that are fulfilled by the exported *commodities*.

JOURNEY

An *animal* transport journey commences when the first *animal* is loaded onto a *vehicle/vessel* or into a *container* and ends when the last *animal* is unloaded, and includes any stationary resting/holding periods. The same *animals* do not commence a new journey until after a suitable period for rest and recuperation, with adequate *feed* and water.

KILLING

means any procedure that causes the death of an *animal*.

LABORATORY

means a properly equipped institution staffed by technically competent personnel under the control of a specialist in veterinary diagnostic methods, who is responsible for the validity of the results. The *Veterinary Authority* approves and monitors such laboratories with regard to the diagnostic tests required for *international trade*.

LAIRAGE

means pens, yards and other holding areas used for accommodating *animals* in order to give them necessary attention (such as water, *feed*, rest) before they are moved on or used for specific purposes including *slaughter*.

LISTED DISEASE

means a disease, *infection* or *infestation* listed in Chapter 1.3. after adoption by the World Assembly of Delegates.

LOADING/UNLOADING

Loading means the procedure of moving *animals* onto a *vehicle/vessel* or into a *container* for transport purposes, while unloading means the procedure of moving *animals* off a *vehicle/vessel* or out of a *container*.

MARKET

means a place where *animals* are assembled for the purposes of trade or sale.

MEAT

means all edible parts of an *animal*.

MEAT PRODUCTS

means *meat* that has been subjected to a treatment irreversibly modifying its organoleptic and physicochemical characteristics.

MILK

means the normal mammary secretion of milking *animals* obtained from one or more milkings without either addition to it or extraction from it.

MILK PRODUCT

means the product obtained by any processing of *milk*.

MONITORING

means the intermittent performance and analysis of routine measurements and observations, aimed at detecting changes in the environment or health status of a *population*.

NOTIFIABLE DISEASE

means a disease listed by the *Veterinary Authority*, and that, as soon as detected or suspected, should be brought to the attention of this *Authority*, in accordance with national regulations.

NOTIFICATION

means the procedure by which:

a) the *Veterinary Authority* informs the *Headquarters*,

b) the *Headquarters* inform the *Veterinary Authority*,

of the occurrence of disease, *infection* or *infestation* in accordance with Chapter 1.1.

OFFICIAL CONTROL PROGRAMME

means a programme which is approved, and managed or supervised by the *Veterinary Authority* of a Member Country for the purposes of controlling a *vector*, pathogenic agent or disease by specific measures applied throughout that Member Country, or within a *zone* or *compartment* of that Member Country.

OFFICIAL VETERINARIAN

means a *veterinarian* authorised by the *Veterinary Authority* of the country to perform certain designated official tasks associated with animal health or public health and inspections of *commodities* and, when appropriate, to certify in accordance with Chapters 5.1. and 5.2.

OFFICIAL VETERINARY CONTROL

means the operations whereby the *Veterinary Services*, knowing the location of the *animals* and after taking appropriate actions to identify their owner or responsible keeper, are able to apply appropriate animal health measures, as required. This does not exclude other responsibilities of the *Veterinary Services* e.g. food safety.

OUTBREAK

means the occurrence of one or more *cases* in an *epidemiological unit*.

OWNED DOG

means a dog for which a person claims responsibility.

PAIN

means an unpleasant sensory and emotional experience associated with actual or potential tissue damage. It may elicit protective actions, result in learned avoidance and *distress* and may modify species-specific traits of behaviour, including social behaviour.

PATHOLOGICAL MATERIAL

means samples obtained from live or dead *animals*, containing or suspected of containing infectious or parasitic agents, to be sent to a *laboratory*.

PLACE OF SHIPMENT

means the place where the *commodities* are loaded into the *vehicle* or handed to the agency that will transport them to another country.

POPULATION

means a group of *units* sharing a common defined characteristic.

POULTRY

means all birds reared or kept in captivity for the production of any commercial animal products or for breeding for this purpose, fighting cocks used for any purpose, and all birds used for restocking supplies of game or for breeding for this purpose, until they are released from captivity.

Birds that are kept in a single household, the products of which are used within the same household exclusively, are not considered *poultry*, provided that they have no direct or indirect contact with *poultry* or *poultry* facilities.

Birds that are kept in captivity for other reasons, including those that are kept for shows, racing, exhibitions, zoological collections and competitions, and for breeding or selling for these purposes, as well as pet birds, are not considered *poultry*, provided that they have no direct or indirect contact with *poultry* or *poultry* facilities.

PRE-JOURNEY PERIOD

means the period during which *animals* are identified, and often assembled for the purposes of *loading* them.

PREVALENCE

means the total number of *cases* or *outbreaks* of a disease that are present in a population at risk, in a particular geographical area, at one specified time or during a given period.

PROTEIN MEAL

means any final or intermediate solid protein-containing product, obtained when animal tissues are rendered, excluding peptides of a molecular mass less than 10,000 daltons and amino-acids.

PROTECTION ZONE

means a *zone* where specific *biosecurity* and *sanitary measures* are implemented to prevent the entry of a pathogenic agent into a free country or *zone* from a neighbouring country or *zone* of a different *animal health status*.

QUALITATIVE RISK ASSESSMENT

means an assessment where the outputs on the likelihood of the outcome or the magnitude of the consequences are expressed in qualitative terms such as 'high', 'medium', 'low' or 'negligible'.

QUANTITATIVE RISK ASSESSMENT

means an assessment where the outputs of the *risk assessment* are expressed numerically.

QUARANTINE STATION

means an establishment under the control of the *Veterinary Authority* where *animals* are maintained in isolation with no direct or indirect contact with other *animals*, to ensure that there is no transmission of specified pathogenic agents outside the establishment while the *animals* are undergoing observation for a specified length of time and, if appropriate, testing or treatment.

REGISTRATION

is the action by which information on *animals* (such as identification, animal health, movement, certification, epidemiology, *establishments*) is collected, recorded, securely stored and made appropriately accessible and able to be utilised by the *Competent Authority*.

RESPONSIBLE DOG OWNERSHIP

means the situation whereby a person accepts and commits to perform various duties in accordance with the legislation in place and focused on the satisfaction of the behavioural, environmental and physical needs of a dog and to the prevention of risks (aggression, disease transmission or injuries) that the dog may pose to the community, other *animals* or the environment.

RESTING POINT

means a place where the *journey* is interrupted to rest, *feed* or water the *animals*; the *animals* may remain in the *vehicle*/*vessel* or *container*, or be unloaded for these purposes.

RESTRAINT

means the application to an *animal* of any procedure designed to restrict its movements.

RISK

means the likelihood of the occurrence and the likely magnitude of the biological and economic consequences of an adverse event or effect to animal or human health.

RISK ANALYSIS

means the process composed of *hazard* identification, *risk assessment*, *risk management* and *risk communication*.

RISK ASSESSMENT

means the evaluation of the likelihood and the biological and economic consequences of entry, establishment and spread of a *hazard*.

RISK COMMUNICATION

is the interactive transmission and exchange of information and opinions throughout the *risk analysis* process concerning *risk*, *risk*-related factors and *risk* perceptions among *risk* assessors, *risk* managers, *risk* communicators, the general public and other interested parties.

RISK MANAGEMENT

means the process of identifying, selecting and implementing measures that can be applied to reduce the level of *risk*.

SAFE COMMODITY

means a *commodity* that can be traded without the need for *risk* mitigation measures specifically directed against a particular *listed disease*, *infection* or *infestation* and regardless of the status of the country or *zone* of origin for that disease, *infection* or *infestation*.

SANITARY MEASURE

means a measure, such as those described in various chapters of the *Terrestrial Code*, designed to protect animal or human health or life within the whole territory or a *zone* of a Member Country from *risks* arising from the entry, establishment or spread of a *hazard*.

SEMEN COLLECTION CENTRE

means an *approved* facility that meets the conditions set out in the *Terrestrial Code* for the collection, processing and storage of semen.

SLAUGHTER

means the *killing* of an *animal* primarily intended for human consumption.

SLAUGHTERHOUSE/ABATTOIR

means premises, including facilities for moving or lairaging *animals*, used for the *slaughter* of *animals* to produce animal products and approved by the relevant *Competent Authority*.

SPACE ALLOWANCE

means the measure of the floor area and height allocated per individual or body weight of *animals*.

SPECIFIC SURVEILLANCE

means the *surveillance* targeted to a specific disease or *infection*.

STAMPING-OUT POLICY

means a policy designed to eliminate an *outbreak* by carrying out under the authority of the *Veterinary Authority* the following:

a) the *killing* of the *animals* which are affected and those suspected of being affected in the *herd* or *flock* and, where appropriate, those in other *herds* or *flocks* which have been exposed to *infection* by direct animal to animal contact, or by indirect contact with the causal pathogenic agent; *animals* should be killed in accordance with Chapter 7.6.;

b) the disposal of carcasses and, where relevant, animal products by rendering, burning or burial, or by any other method described in Chapter 4.13.;

c) the cleansing and *disinfection* of *establishments* through procedures defined in Chapter 4.14.

STOCKING DENSITY

means the number or body weight of *animals* per unit area on a *vehicle/vessel* or *container*.

STUNNING

means any procedure that causes loss of consciousness for the purpose of *killing* without avoidable *distress*, fear and *pain*.

SUBPOPULATION

means a distinct part of a *population* identifiable in accordance with specific common animal health characteristics.

SURVEILLANCE

means the systematic ongoing collection, collation, and analysis of information related to animal health and the timely dissemination of information so that action can be taken.

TERRESTRIAL CODE

means the WOAH *Terrestrial Animal Health Code*.

TERRESTRIAL MANUAL

means the WOAH *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals*.

TRANSIT COUNTRY

means a country through which *commodities* destined for an *importing country* are transported or in which a stopover is made at a *border post*.

UNIT

means an individually identifiable element used to describe, for example, the members of a *population* or the elements selected when sampling; examples of *units* include individual *animals*, *herds*, *flocks* and *apiaries*.

VACCINATION

means the administration of a vaccine, in accordance with the manufacturer's instructions and the *Terrestrial Manual*, when relevant, with the intention of inducing immunity in an *animal* or group of *animals* against one or more pathogenic agents.

VECTOR

means an insect or any living carrier that transports an infectious agent from an infected individual to a susceptible individual or its food or immediate surroundings. The organism may or may not pass through a development cycle within the *vector*.

VEHICLE/VESSEL

means any means of conveyance including train, truck, aircraft or ship that is used for carrying *animals*.

VETERINARIAN

means a person with appropriate education, registered or licensed by the relevant *veterinary statutory body* of a country to practice veterinary medicine/science in that country.

VETERINARY AUTHORITY

means the Governmental Authority of a Member Country having the primary responsibility in the whole territory for coordinating the implementation of the standards of the *Terrestrial Code*.

VETERINARY LEGISLATION

means laws, regulations and all associated legal instruments that pertain to the veterinary domain.

VETERINARY MEDICINAL PRODUCT

means any product with approved claims to having a prophylactic, therapeutic or diagnostic effect or to alter physiological functions when administered or applied to an *animal*.

VETERINARY PARAPROFESSIONAL

means a person who, for the purposes of the *Terrestrial Code*, is authorised by the *veterinary statutory body* to carry out certain designated tasks (dependent upon the category of *veterinary paraprofessional*) in a territory, and delegated to them under the responsibility and direction of a *veterinarian*. The tasks for each category of *veterinary paraprofessional* should be defined by the *veterinary statutory body* depending on qualifications and training, and in accordance with need.

VETERINARY SERVICES

means the combination of governmental and non-governmental individuals and organisations that perform activities to implement the standards of the *Terrestrial Code*.

VETERINARY STATUTORY BODY

means an autonomous regulatory body for *veterinarians* and *veterinary paraprofessionals*.

WILD [ANIMAL]

means an *animal* that has a phenotype unaffected by human selection and lives independently without requiring human supervision or control.

WILDLIFE

means *feral animals*, *captive wild animals* and *wild animals*.

ZONE

means a part of a country defined by the *Veterinary Authority*, containing an animal *population* or *subpopulation* with a specific *animal health status* with respect to an *infection* or *infestation* for the purposes of *international trade* or disease prevention or control.

NB: FIRST ADOPTED IN 1968; MOST RECENT UPDATE ADOPTED IN 2024.

This is **Exhibit "C"** referred to in the Affidavit of **CATHY FURNESS** affirmed before me at Guelph, Ontario, this 30 day of January, 2025.



Owner or occupier Propriétaire ou occupant	Location of animal(s)/thing(s) Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 301 Langille Road, Edgewood, BC, V0G 1J0	034 301 Langille Road, Edgewood, BC, V0G 1J0 Lat: 49.862402 Long: -118.149296 Premise ID: BC44K4PMR

I have determined or suspect that the animal(s)/thing(s) described below is (are) affected or contaminated by

Je constate ou soupçonne que les animaux ou les choses décrits(es) ci-dessous sont atteints(es) ou contaminés(es) par

Avian Influenza

and pursuant to 48.(1) of the *Health of Animals Act*, I hereby require you, the owner or person having the possession, care or control of the animal(s)/thing(s) to dispose of them during the period commencing on the date of this notice and ending on

et, en vertu du paragraphe 48.(1) de la *Loi sur la santé des animaux*, j'exige que vous, le(la) propriétaire ou la personne qui a la possession, la responsabilité ou la charge de ces animaux ou de ces choses, preniez à leur égard, d'ici le

2025-02-01 ,

and in the following manner:
Method of Destruction to be communicated by CFIA

les mesures décrites ci-dessous :

Digitally signed by ZHANG, XIANG
Date: 2024.12.31 13:36:51 -08'00'

Inspector / Inspecteur Ian Zhang	Date 2024-12-31	Telephone / Téléphone

Identification Number Numéro d'identification	Age Âge	Sex Sexe	Description of Animal(s) or Thing(s) Description de l'(des) animal(aux) ou de la(des) chose(s)
1			All poultry and poultry carcasses along with other material
2			approved by CFIA disposal crew from the above noted poultry
3			production premises.
4			
5			
6			
7			
8			
9			
10			
11			File Number:BC-820 22874
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			

Disposal

Subsection 48 (1) of the Health of Animals Act:

48.(1) The Minister may dispose of an animal or thing, or require its owner or any person having the possession, care or control of it to dispose of it, where the animal or thing

a) is, or is suspected of being, affected or contaminated by a disease or toxic substance;
b) has been in contact with or in close proximity to another animal or thing that was, or is suspected of having been, infected or contaminated by a disease or toxic substance at the time of contact or close proximity; or
c) is, or is suspected of being, a vector, the causative agent of a disease or a toxic substance.

