

Canada's Inter-Agency Wild Bird Influenza Survey 2009

BACKGROUND

In 2005, Canada initiated a national inter-agency survey for influenza A viruses in healthy live wild ducks. This survey was stimulated, in the first instance, by a major outbreak of influenza in the Canadian poultry industry in 2004, and subsequently by the spread of the Asian H5N1 highly pathogenic strain from SE Asia to Europe and Africa in 2004-05. The Survey objectives were to identify strains of influenza