Mesures de dispositions

Le paragraphe 48(1) de la Loi sur la santé des animaux :

48.(1) Le ministre peut prendre toute mesure de disposition, notamment de destruction, - ou ordonner à leur propriétaire, ou la personne qui en a la possession, la responsabilité ou la charge des soins, de le faire - à l'égard des animaux ou choses qui :

a) soit sont contaminés par une maladie ou une substance toxique, ou soupçonnés de l'être;
b) soit ont été en contact avec des animaux ou choses de la catégorie visée à l'alinéa a) ou se sont trouvés dans leur voisinage immédiat;
c) soit sont des substances toxiques, des vecteurs ou des agents causant des maladies, ou sont soupçonnés d'en être.

Penalty

Section 66 of the Health of Animals Act:

66. Every person who fails to comply with a notice delivered to the person under section 18, 25, 27, 37, 43 or 48 or the regulations is guilty of

a) an offence punishable on summary conviction and liable to a fine not exceeding fifty thousand dollars or to imprisonment for a term not exceeding six months, or to both; or
b) an indictable offence and liable to a fine not exceeding two hundred thousand dollars or to imprisonment for a term not exceeding two years, or to both.

Pénalité

L'article 66 de la Loi sur la santé des animaux:

66. Quiconque contrevient à l'avis qui lui a été signifié au titre des articles 18, 25, 27, 37, 43 ou 48 ou des règlements commet une infraction et encourt, sur déclaration de culpabilité :

a) par procédure sommaire, une amende maximale de cinquante mille dollars et un emprisonnement maximal de six mois, ou l'une de ces peines; ou
b) par mise en accusation, une amende maximale de deux cents mille dollars et un emprisonnement maximal de deux ans, ou l'une de ces peines.

Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

HEALTH OF ANIMALS ACT
ATTACHMENT TO FORM

LOI SUR LA SANTÉ DES ANIMAUX
ANNEXE AU FORMULAIRE

Owner or occupier Propriétaire ou occupant	Location of animal(s)/thing(s) Endroit où se trouvent l'(les) animal(aux) ou la(les) chose(s)
Universal Ostrich Owner Name (legal owner of premise): Dave Bilinski Email: universalostrich@gmail.com Phone #: 778-692-9389 ~~301 Langille Road, Edgewood, BC, V0G 1J0~~	301 Langille Road, Edgewood, BC, V0G 1J0 Lat: 49.862402 Long: -118.149296 Premise ID: BC44K4PMR

Identification Number Numéro d'identification	Age Âge	Sex Sexe	Description of Animal(s) or thing(s) Description de l'(des) animal(aux) ou de la(des) chose(s)
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			

Inspector Name / Nom de l'inspecteur	Inspector (Signature) Inspecteur	Date
Ian Zhang		2024-12-31

Note: When this form is used to describe additional animals, the original of any form it is used with should have the following statement placed on it:

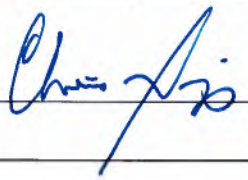
The description of animals/things to which this form applies is on the attached copy(ies) of form CFIA/ACIA 4209 which bear the name and date above.

Nota : Lorsque ce formulaire sert à décrire d'autres animaux, l'original de tout formulaire qui l'accompagne devrait porter la mention suivante :

La description d'animaux/de choses auxquels s'applique le présent formulaire figure sur la(les) copies annexée(s) des formulaires CFIA / ACIA 4209 qui portent le nom et la date ci-haut.

Canada

This is **Exhibit "D"** referred to in the Affidavit of **CATHY FURNESS** affirmed before me at Guelph, Ontario, this 30 day of January, 2025.



CFIA Highly Pathogenic Avian Influenza (HPAI) Event 2022 - Western HPAI Response

10 January 2025

Re: Distinct Unit Evaluation and request for exemption from destruction order issued on December 31 2024 for Ostriches on BC-820-IP-233 (Universal Ostrich Farms Inc., Edgewood, B.C.)

To Whom It May Concern,

Thank you for submitting the Distinct Unit Assessment request package for the HPAI infected premises of Universal Ostrich Farms Inc.

It is critical that, in honouring requests for exemptions from depopulation, we at CFIA remain aligned with our World Organisation for Animal Health (WOAH) obligations to Canada's stamping-out policy with regards to the detection of HPAI. We take these requests seriously and give each request that meets our initial screening criteria due consideration. Conclusions reached in reviewing these applications are final and will not be re-evaluated.

WOAH considers the genus *Struthio spp.* (Ostrich) as "poultry" in their definition of poultry and they are not exempt from a stamping-out policy. This stamping-out policy reflects the risks posed by HPAI infected poultry flocks to humans, domestic animals, and wildlife. As part of the stamping-out policy, the CFIA does not consider individual bird test results when evaluating the epidemiological unit on an HPAI infected premises. In order for Canada to mitigate the risks posed by HPAI infected poultry, maintain its international obligations and the expectation of our trading partners, all birds within the HPAI infected epidemiological unit of a non-commercial poultry infected premises must be destroyed and appropriately disposed.

All criteria listed in the Distinct Unit Assessment must be adequately addressed in order to be granted an exemption from depopulation.

The CFIA defines a Distinct Epidemiological Unit as a group of animals on an infected premises that are separated from an infected susceptible population such that they are not considered exposed to the pathogenic agent. After reviewing all the information provided, including, but not limited to, email communications from Universal Ostrich Inc., an on-site visit conducted by CFIA staff as well as all communications for the purposes of completing the premises investigation questionnaire, we did not find that this proposed distinct unit adequately met the criteria for:

- *A distinct epidemiological unit*. There is no evidence that a subset of animals are a distinct unit or at a different level of risk; all animals on the infected premises are under the same risk of HPAI exposure.

The CFIA may grant an exemption to depopulation for select flocks that meet the requirement of having rare and valuable poultry genetics. This consideration requires a significant burden of proof to demonstrate the high economic value the flock provides to the broader poultry industry. Robust processes must be in place (ex. genomic testing) to actively select and breed for specific desirable traits, with subsequent evidence that this genetic value is critical to the Canadian poultry industry. An evaluation of the information provided was conducted to determine if the genetics of the flock were demonstrated to be of uncommon genetic lines that hold a high economic value to the poultry industry; in conjunction with information available at Animal Genetic Resources of Canada, the material provided for evaluation of the birds present at Universal Ostrich Farms Inc. failed to meet the above definition of rare and valuable poultry genetics. After reviewing all of the information provided, including, but not limited to, email communications from Universal Ostrich Inc. and Yasuhiro Tsukamoto, as well as Struthio Biosciences Inc. business plans, the request for an exemption to depopulation based on rare and valuable poultry genetics is denied. This decision is final and is not subject to appeal.

The CFIA/ACIA 4202-Requirement to Dispose of Animals or Things was delivered on December 31, 2024, and must be completed by February 01, 2025. A draft plan for the destruction and disposal of all birds and things listed on the 4202 can be provided to your case officer for subsequent CFIA review and approval. We appreciate that this is a difficult decision, and should you need support regarding a plan for destruction and /or disposal please let your case officer know. We have also provided the link for the AgSafe mental health website. They have valuable resources that you may find helpful.

Sincerely,

Bourque, TroyBourque
Digitally signed by Bourque, TroyBourque
Date: 2025.01.10 14:54:30 -07'00'

Troy Bourque B.Sc.,D.V.M.

Planning Chief, Western HPAI Response

Fotheringham, Cortnie
2025.01.10 13:57:52 -08'00'

Cortnie Fotheringham

Incident Commander, Western HPAI Response

Court File No. T-294-25

FEDERAL COURT

BETWEEN:

UNIVERSAL OSTRICH FARMS INC.

Applicant

- and -

CANADIAN FOOD INSPECTION AGENCY

Respondent

TRANSCRIPT OF PROCEEDINGS
HEARD BEFORE THE HONOURABLE JUSTICE BATTISTA
held via video conference,
on Friday, January 31, 2025

APPEARANCES:

Michael D. Carter — for the Applicant
Alyona Kokanova

Paul Saunders — for the Respondent
Jordan Marks

Also Present:

Court Registrar

via video conference
--- Upon commencing on Friday, January 31, 2025
THE REGISTRAR: Good morning, Mr. Justice Battista. May I open Court, please?
THE COURT: Yes.
THE REGISTRAR: Oh, I meant to say good afternoon. But good afternoon, good morning. This special sitting of the Federal Court by Zoom video conference is now open.
The Honourable Mr. Justice Battista presiding before Court File T-294-25, between Universal Ostrich Farms Inc. v. Canadian Food Inspection Agency.
Appearing on behalf of the Applicant we have Mr. Michael Carter and Ms. Alyona Kokanova, and appearing on behalf of the Respondent we have Mr. Paul Saunders and Mr. Jordan Marks. Thank you.
THE COURT: Good morning, counsel.
MR. SAUNDERS: Good morning.
MR. CARTER: Good morning.
MS. KOKANOVA: Good morning.
THE COURT: So I have a proposal about proceeding today. Counsel Carter, your friends have arrived and they have sent in a letter

objecting to the hearing of the motion. So my proposal is to hear from your friends to hear from Counsel Saunders, Counsel Marks about why the motion should not be heard. And then I'll hear from you, Counsel Carter, and make a decision on hearing the motion.

And then, if I decide to hear the motion, we'll hear it on the merits and, at that point, we will determine the parameters and the role of your friends, whether they want to just observe or whether they want to participate.

Does that sound okay with everyone? Counsel Carter, do you want to comment? And then I'll turn it over to your friends about the way of proceeding?

MR. CARTER: Certainly. I mean, I'm in your hands as far as how you'd like to proceed. I mean, our position of course is that it is ex parte 361. But I'll let my friend talk, and then I can respond to that.

THE COURT: Just in terms of how I propose proceeding, is that okay with you, Counsel Saunders?

MR. SAUNDERS: Yes, it is. Thank you.

THE COURT: Okay. So I'll hear from you about whether the motion should be heard this morning. And then from Counsel Carter, I'll make a decision about whether to hear it, and then we'll take it from there.

Over to you, Counsel Saunders.

MR. SAUNDERS: Thank you. So the motion is brought under Rule 361 as an ex parte hearing. But this is unusual in that we were provided notice on Monday of a pending injunction. And then we received the materials yesterday throughout the day, the last of which we got late, 9:30 last night, one of the affidavits.

And just to give you a sense of the timeline, we got the Notice of Motion, unfiled, just after 9:30, along with the Bilinski Affidavit and the Espersen Affidavit. We then got an unfiled copy of the Notice of Application and also the Affidavit of Dr. Steven Pelech and Karina Jones(ph) at 2:35 p.m. And the last Affidavit that we got at -- the one I referred to just before 9:30 was the Affidavit of counsel attaching an expert report from Dr. Jeff(ph) Wilson.

So we're kind of in an odd situation where we understood that we were to

appear. We didn't fully understand what process was at work here and how this was an ex parte hearing. An ex parte hearing is appropriate when it's not possible to give notice -- that there's urgency and it's not possible to give notice.

So, in my submission, this can't be an ex parte hearing. We're here, we had notice. It cannot be, impossible.

Where we really are is under Rule 362, which says that a party seeking to bring a motion with less than three days notice needs to convince the Court of its urgency.

And so we've had one day's notice. The notice requirement hasn't been met. And there's a burden on the moving party to convince the Court that there is urgency here, and we have a number of issues with that.

The first -- the big picture issue is that this is a public law injunction that's seeking to restrain the Canadian Food Inspection Agency, the Agency, from implementing a measure designed to or intended to mitigate the spread of a pathogen that could have impacts on animal/human health and Canada's economy. Like, this is not something that should be done without

effective notice to the Crown, and very little ability to respond.

We've done our best. We have material, to be clear, that we haven't yet filed, but we've put together an Affidavit, we've put together a Memorandum of Fact and Law under extremely tight timelines to be prepared to speak to the test of an injunction today. But we simply haven't been able to respond to materials that have been given to us. Because it truly is -- the Crown has resources, but it's simply not possible to do that.

So that's kind of the overarching concern with hearing this in this manner. But in addition to that this doesn't, in my submission, meet the requirements of urgency because the urgency in this case is simply the delay in bringing the motion itself. The motion was brought -- for whatever reason, couldn't be brought earlier or it wasn't brought earlier. But there's no explanation of -- that I've seen in any of the materials as to why the Court should be satisfied that this is actually urgent.

This Court, in particular, deals with these types of matters routinely. And if

simply an approaching deadline to do something, including a Court deadline, satisfied the requirement of urgency, that would be problematic.

In the materials, I appreciate that they're not in front of you, but in our materials we did find some cases in the context of administrative stays of immigration that have held that that kind of delay alone is sufficient to dismiss at least that kind of motion.

The other thing I want to bring to the Court's attention on this point, you don't have our materials at this point, but I wonder if you could pull up the Affidavit of David Bilinski?

THE COURT: And where would I find that?

MR. SAUNDERS: Pardon me.

THE COURT: It's in the Motion Record, yes, I've got it.

MR. SAUNDERS: It's in the Motion Record. And -- pardon me, I'm just trying to turn up --

THE COURT: No, problem, take the time.

MR. SAUNDERS: If counsel wants to help me, I'm simply looking for the Order that is

the subject of this Judicial Review, and I'm looking --

MS. KOKANOVA: It's in the Bates numbering of 015, it should be Tab 3.

MR. CARTER: Tab 3 (inaudible) itself is at -- that's page 32 of that affidavit.

MS. KOKANOVA: Are you looking for the affidavit?

MR. CARTER: Or the Order, the Order to dispose of animals?

MR. SAUNDERS: Yes.

THE COURT: It's at page 60 in the PDF and page 32 of the record.

MR. SAUNDERS: So I just want to bring the Court's attention to the Order, because the urgency that has been presented here in addition to Court timelines, including the limitation for the Judicial Review itself, which is set to expire, is that when I read these materials comes off as this Order comes into effect.

But this is an Order requiring, under Section 41 of the *Health of Animals Act*, or directing, that Universal dispose of or cull its animals because they've been detected to have been infected with the avian flu.

And the Order was effective immediately when it was made December 31st and required them to do this by February 1st. And if you scroll down further in that Order you'll see that it goes through the fact that failure to take the actions set out therein is an offence.

So we're not -- this isn't an injunction that's being brought today to prevent an Order from coming into effect tomorrow, it's an injunction to relieve Universal of the consequences of not complying with it. That's all it can be.

The other issue there is that under Section 48(1) of the *Health of Animals Act*, which I'll take you to in my submissions on the injunction text later, presuming we get there, it says that the Minister can order, in this case, Universal or, you know, a farm or an operator, to cull animals or dispose of animals, but the Minister retains that authority to do that.

So we have an Order here that said to Universal, cull these animals by February 1st, the consequences of which are liability, including the potential that it's an offence. But the Minister can still do that. So we're in a strange situation where the urgency isn't the

coming into effect of the Order, it's that a dead line has passed. And the deadline was to cull 400, I understand 400 ostriches.

We're already in a situation where -- I'm not an expert in how that's done, but I don't think that's being done tomorrow. So the Court's been asked to relieve Universal of -- essentially of compliance with the Order under circumstances where the Minister can still effect this cull. It's a very unusual situation and, in my submission, it doesn't rise to this level of urgency.

And it's not the kind of thing that the Court -- I fail to see the public interest in the Court intervening in this kind of -- on these kind of circumstances on an urgent basis when this could have been brought, especially when this was brought earlier.

So, with that being said, as I mentioned, we have prepared materials and we have a Memorandum of Fact and Law and an Affidavit, what we could get together. And I understand that I'm speaking a lot about the public interest. The Court is here, the Court has mobilized its resources.

So I would propose to, having made those submissions on delay which are themselves, in my view, enough to dismiss this motion, I would propose to hear from the Applicants and speak to the Court about the injunction test as best that I can today just to give the Court the overall context and comfort that that test has not met as well.

THE COURT: Thank you. So we'll turn it over to you, Counsel Carter, for your submissions just on whether this should be heard.

MR. CARTER: Thank you. Mr. Justice, again, this is a motion under Section 361, ex parte. So, as you have heard now, I did contact CFIA earlier this week to let them know that we were seeking to bring this Motion. Talked to my friend on Tuesday, he raised these concerns about notice. I said, well, we could have a short extension of the cull order to give them time to respond more fully. He said, absolutely not, they didn't want to do that.

So we've been working all week in terms of obtaining the material. We knew that one of the important things that we were going to have to address is the potential public safety risk.

And so we did obtain expert reports from two experts who opined on this issue. And so we received those reports on Thursday. And again, we were retained late last week.

So all of earlier this week was spent tracking down experts, consulting with them, and obtaining those reports. We received the reports by Thursday, we filed the motion record, provided all that material to my friend.

Now, the other thing I think to keep in mind here is that there haven't been illness-related deaths in over two weeks in this herd. The expert opinions have said that there is -- extremely likely that there's herd immunity, there is very little risk to the public in terms of health risks.

And actually, the opinions say that it would be safer to keep a herd of ostriches that have immunity to the avian influenza, H5N1, than it would be to cull all those ostriches, bring in new ostriches that are susceptible to the pathogen.

THE COURT: We're just dealing with submissions on the delay and the (inaudible) and whether it should be heard. So we're not

getting into the main...

MR. CARTER: Certainly. So as far as -- and so we filed all that material on Thursday and, again, as I said, presented that material to my friend.

So my friend referred to the December 31st Order. Now, you know, as we get into -- if we get into the material here this morning, you'll see that one of the reasons -- one of the issues here is that CFIA communicated to Universal Ostrich Farm that this herd of ostriches fell into this exception from the cull order for rare and valuable genetics.

So the -- Universal was kind of operating under that understanding until on January 10th they responded to saying, oh, it's a very high burden and you didn't meet that burden. So up until that point they were under the understanding that, you know, there would be an exemption to the cull order.

From there, they immediately went into action in terms of trying to locate counsel. They didn't have -- one counsel that they were working with and that didn't workout, and then they had to find other counsel, and then they contact us

last week. We were able to meet with them and get retained late last week.

Now, again, this Universal Ostrich Farm is in rural central British Columbia, they're 125 kilometres southeast of Vernon, they're operating under a quarantine order. So they have -- they still have a herd of 400 ostriches that they're caring for, feeding, they have daily chores, they're trying to, you know, care for their animals.

They have these quarantine orders that restrict -- make everything a lot more difficult in terms of moving in and out of the area. So they have to do all their work, comply with quarantine orders, and deal with what's going on here.

So even in terms of communicating and getting affidavits and all of that stuff, it took more time potentially than it would be if you're dealing with somebody who's in your same town and not operating under these quarantine orders, dealing with a herd of animals.

So Universal certainly worked as diligently as they could. As soon as they learned that they didn't qualify for this exemption and, as

I said, retained us late last week, we immediately went to work to prepare all the material, get the expert reports, and we had those reports by this Thursday.

So the cull order takes effect on February 1st. So my friend says well, you know, it was really December 31st. Again, they were -- they understood that there would be an exemption to that cull order, because that's what CFIA had indicated.

And also, there's not really any --there's very little impact on CFIA if there was a short extension granted here, or an injunction, because they still have that order in effect that would resume at the end of the injunction period. Again, there's little health risk.

So I don't see the prejudice to CFIA here. We're not asking for an indefinite injunction. There is a Judicial Review Application that raises these significant issues that need to be determined, including whether there was procedural fairness or, you know, the rules of natural justice were followed in terms of not notifying Universal of this significantly, or very high bar, to qualify for the exemption.

So we're seeking an injunction to

just be able to deal with the judicial review. Hopefully, we can deal with the judicial review on a shortened timeline, and maybe that's something my friend and I can deal with in terms of timelines or with the Court and/or, in the alternative, if there's, you know, an injunction for -- a short injunction to allow time for my friend to respond later next week, you know, for example, a seven-day injunction, then we could have this hearing to determine the merits at that point.

But, again, I think our main focus is trying to get this Judicial Review Application heard as quickly as possible.

THE COURT: So does the quarantine order -- oh, first of all, where do I find the quarantine order in your materials?

MR. CARTER: That's at Tab 3. There's a couple different amendments and variations, but the first --

THE COURT: Does the quarantine order apply to your -- to the owners of the Applicant, the owners of the business?

MR. CARTER: Yes. So the property itself is under quarantine. They don't live in the quarantined area, but there's a whole set of

requirements/protocols for entering and exiting that area. So to feed the animals and care for them, they have to comply with all those protocols.

THE COURT: Okay. And so thank you for your submissions.

So back to you, Counsel Saunders, question for you. I understand that you have materials prepared or almost prepared. I think the Court would benefit from those materials.

Your friend has proposed a short interim injunction. I wonder if you'd be amenable to a short interim injunction so that we can put this matter over for full argument with the benefit of your materials?

MR. SAUNDERS: I don't think that can be done in these circumstances for the reasons that I discussed. I don't -- I can't undertake on behalf of CFIA or the Minister that a response action won't be taken that wouldn't -- like, the injunction wouldn't enjoin response action from the Minister or CFIA. It only refers to the -- it only requires Universal, the farm or the operator, to cull the animals.

So I think, given that we're here and I have at least some materials, we would be

better off speaking to the test today as best that I can do. And, you know, I have a memorandum, I don't have speaking notes. I'll do my best. And to the extent that my submissions are not the greatest, I think our memorandum is -- we've set out what we want to say in our memorandum.

So I think what I prefer to do is file this with the Court, or get it in front of the Court, our response record, and speak to the injunction today.

THE COURT: Certainly. All right, so then I have decided to hear the motion today. I am satisfied that there was an urgency based on the timeline that was provided by counsel for the Applicant in his letter dated January 30th.

And I do find that the circumstances justify the hearing of the motion, with accommodation to you, Counsel Saunders, for whatever you need to make the Court aware of your materials. You can send them in now and the Registrar can bring them to my attention as argument proceeds, you can send them after argument, whatever you prefer.

MR. SAUNDERS: Shall I send it by e-filing or is there --

THE COURT: I'll have to turn to the Court Registrar for that information.

THE REGISTRAR: If you can just send it to my email, please, it would be faster. I think I sent -- oh, you don't have it. Just a minute, I'll send you an email and then just send me your material. Thank you.

MR. SAUNDERS: Okay. That would be great, thank you.

THE COURT: All right, so we are proceeding to hear the motion on the merits of the motion, and so I will turn it over to Counsel Carter.

MR. CARTER: Thank you. So the purpose --

THE COURT: Oh, Counsel Carter, before you start --

MR. CARTER: Yes?

THE COURT: -- I just wanted to draw your attention to one thing. So, as you know, there's the three-part test that we have to deal with.

MR. CARTER: Right.

THE COURT: The first part of which deals with the serious issue. In your

submissions you speak a lot about the refusal of the exemption. The serious issue has to pertain to the main decision that's under attack in the main application, so that would be the culling decision.

So I would ask you to focus on the serious issues that arise from what you referred to as the December decision, the culling decision.

MR. CARTER: Certainly.

THE COURT: Thank you.

MR. CARTER: So the motion today is for an injunction staying the enforcement of the notice to dispose of animals or things that was issued on December 31st so that a judicial review can occur.

We also seek an amendment of the requirement to quarantine, to allow testing of the animals pursuant to protocols that would comply with CFIA requirements.

Legal basis for the motion is Sections 18(1), 18.2 and 44 of the *Federal Court Act* and, as I mentioned previously, Rule 361.

So just in terms of a roadmap, I'll give you overview of the issues and then go into some of the affidavit evidence, and then we'll

turn to the legal arguments in the Notice of Motion.

But you heard a little bit about Universal Ostrich Farms, raises ostriches on a 58-acre parcel of land located 10 kilometres outside of Edgewood, British Columbia, which is quite remote. They've been raising ostriches for 32 years there, and through the entire time they've been working to improve the genetics of their herd by selectively breeding the ostriches to create a large ostrich.

And then there's actually been two sets of illnesses. There was one in 2020, February 2020, that the herd had and recovered from. There was a few ostriches that died that time. And then there was this one in December 2024 when they started showing signs of illness and the CFIA came in, did the testing, and the results showed the H5N1 type of avian influenza.

And it sounds like you've seen from the material there there was this exemption for the rare and valuable genetics of the poultry. So that's kind of the overview.

But the Affidavit of Mr. David Bilinksi sets out in more detail the biology and

what this is all about. So I'll turn to that affidavit, which can be found at Tab 3 of the Motion Record.

So starting at paragraph 2 there, Mr. Bilinski just talks about his background. So he says:

"I began raising ostriches in 1993 after I decided to diversify from raising beef cows. At the time, I'd bee working with Dr. Robert Church who is a pioneer of molecular genetics and embryo transfer technology in cattle. Dr. Church, a PhD, was a founding member of the Faculty of Medicine at the University of Calgary and Associate Dean of Research from 1981 to 1988. He was also the first Head of the Department of Medical Biochemistry, a position he held for 14 years. I've also taken training in genetics through Olds College in Alberta and Thompson Rivers University using artificial insemination and selected genetics. I, with my family, created a registered bloodline of cattle that topped breed sales for three years out of five years in Calgary. And contributed genetics to the Grand Champion Carcass at the PNE. At that time, we had 750 cows on two ranches; one in Edgewood, and one in Fort St. John,

before realizing that ostrich had more to offer to mankind than beef cattle. In 1993 Dr. Church, Steve Wilford, a farmer from Zimbabwe, and I, decided to start raising ostriches. We started Rocky Mountain Ostrich. After researching the advantages of the ostrich bird and the limited genetic information available, we decided that we would go to Africa to start selecting ostriches to import to Canada. Dr. Church was well-versed in importing animals, and he was looking for the best quality ostriches in Africa to import. RMO decided to import the largest species of ostrich. Others in North America had been importing the smaller species because they were easy to transport. But we determined that the larger species had better attributes and more economic value. In 1993 our Rocky Mountain constructed quarantine facilities in Zimbabwe and in (inaudible) where the ostriches with the genetics we selected were quarantined before being exported. The ostriches were then flown to the United Kingdom and quarantined for one month in another facility we constructed there. They were then flown to Edmonton for a final month of quarantine before becoming Canadian. Rocky Mountain became the go-to farm for the production

of large-body genetics and we grew into the largest ostrich farm in Canada -- (As Read)

THE COURT: If I can just interrupt. I did take a look at the materials, I don't need them read to me.

MR. CARTER: Okay.

THE COURT: You can just highlight the facts that you think are significant to the three-part test.

MR. CARTER: Certainly, okay. So you've already -- you've worked through the affidavit material there.

THE COURT: The materials were sent to me last night.

MR. CARTER: Okay. So one of the issues I guess in this particular case I know we want to focus on the actual issuance of the Order itself. But the uniqueness of the ostrich in terms of its -- just, although classified as a bird it's, you know, a large animal, up to 350 pounds, has a robust immune system, has this unique feature of having high concentrations of antibodies that are developed and appear in the egg yolk.

So all these features distinguish it from, you know, a chicken in a chicken barn with

400,000 other chickens. Again, the value of the animal, the size of the animal, the dynamics that it's outside, these will all become important considerations in implementing a culling order, because there are other options in terms of vaccinating or dealing with the illness in other ways.

So an ostrich is not like your chicken the chicken barn that's being raised with 400,000 other chickens. I think the other thing is the -- just the antibody research that was being done. So you saw from the materials that although they have been, you know, doing other things with ostriches as of March 2020 when the COVID pandemic came, they started doing this research into the antibody production.

And so, again, I say that this is an important feature because it just highlights the uniqueness of ostriches and then also this herd -- specifically this herd.

So the 2020 illness, I'll just talk about there. This is at paragraph 45 of the affidavit -- or, sorry, Mr. Justice, I'm going to go back up to paragraph 41, because this just talks about BioSolutions.

So what had happened is Universal had began doing research with Dr. Tsukamoto from a university in Japan. They were involved in a venture in terms of researching the ostrich's ability to produce antibodies. They had been doing research with another Canadian company to try to work on responses to the COVID pandemic. And then they started this venture with BioSolutions.

So paragraph 41 says -- no, sorry, BioSolutions isn't what they started the venture as, that was the research firm. But paragraph 41, it says:

"BioSolutions found that UOF antibodies were superior to the previous chicken-derived antibodies since they were stronger and more robust. Since the results from the ostrich eggs were showing positive results, we decided to commit the entire operation of UOF to antibody production." (As Read)

Then they began a venture with Struthio BioScience and entered into a contract where Universal must provide Struthio with ostrich eggs pursuant to the terms of that agreement.

So since 2020 this entire herd had been just dedicated to research and the

production of antibodies. It is not a commercial poultry operation. They did not produce any ostrich meat or eggs for human consumption, and that's highlighted at paragraphs 43 and 44 of Mr. Bilinski's Affidavit.

Now again, I say that this is an important consideration because it is part of the overall framework of a response that CFIA would have to this operation.

Then in 2020, so as of February 2020 UOF had approximately 250 ostriches, some of them became sick and about 10 of them died. They took tissue samples from deceased ostriches to our veterinarian and they were sent for analysis. Report from the BC Animal Centre returned positive results for -- full name in there is set out, but I'll call it pseudomonas.

All but 10 of the ostriches recovered from the 2020 illness within a couple weeks, and remained healthy.

So the next section in the Affidavit just deals with what happened December 2024. So, as you probably saw from the material there, about December 10th they noticed that there were some ostriches beginning to show signs of

illness. Then later on, some of them started dying.

And CFIA came in and did an inspection, and on December 31st it says at paragraph 52, "We received an email from CFIA with a requirement to quarantined." It says, "We had already implemented strict quarantine measures which included, amongst other things, restricting access to and from the property."

Then he says, "We have complied with the conditions of the requirement to quarantine." "December 31st we were told by CFIA that the PCR test result was positive for the H5N1 type of avian influenza."

And then on January 2nd, 2025 is when they received the email with the notice to dispose of animals, so the cull order.

So the next section talks about what they did after they received that email from (inaudible) and the cull order. And again, I'll take you to the exhibits, but what CFIA had said was that they had determined that the ostriches fell into this category of rare and valuable genetics poultry. And had asked Universal to send in some documents showing the work that they were

doing with Dr. Tsukamoto.

At paragraph 58 Mr. Bilinski says:

"Karen and I were extremely relieved by the fact that the ostriches fell into this category, because it was we had been working on for 32 years." As part of that email on January 2nd, (inaudible) fill out and return (inaudible) package, which is another type of exemption. The next day, on January 3rd, we had a 5.5 hours meeting with various CFIA representatives, discussed the layout of the property, movements on and off the property, the quarantine requirements, and many other things. To the best of my recollection, not once in that meeting did anyone from CFIA discuss the (inaudible) package or the rare and valuable genetics category, what would be required from UOF as part of that process. In the following days we were pulled between, amongst other things, trying to care for the ostrich herd, attending to dead ostriches, creating and implementing protocols, applying for feed and movement permits, and responding to CFIA's request." (As Read)

He just gives some more examples

in the next paragraph, so I'll skip over that.

In paragraph 64 he just talks about how all of the response at that time is just focused on dealing with the quarantine and how they were going to handle the outbreak.

Then he says at the end of paragraph 64, "We wanted to be cooperative and do everything we could to contain the illness, stop the spread, and care for our animals."

At paragraph 65 he says:

"Aside from the initial January 2nd, 2025 email from CFIA, there was no explanation during this time of what was required for the rare and valuable genetics exemptions. When it came to the exemption, in Ms. (inaudible) email on January 2nd, she asked us to send in documents of the agreement between UOF and Dr. Tsukamoto's group, which we did, along with other documentation." (As Read)

And then the next paragraph just says on January 10th they received a letter where it said, "(inaudible) there was a significant burden of proof required and robust processes must be in place to qualify for that exemption."

Paragraph 16, Mr. Bilinski says:

"We were shocked by the January 10th, 2025 email because we had not been told what the test was or about the significant burden of proof required. None of those requirements were (inaudible) to us. Rather, in Ms. (inaudible)'s email, it seemed to us that CFIA had already placed UOF's ostriches into the bird classified as having rare and valuable genetics category. We were just told to send in some documents to show that -- what we had been doing." (As Read)

THE COURT: Can I interrupt you just one more time?

MR. CARTER: Yes?

THE COURT: I understand -- we're getting back into reading the materials. And I do also want to go back to the fact that your Notice of Application, the original attack that you filed with the Federal Court, attacks the decision of December 31st, 2024.

And so the burden on you in this motion is to show that there's a serious issue with your attack on the December 31st, not the refusal to grant the exemption, but the December 31st culling order.

And you've made some submissions

on that in your Notice of Application from paragraph 52 onward, and 71 onward you've made attacks on that December 31st. That's what I'm interested in hearing, because it seems like the balance of your submissions are really on the unreasonableness of the refusal of the exemption. But, in fact, your main application attacks the December 31st order.

So you have to convince me that there's a serious issue or more than one serious issue in the attack on the December 31st order notice.

Does that make sense?

MR. CARTER: Yes, yes.

THE COURT: (inaudible/speaking simultaneously) you're getting into the circumstances around the refusal of the exemption. But that's not before the Court in the main matter. What's before the Court in the main matter is the December 31st issue. And you have addressed that, I'd just like to focus you on that rather than on the exemption refusal.

MR. CARTER: M'hmm, okay. So I think you -- I mean, certainly the effect of -- well, the effect of culling the herd is applicable

to the injunction test. So I'll start at paragraph 82.

THE COURT: Eighty-two of what?

MR. CARTER: The paragraph(sic) of Mr. Bilinski.

THE COURT: The Affidavit of Mr. Bilinski?

MR. CARTER: Sorry, yes, paragraph 82 of the Affidavit of Mr. Bilinski.

THE COURT: Right, okay.

MR. CARTER:

"CFIA has ordered that we kill all the ostriches by February 1st, 2025. The first major problem is that UOF would be incapable of recovering if the ostriches were killed. Again, some of the ostriches in the herd are from the very first group we stared with 32 years ago, and we have spent the last 32 years improving the genetics in this particular herd. There is no way to replace the herd with the same level of genetics if we had to kill the entire herd and start over. Not only that, but there's no way to replace the herd at all. UOF is the largest ostrich producer in Canada, and there are not many others. So it may be nearly impossible to purchase 400 ostriches in

Canada. Losing UOF as a producer will have an impact on the ostrich industry as a whole. As well, due to the importing/exporting restrictions that are now in place, it is very difficult to import ostriches from other countries. Even if UOF was able to purchase more ostriches, it would be yearlings and would take about two years before they started to produce eggs, and thereby generating income for UOF would take much longer than two years to develop the type of farming relationship that we have with our ostriches. UOF cannot afford to start from scratch and raise the entire herd of ostriches for two years without any income from the eggs. Another consideration is that under the compensation regime of the (inaudible) maximum compensation for an ostrich is listed as $3,000. In reality though, an ostrich costs around $7,500 to purchase. There's a deficit of $4,000 per ostrich, and UOF cannot afford to replace its herd with that type of deficit in the compensation. Another consideration is that UOF had contractual liability of Struthio for several hundreds thousands of dollars based on the agreement that UOF to deliver its ostrich eggs to Struthio. If the herd was killed, then UOF would

be in breach of it's agreement with Struthio. If the ostriches are not killed, UOF does not intend to and will not be delivering any eggs to Struthio until all of the CFIA quarantine restrictions are removed. UOF would not be able to survive the financial impact of having the herd killed, which would in turn affect me as the owner of UOF. I am 72 years old and do not have enough time left to recover from the financial impact of killing the entire herd. The second major problem, if the herd is killed, is that it would negate any ability for the scientific community to research the effect of the ostrich's natural immunity to H5N1. Importantly, none of the ostriches in the herd that survived the illness back in February 2020 became sick with the December 2024 illness." (As Read)

And that, again, we might have skipped over in the affidavit material. But the ostriches that survived that original February 2020 outbreak, none of them got sick or died from this later December 2024 outbreak.

There was a group of scientists at the University of British Columbia and at the University of Guelph who would like to research how UOF's ostriches have responded to the illnesses.

In fact, ostriches have good research potential because of high concentration of antibodies in the egg yolks combined with the fact that the herd has made it through two illnesses makes the ostriches uniquely situated for research.

And then the last paragraph there, just talks about the practicalities of trying to dispose of ostriches. The farm is not set up for containing them, to gas them or, you know, they're extremely large birds of course and run very fast, so trying to just shoot them in the fields is not practical. So there's certainly practical implications of having to, you know, try to cull this herd of ostriches.

THE COURT: So this goes to irreparable harm. This goes to the second aspect of the test which requires you to demonstrate irreparable harm from the --

MR. CARTER: Right.

THE COURT: Right. Okay, continue.

MR. CARTER: So that's the end of the affidavit there. So I'll just take you through some of the exhibits, starting at page 5.

THE COURT: I'm interested in

going back to the serious issue component. Like, what are the serious issues that arise from the December decision? What are the problems with it?

In your Notice of Application you talk about the reasonableness of the decision, you talked about the potential of incursion on provincial jurisdiction. Tell me more about that.

MR. CARTER: Okay. So right now CFIA has essentially just implemented an automatic stamping out -- it's called stamping out, the cull order. So there are kind of policies and guidelines with the World Organization for Animal Health that recognizes that, you know, stamping out is not -- like, they have a vaccination policy that should be also looked at and implemented. Especially when you're dealing with an animal, for example, that's a bit more valuable or unique than a smaller -- like a chicken in a barn, right?

So there are these directions to move away from just a stamping out -- a strict stamping out policy that would try to eradicate the infected population of the animals.

So there's a movement both, you know, just with WOAH and generally to adopt some responses that are more appropriate to the

situation and also take into consideration the development and what's happening with avian influenza.

So this is no longer a pathogen or a virus that needs to be contained so that it doesn't spread. It is everywhere, and the expert opinions talk about, you know, in terms of just the migratory ducks are spreading avian influenza. So stamping out a population is not going to contain the virus and stop it from moving up throughout, you know, the province or just throughout the area, because it travels by way of the migratory ducks.

So the decision didn't take into consideration or factor all of these things, that there are other options to stamping out. They treated the ostriches like chickens in a chicken barn, rather than unique animals that have robust immune systems that are in a rural part of British Columbia and have recovered from previous illnesses.

THE COURT: Was the prospect of vaccination or treatment ever put to the authorities by your clients?

MR. CARTER: Yes, I think they discussed those options.

THE COURT: Where would I find that in your materials? Is it in one of the affidavits?

MR. CARTER: I think -- I mean, it's just general discussions in the affidavits. But Dr. Tsukamoto in his research material does talk about vaccinations as an option.

THE COURT: I was just wondering if your clients ever put it forward as a serious alternative to culling?

MR. CARTER: I understand in the discussions they did and they also sent the materials from Dr. Tsukamoto to CFIA.

THE COURT: Okay, continue.

MR. CARTER: So, yes, in terms of I guess the reasonableness of the decision, there's a movement again within WOAH to look at these populations of animals in a more nuanced way and not...

Like, it doesn't make sense to use a stamping out policy to try and stop the spread of H5N1 in this population of ostriches, and the expert opinions talk about this too; the virus is already out there, right? It's just like trying to contain COVID in 2025. There has to be a

different approach to it rather than just stamping out.

And so that's one of the issues that we say needs to be looked at on judicial review, is was that reasonable, was the decision reasonable?

THE COURT: Under the legislation there's an option for the Minister to treat as opposed to destroy too.

MR. CARTER: Exactly, yes, under Section 48(2).

THE COURT: Right. Okay. And then you also referred to the interference with provincial jurisdiction?

MR. CARTER: So, Mr. Justice, would it be helpful to kind of go through -- the Notice of Motion basically sets out the argument on that reasonableness decision. Do you want me to kind of go through that in more detail with you from the wording of the Notice of Motion?

THE COURT: I mean, I thought that that's what you were doing. But I did read the submissions in the Notice of Application.

MR. CARTER: Yes.

THE COURT: I just wondered if you

had anything more to say about that.

MR. CARTER: No, the submissions are all set out in the Notice of Motion. It talks about the WOAH.

And I'll just check my argument here to see if there's something that I wanted to touch on more as far as that part goes. Oh yes, paragraph 62, I guess. This is, again, from the Notice of Motion that I'm reading. Recognizes the use of the vaccination against highly pathogenic avian influenza, and it's been used in outbreaks in other countries.

Paragraph 65 says:

"The WOAH manual states that experimental work for HPAI has shown that potent and properly-administered vaccines increase resistance to and prevent infection, protect against clinical signs of mortality, prevent drops in (inaudible) production, reduce virus shedding from respiratory and intestinal tracts, protects from diverse fueled viruses within the same hemagglutinin subtype, protect from low and high-challenge exposure, and reduce excretion and thus prevent contact transmission of challenge virus." (As Read)

And then, again, even in the CFIA's own website, and their material, they acknowledge vaccination has and can be used as an effective tool to fight against HPAI.

"CFIA states that vaccination has been used in various poultry species and has effectiveness in preventing clinical signs of mortality, is well-documented. CFIA has even formed the Highly Pathogenic Avian Influenza Vaccination Task Force in June 2023 to study the development and implementation of HPAI vaccination program in Canada, recognizing vaccination as a vital means of fighting against HPAI." (As Read)

So they have a whole program and task force that looks at the viability of vaccinations.

"Despite being presented with a optimal opportunity to utilize the vaccination alternative and order UOF to vaccinate its ostriches against HPAI, the CFIA acted unreasonably by failing to consider vaccination as an option and instead resorted to ill-suited method of stamping out the herd." (As Read)

Again, we already talked about under Section 48(2) there is the option to treat

the animals. The Minister has that power. And at paragraph 7(e)(ph):

"The Minister has the discretion to order the UOF to treat its ostriches against HPAI rather than impose a stamping out order. The CFIA acted unreasonably by failing to exercise this discretion and failing to consider treatment as an alternative to stamping out of the ostriches." (As Read)

So that's one of the serious issues to be tried in terms of the initial decision itself. The other is that provincial authority. So this is kind of the overlap here. I mean, we're talking about Canadian Food Inspection Agency, but this particular ostrich farm does not -- it doesn't work its way into the -- you know, it's not food. This is devoted to research. They do not sell the meat or the eggs for human consumption.

So we have an opportunity here in terms of the response to this, you know, illness that's going around, avian influenza, and how can we develop a better response that protects British Columbians, that helps protect British Columbians' health, and British Columbians' property?

So Universal, I mean it's located

in British Columbia, we have an order here that is seeking to destroy or, you know, cull not only the ostriches, but eggs, anything that would relate to this illness, this outbreak from 2024. And even some of the quarantine orders are looking to go even further back in terms of disposing of eggs before this December 2024 outbreak.

The Province of British Columbia --so this is property that's being destroyed, and we say unreasonably, right? There's no -- there are other options, viable alternatives to this stamping out policy. And British Columbia itself has an interest in the research that can be done here. And the experts will opine on this, but this is a unique opportunity, an important opportunity to be able to study this particular herd, see what's been happening, study the ability of the herd to develop this natural immunity.

Again, based off of this unique circumstance where ostriches develop high concentrations of antibodies in the egg yolks. Dr. Wilson and Dr. Pelech both talk about how this would be a prime research tool to better advance our understanding of the response to avian influenza, how to develop better protocols, how to

develop vaccines, how to be able to address what's been happening.

The Province has a vested interest in that because of just how it's affecting British Columbians and how it's affecting British Columbians' property. So when avian influenza outbreaks come through the Province there are many many chicken farmers and others who have to destroy their entire flock of animals, and they are not fully compensated for that.

Although there is compensation for the market value of the animal itself, the compensation regime does not cover peripheral costs of having to dispose of the animal.

So there is property lost to British Columbians all the time because of the avian influenza situation in BC. The Province has an opportunity here to study and learn how to better respond. But if this cull order takes effect, all of that research possibility, potential and opportunity will be eradicated.

So we say the Province should be afforded the opportunity to weigh-in on what's going on. And the Province has its own *Animal Health Act* that gives it powers to be able to

inspect and issue orders.

So at paragraph 75 of the Notice of Motion there we say, "UOF's property and its research is subject to the *Animal Health Act* of British Columbia. Despite the UOF's operations being subject to provincial authority, an inspector under the *Animal Health Act* has not been offered an opportunity to attend UOF property to conduct inspections.

So the provincial authority should be afforded an opportunity to inspect, and also we say afforded an opportunity to weigh-in on whether this is important research that should be conducted to better protect British Columbians.

And we also say that there is a potential Charter violation just in terms of how they are -- the decision itself in light of all these factors just, you know, destroying Universal's property, the ostriches, the eggs, and there is a potential Charter argument that is a violation of the rights of property.

So those are the main issues on the actual Judicial Review Application as I'm sure you're aware and read in the Notice of Motion. It's a low threshold for arguing a serious issue to

be tried. You know, showing that it's not vexatious or frivolous.

And I don't know if you want me to take you to the materials. I'm guessing that you've already read through the authorities, you're well-aware of the authorities and the tests and...

So, Mr. Justice, would you like me to take you to the injunction test on serious issues to be tried or...?

THE COURT: I'm quite familiar with it. The Court uses the test frequently.

MR. CARTER: Right, okay.

So the next issue would be the irreparable harm, and that's at paragraph 80 of the Notice of Motion.

So at paragraph 80 of the Motion it says:

"Irreparable harm refers to the nature of the harm suffered. Harm is irreparable if it cannot be quantified in monetary terms, cannot be cured or would be difficult to compensate in damages. Examples of irreparable harm include being put out of business, suffering a permanent market loss or irrevocable damages to business reputation, or a permanent loss of natural

resources." (As Read)

And that's in the *McDonald* case at paragraph 64.

"An Applicant need only demonstrate that it may suffer irreparable harm because there's a doubt damages would provide an adequate remedy should it succeed at trial. Clear proof of irreparable harm is not required." (As Read)

In the case at hand, UOF will suffer irreparable harm if the ostriches are killed. First, it will not be able to replace the ostriches. Mr. Bilinski and Ms. Espersen have spent the last 32 years improving the genetics of this particular herd. The herd with the same level of genetics is irreplaceable.

Not only is the herd with the same level of genetics irreplaceable, but there's no way to replace it at all. So UOF is the largest ostrich producer in Canada, there are not many others, and it would be nearly impossible to purchase 400 ostriches.

So we have two points there. The first is that this particular herd has been developed over 32 years through their processes of

selectively breeding it and developing a large ostrich, and that herd itself is irreplaceable because of the work that they've been doing with this herd.

Then the second part is that even if they replace it with other ostriches, there's not even -- the ability to buy 400 ostriches in Canada is essentially non-existent.

So losing Universal as a producer will have an impact on the industry as a whole. And, as well, due to the importing and exporting restrictions that are now in place it is very difficult to import ostriches from abroad.

So they are more or less constrained to being able to find ostriches in Canada, and part of this has to do with the importing, the exporting, and restrictions because of the avian influenza, and you have to find a disease-free country in order to be able to import from.

Second, the financial impact of killing the ostriches will cause Universal to go out of business. Under the compensation regime of the *Health of Animals Act* the maximum compensation for an ostrich is $3,000. However, the cost to

purchase an ostrich is $7,500. So we have a deficit there of $4,000. And these are for breeder ostriches. But they're not going to be fully compensated because the *Health of Animals Act*, there's a compensation regime under the Regulations and it sets the maximum that they can be paid for the ostrich if it's killed.

So damages under the regime are not going to be an adequate (inaudible). Also there's the issue of, you know, if they were able to find ostriches, they would be yearlings, which would be the younger ones. It takes up to 3.5 years for them to become good breeders, meaning ostriches that can lay eggs, and of course Universal is geared towards research using the eggs for research and developing the antibodies.

So there's a period, a lag period there where they're not going to be generating income as they wait for these ostriches to grow.

So if the ostriches are killed, then UOF will not be able to supply, the financial impact of these factors, and they'll go out of business.

Third, killing the ostriches will cause irreparable harm because it will extinguish

any ability to research the effect of these particular ostriches' natural immunity to H5N1.

Dr. Steve Pelech has opined that the UOF ostriches represent an important potential research model for, amongst other things, testing how long and effective herd immunity to H5N1 can last. Dr. Pelech also said that testing egg yolks from an ostrich hen for the presence of antibodies against a virus like H5N1 would be an ideal method to evaluate natural immunity from previous infection or immunity that may be produced using a vaccine.

Also, irreparable harm will be established if the underlying application for judicial review is rendered moot, which is what would happen in this particular case. If the ostriches are culled tomorrow, then the application for judicial review is essentially moot, there's no point to it.

Finally, in the application for judicial review UOF has asserted that its Charter rights have been violated. Assessment of irreparable harm involving Charter rights should keep in mind that damages are not the primary remedy for a Charter violation. And that's the

McDonald case at paragraph 65.

Mr. Justice, can I take you to the doctor reports? Would it be helpful to go into those in more detail?

THE COURT: I'm familiar with them, I'm conscious of the time, we're at 1:08, and you still have to address balance and convenience. And I have to hear from your friends.

MR. CARTER: Okay.

THE COURT: So, as I said, I received the materials last night, I've had time to go over them last night and this morning. And if you want to just make the points from the affidavits, that would be fine. But I want to make sure that your friends have an opportunity.

MR. CARTER: Right, okay. Yes, so I've referred to what Dr. Pelech opined on. I think, you know, the questions I would say that are most relevant from his opinion are addressing the public health risk, which is the first question in his report. And then of course the unique opportunity and the value that this herd would have towards research in general.

We received the second report later yesterday afternoon after the motion record

was filed. So I believe it was e-filed this morning, but there should be an affidavit attaching a report of Dr. Wilson. I'm not sure we can email that in if you don't have it --

THE COURT: I have -- I have it.

MR. CARTER: Okay. So Dr. Wilson is a doctor of veterinary medicine at the University of Guelph. He has his PhD in epidemiology, specializing in zoonotic diseases. He's 18 years as a cross-appointed professor of public health at the University of Guelph, and is a Senior Epidemiologist and Manager at the Public Health Agency.

And then a couple points down, he has over 30 years of extensive involvement in poultry infection, diseases research and industry projects. And so he has worked specifically in this area of poultry illnesses.

And if we look at page 6, I believe, of the affidavit, with the Bates numbering system. Sorry, just one second here. Just want to make sure we're on the right page here. Sorry, we just sent this in last night, so I'm going to get the correct page numbers.

So under page 6, potential of

herd immunity in the farm family. And then under implications for transmission and future flock management he has a number of points there.

Point 1:

"Acquired immunity in both birds and people will help prevent further transmission to other animals and humans, both on and off the farm. If the current flock is culled, repopulating the farm with new ostriches will likely introduce birds with no immunity to HPAI, unlike the existing flock which has likely developed immunity. These new birds would be susceptible to reinfection from wild waterfowl. The new susceptible birds could pose a greater threat by serving as a reservoir for reinfection, potentially spreading the disease." (As Read)

Then at the next page, the second paragraph down, starting with "If these birds..." Says:

"If these birds also possess antibodies to HPAI, which appears likely based on the evidence outlined above, then their eggs could otherwise be critical for research and potential clinical applications in human HPAI cases." (As Read)

So we have a concern here about how this virus could potentially affect humans. And this situation with the ostriches at Universal Ostrich Farms provides a unique ability, an opportunity, to research the antibody response and production and how that could be used as a valuable resource for pandemic preparedness, and also its applications to humans in HPAI cases.

So, again, all of that would be lost if this cull order takes effect tomorrow.

The next paragraph down, Dr. Wilson says:

"This is highly significant because HPAI is arguably the most imminent candidate for a future human pandemic. Given this reality, depopulating the farm could in fact increase public health risk by eliminating a valuable resource for pandemic preparedness." (As Read)

The next paragraph down, "From a public health and outbreak management perspective, it is reasonable to conclude that maintaining the flock under the structured best practice outbreak response framework described above poses a lower risk to Canadian public health than culling them

prematurely."

And then under the next heading, he says, "The current approach to HPAI control in animals and humans in Canada is not aligned with established best practices."

So Dr. Wilson, again having 30 years of experience, and dealing with avian influenza outbreaks in poultry, says that this is a critical opportunity and model to study to determine how to create a better response to AI, avian influenza.

Dr. Pelech also addresses those arguments in his report, or opines on those things. But you had that report yesterday, so those would be under the -- the first question deals with the public health risk or lack thereof, because it's extremely unlikely that a virus is shedding at this point, so it poses no public health risk. And then the high value of this for clinical trials and research.

So balance of convenience. And I'm reading from paragraph 97 of the Notice of Motion --

THE COURT: No need to read. I'm happy to hear your submissions on it, but I'm conscious about giving your friends enough time.

MR. CARTER: Okay. So the summary of my submissions on the balance of convenience here is that we have -- you know, if this order is not stayed and any implementation requiring them to be culled tomorrow, Universal of course will essentially, as they say in their material, go out of business. They cannot recover from the financial impact and we lose this important opportunity to research and advance our understanding of a response to avian influenza.

Conversely, there's little to no impact on CFIA. There is no public health risk, and they still have the same remedies after the injunction ends as they would have now. If the ultimate judicial review is not successful, they can still carryout those orders.

So in the interim with the fact that there's no -- little to no public health risk here and the significant loss that we're facing, the balance of convenience overwhelmingly weighs in favour of granting the injunction.

And, Mr. Justice, we're also asking for an order just amending the quarantine to allow testing. Right now, the quarantine order does not even allow testing of the ostriches. So

that would be one of the things that we would want to see happen.

THE COURT: Thank you. So I take it those are your submissions. And I'll turn it over to Counsel Saunders.

MR. SAUNDERS: Justice, we have sent in our record --

THE COURT: And I do have that.

MR. SAUNDERS: Okay. What I was going to -- pardon me, Justice.

THE COURT: Go ahead.

MR. SAUNDERS: What I was going to propose is just to provide the Court some time to review those materials, perhaps in a 15-minute break, if that makes sense.

THE COURT: I would love that. So we can recess for 15 minutes. Is that going to leave you enough time? I know we're scheduled here for two hours. I don't have a constraint, but are you -- how much time do you think you'll need?

MR. SAUNDERS: So I'm going until 11:00, is that correct?

THE COURT: Yes, that's right. So it's scheduled to end at 11:00.

MR. SAUNDERS: I think we'd be

well-served with providing the Court 15-20 minutes, as much time as you feel that you need to review the materials. Because, you know, there's no sense in me walking you through what you can read. And you may come back with some questions, and we can focus on what's more interesting or what matters more to the Court.

THE COURT: All right. And do you have time constraints, Counsel Carter?

MR. CARTER: I do not, no. We're available.

THE COURT: Okay. So why don't we recess for 15. So we'll come back in 15 minutes and we'll hear from you, Counsel Saunders.

MR. SAUNDERS: Thank you.

THE REGISTRAR: Okay, the Court is in recess for 15 minutes. Thank you.

--- UPON RECESSING

--- UPON RESUMING

THE COURT: So, Counsel Saunders, I'm ready whenever you are. And, you know, just to help you out on the serious issue, yes, I am of the view that the serious issues that are alleged have to relate to the main application and not to the refusal of the exemption.

So you can focus on the issues that the Applicant identified, and of those issues the ones that have caught my attention have been the reasonableness of the decision in terms of the discretion afforded to the Minister under the statute to treat versus destroy.

And, secondly, the issue of the provincial jurisdiction. Those are the two issues that are of most interest to me.

MR. SAUNDERS: Thank you for that guidance, Justice.

So, as you've seen, CFIA's position is that an interlocutory injunction should not be granted because the three-part test hasn't been met. And I stressed earlier that this is an injunction in the public law realm which, in my submission, is not adequately addressed or is not fully addressed in the motion before you, the extent to which other public interest considerations come into play. So I'm going to deal with that.

Our primary position is that the public interest in allowing the Canadian Food Inspection Agency to carryout its duties under the *Health of Animals Act* to protect the health and

safety of animals and all Canadians far outweighs economic harm to the applicant, which they may suffer if an injunction isn't granted.

And I want to emphasize as well with respect to the additional relief sought, asking the Court to amend a quarantine order. I don't believe the Court can make such an order. The Court could simply quash such an order, but it's not before the Court, in my submission. So that --

THE COURT: I have reservations about that as well.

MR. SAUNDERS: I did want to make one more point that kind of follows from the urgency issues we discussed earlier. We're in a difficult position because we haven't been able to respond to everything or fully respond to everything and, in some cases, at all.

So to the extent that CFIA hasn't been able to respond to an issue or you find that there are some gaps in the evidence, I would just ask the Court to not draw an inference that the CFIA couldn't respond to that and could not fulsomely respond to that.

In the Motion Record there's an

affidavit that we have prepared, and that's from Cathy Furness, you can find it at page 1 of the record. And I won't go through everything that's set out in paragraph 1, but Ms. Furness is Deputy Chief Veterinary Officer Canada, Office of the Chief Veterinary Officer Policy and Programs Branch at the Canadian Food Inspection Agency.

And skipping to paragraph 3, she discusses how she served as the National Incident Manager for CFIA Outbreak Response to highly pathogenic avian influenza from October 2023 until March 2024, and then again from November 2024 to present.

And she talks about how in this role she provides leadership and disease management expertise and support communication between industry and government partners. So someone who's familiar with CFIA and Canada's broader response to avian influenza.

In this affidavit she gives really a high-level overview of what this disease is, what CFIA and Canada are attempting to do about it and why, and some facts about what happened in this particular case where over 60 ostriches at Universal Farms died, and that was confirmed to be

from high pathogenic avian influenza.

So it really is just a broad overview for you, but it gives you a sense of the bigger picture here; what CFIA is trying to accomplish, and where this particular response relates to a much broader response.

I'm conscious of giving evidence. I'm not sure if this is in the record, but there are millions of birds have been culled to avoid the spread of this disease, at least as I understand it.

In this affidavit, there are some exhibits. There are some excerpts from the what we call WOAH, or World Organization for Animal Health, I think, if I'm saying that correctly. And we also have two orders. The order that's at issue in the application or that's being impugned in the application, and that is at -- that's Exhibit C beginning at page 33. And I took you or referred to this this morning. But if we could just go back to the order briefly, I think it would be helpful.

So this -- you've noticed that this is the order that is impugned in the underlying judicial review. And when we're talking about harms, we're talking about harms that flow

from this order. We talked a little bit about when it was issued and that it was effective immediately and required Universal to take action to dispose of the animals on the basis that they had been infected.

And what we're dealing with here is really that time period expiring, which will be tomorrow. And I just want to emphasize, again, that under Section 48 of the Health of Animals Act the Minister can require someone to do something or the Minister can do that themselves, including the disposal of animals.

I'll come back to that, but I don't want to make too much of it, that point. But I think it is important just for framing what this injunction is actually about.

And I referred you to the penalty provision. I'm not suggesting there's going to be some penalty here, but if you look at the order, Section 66, of the *Health of Animals Act*, holds that there can be -- that it is an offence not to comply with one of these orders.

And the penalties that are listed include liability for imprisonment. The reason I put that out now is just to -- because I think that

goes to how -- the public importance of following these orders. That's why we have that. This is considered serious by the government, there are significant liabilities to not complying with it.

I'd just like to go to paragraph d -- pardon me, Exhibit D, very quickly, which is the January 10th, 2025 decision or rather the reasons that were provided for not issuing an exemption to the cull policy or the stamping out policy.

And you've noticed that the decision on the exemption is not being judicially reviewed. From a broad picture, a lot of the submissions on the motion about why this meets the test for irreparable harm and other reasons go to this decision and why this decision was alleged to be unreasonable or unfair.

So it's important to distinguish between these two; the order and the decision on the exemption.

THE COURT: I have them completely distinguished in my mind.

MR. SAUNDERS: Thank you.

THE COURT: Yes, I'm very clear that the judicial review was commenced as a review

of the December decision, the order to cull or destroy, or however you want phrase it.

MR. SAUNDERS: Okay. Thank you, Justice, I just wanted to go there, it's an important point. So --

THE COURT: I still feel like I'm missing something about your characterization of the December 31st. You've mentioned it a few times, and I just want it to be clear. This is an order for them to destroy the animals by tomorrow, right? So this is -- and they'll be subject to penalty if they don't.

So I'm not quite sure why you -- if I'm mischaracterizing it or if I'm understanding your full submission on it. We're on the same page, that this is an order for them to dispose of the animals, to cull the animals by the end of the day February 1st or face penalty.

MR. SAUNDERS: Yes, I think it would be helpful to -- the easiest way to bring it up would be paragraph 8 of the Memorandum of Fact and Law that we provided where you can find Section 48 of the *Health of Animals Act*.

THE COURT: Okay, I'm there.

MR. SAUNDERS: And Section 48(1)

says, "The Minister may dispose of an animal or thing, or require its owner or any person having possession, care or control of it to dispose of it, including when it's contaminated by disease."

So this was an order for Universal to undertake this itself. That's my point. My point is it really goes to irreparable harm and the fact that if you enjoin this order you won't be enjoining the Minister from doing this. That authority will still be there.

THE COURT: Okay. Well --

MR. SAUNDERS: I'm not making any suggestion about what will happen, it's just --

THE COURT: Okay, let's deal with that, with irreparable harm then. I assume you're going -- I don't want to throw you off your submissions, if you want to start with serious issue and move onto irreparable harm, that's fine.

MR. SAUNDERS: That's about all that I had to say to you about that for irreparable harms as well, because you brought up the fact that it has to flow from the order. But we have this distinction here between whether Universal does this or the Minister could potentially do this or would have the authority to do so as well

regardless of whether or not this order is followed.

So you're being asked to enjoin this order, in my submission, more to relieve of noncompliance than to avoid a cull. That's the point I'm trying to make. That's how we say that this is better characterized.

So I'm not going to read through this, the memorandum. I trust that, you know, you've read it and (inaudible/noise). Pardon me?

THE COURT: I didn't say anything, I think it was an observer that was entering.

MR. SAUNDERS: Oh, sorry. So the facts begin at paragraph 4 that we have set out. And all of these, to the extent they are cited to evidence or to our only affidavit, and I'll try to alert you if that's not true in any case. But at paragraph 4 you can find a description of the CFIA's mandate, what it does.

And the last sentence there in this is probably the most -- one of the more relevant ones here. That one of the Agency's primary objectives is to protect Canadians from preventable health risks related to food and zoonotic diseases. And zoonotic diseases are

diseases that have potential to transmit from animals to humans.

So that's one of the things that this type of stamping out action or this type of response to avian influenza is intended to avoid.

At paragraph 5 there's a reference to the World Organization for Animal Health, which I referred to earlier, of which Canada is a member. And this is more my -- something that I'm saying, but it somewhat seems analogous to me, at least to the World Health Organization, it's an international partnership which sets out some best practices and standards and so forth.

You heard some submissions about what this organization's doing or what its intentions are. And I didn't find reference to those in the materials. The fact that this organization, like Canada, like CFIA's, is looking into vaccination and its potential as an alternative to the stamping out policy is a bit of a red herring, because there is investigation of that as a policy.

But that certainly isn't CFIA's policy for dealing with this. And applying a

stamping out policy is consistent with WOAH's standards and guidance. And some of that is attached as exhibits to the affidavit and refers to the stamping out policy and what could potentially happen if it's not implemented, and I'll back there. I just wanted to raise that before I forget.

I've already taken you to the -- to Section 48, but there's just a description of CFIA as being responsible for administering and enforcing the *Health of Animals Act*. That's the statutory scheme that we're in.

And because applying these kind of policies and a stamping out policy or requiring a cull of animals that are infected with disease can have economic consequences, there is a compensation regime. You've heard a little bit about that. That's the compensation for destroying animals and things, regulation. So if a cull is ordered, compensation can be assessed under that regulation.

From paragraph 10 to 11 and onward, to paragraph 16, there's just a general overview for the Court of avian influenza, what it is, how it spreads among birds, how it can spread

to other animals, including people. And just a useful distinction that's made at paragraph 12 is between high pathogenic and low pathogenic strains.

So when you see reference to that, just being a person who -- with no particular expertise in virology, I think of it as the bad one and the good one. Maybe I'll get in trouble for using that characterization from a scientific perspective.

But, at the very least, HPAI is the one that's of greatest concern to the CFIA, I can say that. And I believe that includes the potential for -- I'm going to stop there. I'm not going to make more submissions about the virus. But it is set out in the affidavit.

Importantly though in this section, there is some discussion of the potential transmission to humans, which can and does occur, although it's rare. And that, of the cases that have occurred, have been reported since 1997, which doesn't mean all the cases, but the ones that have been reported worldwide. Half of those 900 cases have been fatal. And here in British Columbia in the fall of 2024 there was an incident where a teenager did become critically ill from this virus.

So however that risk is quantified, there's a risk of human transmission, there's a risk of serious illness and death. So it's a virus of concern to CFIA and Canada.

At paragraph 16 there's just a mention of the fact that ostriches we already know are susceptible to the virus, this form, they did die from -- many of them died.

But one of the points that's made throughout the materials is the ostriches are now healthy. So just want to point to some of the discussion here about how -- whether or not the birds recover and appear healthy is not the concern when implementing a cull policy. That concern also includes the potential for the mutation of the virus among healthy birds.

So when a stamping out policy is implemented, it's implemented to the flock of animals as a whole on the basis that there has been exposure to the avian flu, including for that reason, to avoid populations that could incubate and mutate the virus and create new variants.

Again, being a lawyer, I'm not an expert in this area, but that is described in the affidavit -- pardon me, in that memorandum, and

which refers to excerpts from Cathy Furness's affidavit.

At paragraph 17, 18, 19 and onward there's a discussion of CFIA's response to high pathogenic avian influenza. As discussed in Cathy Furness's affidavit, the intention of CFIA's response to the pathogen is aimed at mitigating a variety of different risks.

There is obviously impacts on domestic birds if there's an outbreak in a poultry facility or otherwise. There's also impacts on wild birds of course. There's health impacts on humans, as I've discussed, potentially. And one of the concerns is that an infection in birds could be a precursor to a human flu pandemic. Regardless of how likely that is, you know, once that happens it's happened so that is a concern motivating CFIA's response.

And there are also potential economic ramifications of not applying a policy and losing what is called disease-free status, which I'll move onto.

You can find a description of the stamping out policy at paragraph 18 and 19. And paragraph 19 is where it discusses the consequences

of not applying, or one of those policies under the terrestrial animal health code.

So if stamping out is applied in response to a confirmed outbreak at a poultry facility, the country can return to disease-free status within 28 days of addressing that. Whereas if stamping out is not implemented, disease-free status is lost -- pardon me, disease-free status can be lost and that can have impact.

THE COURT: Is there anything in the materials that describes the considerations that go into an order of this nature requiring the owner to dispose of the animal versus the Minister taking that initiative on the Minister's own behalf? Is there anything in the materials that discusses whether that consideration, you know, is based on the urgency or the level of risk? Anything?

MR. SAUNDERS: There isn't. I raise that simply as a possibility that that's set out in a statute in power. But my understanding is that once the virus is confirmed, as it was in this case, there is at least not consideration -- that there is a process for considering exemptions, but there's not a process for considering let's see

what happens in this case and maybe we'll do something else here or we'll, you know, these birds seem healthy. Like, that's not how the stamping out policy is implemented in my understanding --

THE COURT: No, I do understand that. But you've made the point that really what's before the Court today is not so much whether the birds are disposed of or not, but who does the disposal. As you said, you know, a stay of this order really just means the ball's in the Minister's court to dispose of the birds.

And I guess I was asking, like is there anything in the materials, the policy that provides considerations about when the Minister decides to put the ball in the owner's court versus when the Minister will take that initiative?

MR. SAUNDERS: I don't think that is in the materials, and I don't think I can properly answer that question.

THE COURT: Okay. No, I appreciate that. And my other question was is there anything in the materials -- like, your friend raises an attack on the reasonableness of this by saying that the Minister, under statute, has a discretion to dispose of the -- to order

disposal of the animals or to dispose of the animals, or to treat/vaccinate the animals. The discretion for both exists under the statute.

Anything in the materials that discusses the considerations or the relevant factors to the exercise of that discretion?

MR. SAUNDERS: There isn't, to my knowledge. But Section 48 deals with -- it's not specific to this disease. So I think the only way I can answer that is saying that CFIA policy is to implement stamping out subject to exemption, which I'll talk about. Does that help answer your question?

THE COURT: It does, yes. I was just -- so what you're saying, basically, is that the discretion that exists in 48(2) of the *Act* isn't, in practice, recognized by the Minister? The discretion to treat as opposed to dispose of? In other words, you're saying that once the disease is detected, the Minister pivots toward disposal as opposed to treatment?

MR. SAUNDERS: The implementation of stamping out does involve disposal or attempt to eradicate herd. I don't think I can speak exactly to how that policy relates to the Minister's

broader discretion under Sectio 48 specifically.

But to the extent that the stamping out -- the stamping out policy is not necessarily automatically applied because there are the exemptions, the exemptions do exist, but I'll talk about what those are.

THE COURT: I just feels to me that there's an alternative under the legislation, treatment, and there isn't so much evidence in this case that that was a consideration.

MR. SAUNDERS: It is, but certainly is possible, but that is not consistent with CFIA or the Government of Canada's approach to these pathogens.

THE COURT: Okay, thank you.

MR. SAUNDERS: We may be speaking about powers that exist versus policy, but I don't want to make strong statements about that. I'm not sure that that distinction matters in this particular case.

THE COURT: I mean, but your friend's point is that there's this discretion that exists under the legislation, that Parliament gave the Minister this discretion to treat as opposed to cull, destroy, kill.

And the, you know, *Vavilov* tells us that where there's a discretion that exists in the statute the Minister's decision has to be respectful of that discretion. The discretion has to be exercised for the purpose that it's given. And so I just wanted to know your thoughts on that.

You're telling me that the discretion to treat is kind of disregarded by the Minister?

MR. SAUNDERS: I certainly wouldn't use the term disregarded. I don't think there's anything in the record that suggests that or confirms that a treatment is available or that a treatment -- applying any other kind of treatment like vaccination would avoid the risks that are attempted to be mitigated. So it's more of a -- like, there would have to be something to exist to suggest that treatment was possible and consistent with the containment of the disease.

And I don't think there is anything in this record that says that other than, you know, the possibility that a promise of vaccines, which is already something that CFIA is looking into. But that -- this kind of -- we're getting into, I think, what is a broader point I

think that was made in CFIA's submissions here about how on the injunction the Court is in a difficult position being asked to -- you know, in some cases it's been referred to as act as an academy of science or make a decision about what type of risk is allowable here or...

That's not within my expertise and it's not really within the Court's expertise either, as you've been alluding to. The Court can assess whether a decision was reasonable. But in this situation the Court is in a very difficult situation because by issuing an injunction there's a risk of sort of in effect making a decision about what level of risk is tolerable. And, as you've alluded to, certainly CFIA's policy and Government of Canada's approach may be risk averse and precautionary, but it's difficult to -- pardon me.

THE COURT: The way you've pitched my decision is who bears the responsibility to act on the risk identified by the Minister? I mean, I think there's some weight, there's some justification for the way you characterized it, because the Applicants are really asking to be relieved of the obligation that arose from the December 31st Order.

MR. SAUNDERS: Yes. And that is what we say is the problem here, particularly doing that, you know, making a decision that it's okay. Like, we have a -- I haven't had a chance to review these scientific reports, but there may be a scientist who thinks 60 days -- if we have a 60-day injunction here it's not going to be a problem, everything will be okay.

But, ultimately, the Court's in a difficult situation making an order that will be in effect a decision that the public can bear risks. And there's many -- I've cited quite a few authorities in respect of the balance of convenience that to go to that point. This is presumed to be in the public interest, it's consistent with the statute and it has to do with the control of a pathogen that has potentially far-reaching consequences that greatly exceed the impact on any -- for example, any particular harm. Like, that's the --

THE COURT: But my order, as you've characterized it to me, would not stop the culling or the destruction of the animals. The way you've characterized it, under the statute the Minister -- my order's not going to stop the

Minister from taking whatever steps the Minister needs to take to protect the risk that's identified. My order suspends the obligation -- would suspend the obligation on the Applicants to destroy the animals.

MR. SAUNDERS: I think that does go potentially to irreparable harm. And I suppose it also goes to whether or not an extraordinary remedy should be granted in this instance. An injunction is an extraordinary remedy and the actions of public authorities are assumed to be in the public interest.

So if we deal with this on the basis that the order can be made and the Minister can proceed anyway, I'm certainly not trying to submit that that's the correct approach or predict in the future in terms of what's going to happen her. I think we just have to look at -- you know, we have to apply the injunction test, including the irreparable harm piece, and that's just something that goes to that and what this order is about.

I don't think that's -- and, Justice, if you have trouble with that point, I certainly don't think that's a necessary point for your decision. I don't think that's the main piece

of this. I think what I'm going to say about balance of convenience and, otherwise, about irreparable harm are certainly sufficient to dismiss this motion.

So I don't want to get bogged down and let this issue or suggest that this is really the fundamental issue that's before the Court.

THE COURT: Thank you.

MR. SAUNDERS: So I think I'm already over time.

THE COURT: Yes. So, I mean, I don't -- I'll just ask the Registrar if we have a time constraint administratively. I don't, but let me just find out if there's a problem with us remaining.

THE REGISTRAR: No. For myself, I'm okay. Do you have I guess an ETA until what time this could go on 'til?

THE COURT: So, Counsel Saunders, do you know how long you expect to be?

MR. SAUNDERS: If I could just have 10 minutes with apologies for running over that

THE COURT: Okay. So if we give

you 10 minutes, and then we'll go back to the Applicant for seven minutes. And so we'll say 2:30 we'll wrap-up, 2:30 eastern time, which is 11:30 Pacific.

THE REGISTRAR: Yes, that's no problem for me.

THE COURT: Thank you.

MR. SAUNDERS: I'll move on to serious issue to be tried then, which is beginning at paragraph 44. And, as is stated there, we really haven't had a lot of time to consider what arguments could be made. But we just pointed out a few areas where we say there is no serious issue to be tried or at least the strength of the argument is not strong, which is something that you can then consider and balance with convenience.

As you mentioned, arguments with respect to procedural fairness that go to the exemption decision aren't really relevant here. There's -- I've already mentioned this, but there's a number of different suggestions about research potential, what research would be done, what policies would be preferable to stamping out and that kind of thing.

And we just had a bit of a

discussion about that in terms of just having caution to the many cases that set out that. We're not really here to resolve scientific debate about what is the appropriate risk threshold, or risk, or how it should be quantified, or anything of that nature.

I forgot to -- I think you asked a few questions about discretion, so I just draw your attention to the *Bedard v. Canada* case at paragraph 49, which is somewhat analogous and that was a case in which the Court dismissed an injunction in similar circumstances, and referred to the highly differential standard of review that would be applied by the Court a factor. That may be an authority that is helpful to you.

THE COURT: The case was from 1997 I noticed.

MR. SAUNDERS: Yes, it is from 1997. That might have been why I didn't -- I'll just leave it with you.

THE COURT: Thank you.

MR. SAUNDERS: In terms of the Charter rights. Charter rights are brought up, but there's no -- there really aren't any particulars of what rights were breached, what the arguments

are here other than a reference to property rights. And we say that those kind of bare assertions are -- they don't raise a serious issue to be tried about the Charter. This is fundamentally about the order and impugning the order. We don't see how this can be a Charter case on the basis of what's in the Notice of Application.

With respect to irreparable harm, there were a number of submissions made about irreparable harm that -- what I heard is more that the inability -- the ability to produce ostriches would be impacted, there would be no way to replace them all or it would be difficult to replace them because of import restrictions and that the compensation is inadequate.

But the fact that there is a compensation scheme contemplated and the legislation supports the idea that money damages can be appropriate to compensate an operator for the loss of livestock. There are other harms that are alleged that have to do with the scientific community or loss of knowledge, and those are not irreparable harms to Universal. You could consider those under balance of convenience.

I looked, there's case law that

says that the Crown doesn't have a monopoly on that and the Applicants are free to raise that. I just wanted to draw that to your attention.

There's discussion with respect to irreparable harm about liabilities, the requirements to pay contractual partners. I have difficulty with the idea that monetary amounts that are owing, which are quantifiable, could ever be irreparable harm with respect to the test that the Court is to apply.

Moving onto balance of convenience, because I think we've covered everything else I had to say on irreparable harm elsewhere. I referred to the principle that the exercise of statutory authorities is presumed to be in the public interest, and this is legislation, the *Health of Animals Act* legislation geared towards the production of health in animals, and not the economic interest of other individuals.

I've cited a case at paragraph 63, *River Valley Poultry*, that discusses that in another context. And the importance of that is when you're weighing the consequences to an individual farm against outbreaks that could affect the poultry industry as a whole, we're dealing with

the potential for harm of an entirely different scale.

This is a difficult situation and I understand that this is devastating just as a citizen. But we're dealing with a problem of a much larger scale here. And I talked about the fact that this could have trade implications for Canada, it could prevent potentially the export of poultry.

These are -- it's a very big picture problem and Cathy Furness is probably not, quite frankly, the best situated to speak to all the ramifications of that, being that she focuses more on animal health. But she is familiar with that and did swear to that in her affidavit.

But what I would say about that as well is just that it's difficult to quantify harm such as damage to Canada's trade relationships, to say exactly what that is or what that would be, but it's a consideration here. And I've also mentioned potential for human flu pandemic and the fact that this pathogen can be deadly to humans.

And with apologies for going over time, I think those are my submissions, and CFIA

would rely on anything that's in its written submission to the extent that I've missed anything.

THE COURT: Thank you very much.

So over to you, Counsel Carter, for closing comments.

MR. CARTER: Thank you, Mr. Justice. Yes, my friend, he touched on the public interest of this. And certainly under the balance of convenience part of the test, you know, there is a lot of public interest, not only in just using this as a research in natural immunity, but also in developing antibodies.

Because my friend was trying to say there's a public interest in CFIA implementing its policies. So there's equal I would say, if not more, public interest in looking at this situation uniquely and specifically.

Also the CFIA's policy on vaccination, my friend referred to it and basically just taking a stamping out a approach without any other considerations. We would say that itself is unreasonable.

As you mentioned, there is deference under Section 48 to the *Health of Animals Act* and, you know, we say that they did not -- if

you just close your eyes and say, we're taking a stamping out policy without looking at all these unique circumstances, like the ostrich itself, the robust immune system, the location, it's in remote, rural British Columbia, the prior infection, February 2020, and the fact that CFIA on its own website recognizes vaccination as an option.

All of these things should have been in consideration when a decision is made. We heard today that they just will take an automatic stamping out policy. So they're not considering the options and the discretion that they have to use treatment instead of disposing or culling of the herd.

Another issue on that point is that my friend said, the health of the herd is not a consideration. Well, that itself, you know, just shows that they're not looking at the fact that ostriches are different than laying hens in a barn. Right? The ability of the ostrich to withstand or to survive the pathogen and develop antibodies should have been part of the consideration when this order was made.

So stamping out as a policy in light of all of the other movements forward to

address the AI differently just ignores the ability to learn from this situation, develop antibodies, and address it in a different way.

Now, my friend also referred to kind of just food pandemic and whether that was an issue. So CFIA, on its own website, says that HPAI is not a food safety concern. And that is in the motion record, it's at Tab 6, page 120, the Affidavit of Karina Jones. There's a printout from CFIA's website there. It says specifically, avian influenza's not a food safety concern. There's no evidence to suggest that eating cooked poultry or eggs could transmit the virus to humans.

So it's not a food safety concern. This farm in particular does not sell eggs or meat in any event. And so that should not be -- there's no risk there as far as a risk to human -- public safety risk.

Also Dr. Wilson, in his report, says that eliminating this herd actually increases the public health risk because of their natural immunity. So those are just in terms of addressing the balance of convenience.

And again, my friend referred to the impact on other poultry producers. We have an

opportunity here to learn, to advance the science, to be able to create better responses, and that itself would help the poultry industry as a whole.

So right now, again, it's a remote location, there is quarantine in place. These farmers, you know, the principals of Universal, they've been doing this for 32 years, they have a history of knowing how to build quarantine facilities, that's in the material, they're complying with all the quarantine orders. So all those procedures are in place to mitigate any potential risk to the public.

So I don't think I have any other submissions, unless you have questions, Mr. Justice?

THE COURT: I don't have any questions. I want to thank both sides for your submissions, your extensive written materials, particularly counsel for the Respondent, Counsel Saunders and Counsel Marks, thank you, I know you were put in a difficult, reluctant position, but you did very well, very helpful.

I expect that I'll be able to have my decision for you today.

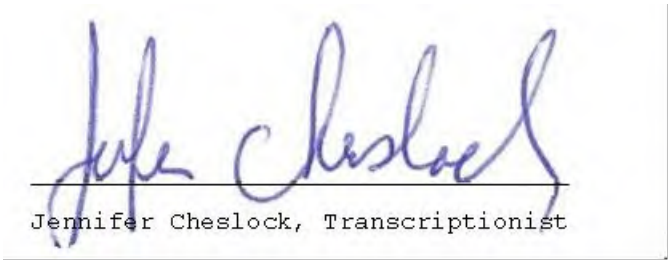
Thank you again for appearing

today, and this concludes the matter.

THE REGISTRAR: Thank you, Justice Battista. Thank you, counsel. This hearing is concluded. Thank you.

--- Whereupon the hearing concluded.

I HEREBY CERTIFY THAT I have, to the best of my skill and ability accurately recorded by Shorthand, and transcribed therefrom, the foregoing proceeding.



_____

Jennifer Cheslock, Transcriptionist

Court File No.: T-294-25

FEDERAL COURT

BETWEEN:

UNIVERSAL OSTRICH FARMS INC.

Applicant

and

CANADIAN FOOD INSPECTION AGENCY

Respondent

NOTICE OF MOTION

TAKE NOTICE THAT the Attorney General of Canada, on behalf of the Canadian Food Inspection Agency, will make a motion to the Federal Court, as soon as the motion can be heard, at 701 West Georgia Street, Vancouver, BC or by videoconference as the Court directs.

THE MOTION IS FOR:

1. An Order clarifying that the Court's Order dated January 31, 2025, staying the December 31, 2024 Notice requiring the Applicant to dispose of its ostriches pursuant to subsection 48(1) of the *Health of Animals Act* ("***HAA***") until a decision is rendered in the underlying application for judicial review does not enjoin the Minister from exercising the Minister's authority to dispose of the ostriches under subsection 48(1) of the *HAA*; or

2. In the alternative, an Order abridging the timelines for the remaining steps in the underlying application for judicial review to allow for an expedited application hearing.

THE GROUNDS FOR THE MOTION ARE:

1. On December 31, 2024, the Canadian Food Inspection Agency ("**CFIA**") received lab-confirmed results from dead bird samples confirming that

ostriches owned by Universal Ostrich Farms Inc. ("**Universal**") had tested positive for a highly pathogenic strain of Avian Influenza.

2. Avian Influenza can, and has, spread to people, causing serious illness and death. Birds, including ostriches, can be infected with Avian Influenza while showing few or no clinical signs of illness. Ostriches without clinical signs of infection can actively transmit the virus, shed the virus, and also facilitate potential mutation. Mutation is a serious concern because certain mutations can cause the virus to become more likely to infect other birds and mammals, including people.

3. On December 31, 2024, CFIA provided notice to Universal that it was required to dispose of all ostriches located at 301 Langille Road, Edgewood, British Columbia, by February 1, 2025 ("**Notice**"), under section 48 of the *HAA.* The Notice constituted notice as required under subsection 48(3) of the *HAA*. Universal was informed that failure to comply with the Notice constituted an offence under section 66 of the *HAA*.

4. On January 30, 2025, Universal filed a Notice of Application for judicial review, seeking an order quashing the December 31, 2024 Notice.

5. Also on January 30, 2025, Universal filed a Notice of Motion seeking an interlocutory injunction staying the Notice.

6. In its written and oral submissions, the respondent argued that the Minister has discretionary authority under subsection 48(1) of the *HAA* to either dispose of affected or contaminated animals, or to require their owners to do so. Therefore, even if the Court quashed the Notice requiring Universal to dispose of its herd, the Minister would retain the statutory authority to dispose of Universal's herd.

7. On January 31, 2025, this Court stayed the December 31, 2024 Notice requiring the applicant to dispose of its ostriches pursuant to subsection

48(1) of the *HAA* until a decision is rendered in the underlying application for judicial review.

8. The Court's Order does not address the Minister's authority to dispose of the ostriches under subsection 48(1) of the *HAA.*

Request for Clarification under Rule 397

9. The respondent requests clarification of the Court's January 31, 2025 Order on an urgent basis to ensure it would not be acting contrary to the Court's intention by the exercise of the Minister's statutory authority to destroy the affected or contaminated ostriches to prevent the spread of highly pathogenic Avian Influenza.

Alternative Relief: Expedited Hearing of the Judicial Review

10. In the event the Court's January 31, 2025 Order enjoins the Minister from disposing of Universal's ostriches until the underlying application for judicial review is determined, or if the Court determines that the respondent's request for clarification of the Order falls outside the scope of Rule 397, the respondent seeks an Order abridging the timelines for the remaining steps in the underlying application for judicial review to allow for an expedited application hearing.

11. The proceeding is urgent and it is in the public interest to expedite the proceedings. If the application for judicial review is ultimately dismissed, the delay in destroying Universal's ostriches caused by the litigation will have posed additional risks to public health and safety. Further, if Canada does not follow the stamping out policy, it risks adverse impacts on producers and Canada's trade relationships, including that trading partners could stop importing poultry and egg trade from Canada, not just from a particular zone or province.

12. Even if the application is ultimately successful, its timely resolution will provide certainty for the parties.

13. Given the urgency of addressing the spread of highly pathogenic Avian Influenza, the respondent is prepared to move swiftly to file any supporting affidavits and the respondent's record. The applicant has already served and filed supporting affidavits and any prejudice caused by having to serve and file any additional affidavits and the applicant's record on an expedited timeline is outweighed by the significant public interest in having this matter resolved as quickly as possible.

14. The respondent relies on the *Federal Courts Act* and the Rules, in particular Rules 3, 4, 8 and 397, in support of the relief sought in this motion.

THE FOLLOWING DOCUMENTARY EVIDENCE will be used at the hearing of the motion:

1. Affidavit of Kelly Quan affirmed February 7, 2025.

February 07, 2025



ATTORNEY GENERAL OF CANADA
Department of Justice Canada
British Columbia Region
National Litigation Sector
900 – 840 Howe Street
Vancouver, BC V6Z 2S9

Per: Aileen Jones
Paul Saunders
Tel: (604) 666-2061
Fax: (604) 666-2760
Email: aileen.jones@justice.gc.ca
paul.saunders@justice.gc.ca
Counsel for the Respondent

TO: The Registrar
Federal Court

AND TO: Michael D. Carter
Cleveland Doan
Barristers and Solicitors
1321 Johnston Road
White Rock, BC V4B 2Z3

Counsel for the Applicant

Federal Court Cour fédérale

Date: 20250217

Docket: T-294-25

Citation: 2025 FC 303

Toronto, Ontario, February 17, 2025

PRESENT: The Honourable Justice Battista

BETWEEN:

UNIVERSAL OSTRICH FARMS INC.

Applicant

and

CANADIAN FOOD INSPECTION AGENCY

Respondent

ORDER AND REASONS

[1] On December 31, 2024, the Respondent issued a Notice directing the Applicant to cull the ostriches on its farm on or before February 1, 2025. The Notice was issued after some ostriches tested positive for Avian Influenza.

[2] This Notice was the subject of an application for judicial review filed with the Court on January 30, 2025, and on the following day, the Notice was the subject of an injunction ("Stay Order") and it was stayed pending a disposition on the application for judicial review. The Stay Order has been appealed to the Federal Court of Appeal.

[3] In the present motion, the Respondent requests the Court to clarify the injunction pursuant to Rule 397 of the *Federal Courts Rules*, SOR/98-106, to indicate whether the Stay Order enjoins the Minister from exercising its authority under subsection 48(1) of the *Health of Animals Act*, SC 1990, c 21, to dispose of the ostriches. Further, the Respondent requests an order for an expedited hearing of the underlying application if the Court finds that the order enjoins the Minister, or if the request falls outside of Rule 397.

[4] The Applicant argues that the clarification request falls outside the scope of Rule 397 because the Stay Order is clear and there was no "slip, error or oversight". The Applicant also argues that there is no urgency or justification for abridging the timelines for the application for judicial review.

[5] The motion for clarification of the Stay Order combined with the fact that the Stay Order is under appeal places the Court in a delicate position. The question of whether the Stay Order enjoins the Minister from culling the ostriches is one of the grounds of appeal. The impression could be created that in clarifying the Stay Order, the Court is attempting to insulate the Stay Order from appellate review.

[6] In any case, I agree with the Applicant that the request for clarification is outside of the scope of Rule 397. The scope of the Rule is narrow, and the Respondent has not identified any matter that was overlooked or accidentally omitted; moreover, the Stay Order reflects the Court's intention (*Canada (Citizenship and Immigration) v Asphall*, 2024 FC 911).

[7] Finally, there is no ambiguity in the Stay Order. It clearly stayed the operation of the Respondent's Notice dated December 31, 2024, until a decision was rendered in the underlying application for judicial review. The Notice was a notice issued by the Respondent requiring the Applicant to dispose of the ostriches in its possession, care or control. Both parties are in agreement that the Stay Order relieved the Applicant from compliance with the Notice pending a decision on the underlying application for judicial review.

[8] In response to the Respondent's request for an expedited timeline for the hearing of the application for judicial review, the Applicant denies the need for urgency and argues that it will be prejudiced by the loss of time needed to cross-examine the Respondent's agents and experts.

[9] I am satisfied that the Respondent's request is reasonable given its mandate to address risks to public health and safety and its concerns in the present case. The Applicant's concerns about being prejudiced by an expedited process can be addressed and resolved by requiring the proceeding to be specially managed pursuant to Rule 384.

ORDER in T-294-25

THIS COURT'S ORDER is that:

1. The Respondent's request for clarification pursuant to Rule 397 is dismissed.

2. Pursuant to Rule 384, file T-294-25 shall continue as a specially managed proceeding and is referred to the office of the Chief Justice for the appointment of a Case Management Judge or Associate Judge.

"Michael Battista"
Judge

FEDERAL COURT

SOLICITORS OF RECORD

DOCKET:	T-294-25
STYLE OF CAUSE:	UNIVERSAL OSTRICH FARMS INC. v. CANADIAN FOOD INSPECTION AGENCY

MOTION IN WRITING CONSIDERED AT TORONTO, ONTARIO PURSUANT TO RULES 397 AND 384 OF THE *FEDERAL COURTS RULES*

ORDER AND REASONS:	BATTISTA J.
DATED:	FEBRUARY 17, 2025

APPEARANCES:

Michael D. Carter	FOR THE APPLICANT
Banafsheh Sokhansanj	FOR THE RESPONDENT

SOLICITORS OF RECORD:

Cleveland Doan LLP White Rock, British Columbia	FOR THE APPLICANT
Attorney General of Canada Vancouver, British Columbia	FOR THE RESPONDENT

e-document-é A-51-25-ID 6

FILED / DÉPOSÉ
FEDERAL COURT OF APPEAL
COUR D'APPEL FÉDÉRALE
March 12, 2025
12 mars 2025
Natalie Wong
VAN 5

Federal Court of Appeal File No. A-51-25
Federal Court File No. T-294-25

FEDERAL COURT OF APPEAL

BETWEEN

CANADIAN FOOD INSPECTION AGENCY

Appellant
(Respondent)

and

UNIVERSAL OSTRICH FARMS INC.

Respondent
(Applicant)

AGREEMENT ON APPEAL BOOK CONTENTS

The parties, by their solicitors, hereby agree to the contents of the Appeal Book, as attached as **Schedule "A"** hereto.

March 12, 2025

DEPARTMENT OF JUSTICE CANADA
Counsel for the Appellant, Canadian Food Inspection Agency

March 12, 2025

CLEVELAND DOAN LLP
Counsel for the Respondent, Universal Ostrich Farms Inc.

SCHEDULE "A"

Federal Court of Appeal File No. A-51-25
Federal Court File No. T-294-25

FEDERAL COURT OF APPEAL

BETWEEN

CANADIAN FOOD INSPECTION AGENCY

Appellant
(Respondent)

and

UNIVERSAL OSTRICH FARMS INC.

Respondent
(Applicant)

APPEAL BOOK
(Table of Contents)

TAB	DESCRIPTION	PAGE NO.
Originating Documents		
1.	Notice of Appeal issued February 10, 2025	1
Orders and Decisions		
2.	Order of the Honourable Mr. Justice Battista dated January 31, 2025 (Injunction Decision)	
Pleadings from the First Instance		
3.	Notice of Application dated January 30, 2025	
4.	Notice of Motion dated January 30, 2025	
Affidavits		
5.	Affidavit of David Bilinski affirmed January 29, 2025	

TAB	DESCRIPTION	PAGE NO.
	Exhibit A – Government of Alberta – Biography of Dr. Robert Bertram Church	
	Exhibit B - Kazuhide Adachi et al, "Development of neutralization antibodies against highly pathogenic H5N1 avian influenza virus using ostrich (Struthio camelus) yolk", (2008) Molecular Medicine Reports 203.	
	Exhibit C – Statistics Canada – 2021 Census of Population for Edgewood, BC	
	Exhibit D – BC Ministry of Agriculture – Animal Health Centre Final Report AHC Case 20-832 dated February 10, 2020	
	Exhibit E – Email and attachments from CFIA West AI Sick Bird to Universal Ostrich re Quarantine documents 4206 Q dated December 31, 2024	
	Exhibit F – Email and attachments from CFIA Case Officer to Universal Ostrich re Initial Documents BC-820-IP-233 dated January 2, 2025	
	Exhibit G – Email from CFIA Case Officer to Universal Ostrich re Exemption from Depopulation Required Documents dated January 2, 2025	
	Exhibit H – Email from CFIA West AI Compensation to Universal Ostrich re BC-IP-233 Compensation Information dated January 3, 2025	
	Exhibit I – Letter from CFIA re Distinct Unit Evaluation and request for exemption from destruction order issued on December 31, 2024 for Ostriches on BC-820-IP-233 (Universal Ostrich Farm Inc., Edgewood, BC) dated January 10, 2025	
	Exhibit J – Email and attachments from CFIA Case Officer to Universal Ostrich re BC-IP-233 Amended Legal Docs, Feed Delivery, Biocontainment Plan, Future Plans dated January 14, 2025	
	Exhibit K – Email from CFIA Case Officer Lead to Universal Ostrich re BC-IP-233 Response to Questions dated January 15, 2025	

TAB	DESCRIPTION	PAGE NO.
	Exhibit L – Email from CFIA Case Officer to Universal Ostrich re Amended control documents – BC IP 233 Universal Ostrich dated January 24, 2025	
6.	Affidavit of Karen Espersen affirmed January 29, 2025	
	Exhibit A – Letter from UBC to Universal Ostrich dated March 20, 2010	
7.	Affidavit of Dr. Steven Pelech affirmed January 30, 2025	
	Exhibit A – Expert Report of Dr. Steven Pelech – Risk of H5N1 influenza transmission from Ostriches located at Universal Ostrich Farms Ltd. dated January 29, 2025	
8.	Affidavit of Katrina Jones sworn January 30, 2025	
	Exhibit A – Canadian Food Inspection Agency – Role of the World Organization for Animal Health	
	Exhibit B – World Organization for Animal Heath – Terrestrial Animal Health Code • Chapter 10.4 – Infection with High Pathogenicity Avian Influenza Viruses • Glossary • Section 5 – Trade Measures, Import / Export Procedures and Veterinary Certification	
	Exhibit C - World Organization for Animal Heath – Manual of Diagnostic Test and Vaccines for Terrestrial Animals • Chapter 3.3.4 – Avian Influenza (including Infection with High Pathogenicity Avian Influenza Viruses) • Appendix 3.3.4.1 – Biosafety Guidelines for Handling High Pathogenicity Avian Influenza Viruses in Veterinary Diagnostic Laboratories	
	Exhibit D – Canadian Food Inspection Agency - Overview of how Canada prevents, prepares and responds to bird flu outbreaks	
	Exhibit E – Canadian Food Inspection Agency – Highly Pathogenic Avian Influenza Vaccination Task Force	

TAB	DESCRIPTION	PAGE NO.
	Exhibit F – Canadian Food Inspection Agency – Avian Influenza Overview, 2.7 Immunity	
	Exhibit G – Canadian Food Inspection Agency – Open and Transparent Agency Policy	
	Exhibit H – Canadian Food Inspection Agency – CFIA's Policy for Providing Guidance on Regulatory Requirements	
	Exhibit I – Innovation, Science and Economic Development Canada – Field-ready Lateral Flow Test for Avian Influenza	
	Exhibit J – Canadian Food Inspection Agency – Latest Bird Flu Situation	
	Exhibit K – Google Maps – Castlegar to Edgewood, British Columbia	
	Exhibit M – Invoice from Universal Ostrich to Mountain Man Dog Sled Adventures	
9.	Affidavit of Michael Carter sworn January 30, 2025	
	Exhibit A – Certificate Concerning Code of Conduct for Expert Witnesses dated January 29, 2025	
	Exhibit B – Expert Report of Dr. Jeff Wilson – Expert Testimony regarding High Pathogenic Avian Influenza (HPAI) in Ostriches – Request for Stay of Execution dated January 30, 2025	
10.	Affidavit of Cathy Furness affirmed January 30, 2025	
	Exhibit A – World Organization for Animal Heath – Terrestrial Animal Health Code, Chapter 10.4 – Infection with High Pathogenicity Avian Influenza Viruses	
	Exhibit B – World Organization for Animal Heath – Terrestrial Animal Health Code, Glossary	
	Exhibit C – Canadian Food Inspection Agency Order dated December 31, 2024	
	Exhibit D – Letter from CFIA re Distinct Unit Evaluation and request for exemption from destruction order issued on	

TAB	DESCRIPTION	PAGE NO.
	December 31, 2024 for Ostriches on BC-820-IP-233 (Universal Ostrich Farm Inc., Edgewood, BC) dated January 10, 2025	
	Other Relevant Documents	
11.	Transcript of Proceedings from the Injunction Hearing on January 31, 2025	
12.	Notice of Motion dated February 7, 2025 (Rule 397 Clarification Motion)	
13.	Order and Reasons of the Honourable Mr. Justice Battista dated February 17, 2025 (Rule 397 Clarification Motion)	
14.	Agreement on Appeal Book Contents dated March 12, 2025	
15.	Certificate of Completeness of Appeal Book dated April __, 2025	

Federal Court of Appeal File No. A-51-25
Federal Court File No. T-294-25

FEDERAL COURT OF APPEAL

BETWEEN

CANADIAN FOOD INSPECTION AGENCY

Appellant
(Respondent)

and

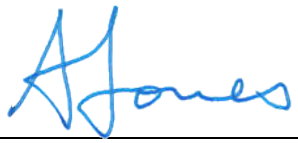
UNIVERSAL OSTRICH FARMS INC.

Respondent
(Applicant)

CERTIFICATE OF COMPLETENESS OF APPEAL BOOK

I, Aileen Jones, solicitor for the appellant, Canadian Food Inspection Agency, certify that the contents of the appeal book in this appeal are complete and legible.

April 10, 2025



DEPARTMENT OF JUSTICE CANADA
900-840 Howe Street
Vancouver, BC V6Z 2S9

Aileen Jones, Paul Saunders and Banafsheh Sokhansanj

Telephone: (604) 666-2061
Facsimile: 604) 666-2760
Email: aileen.jones@justice.gc.ca;
banafsheh.sokhansanj@justice.gc.ca;
paul.saunders@justice.gc.ca

Counsel for the Appellant,
Canadian Food Inspection Agency

TO: **Cleveland Doan LLP**
1321 Johnston Road
White Rock, BC V4B 3Z3

Per: Michael D. Carter

Tel: (604) 536-5002
Fax: (604) 536-5007
Email: michael@clevelanddoan.com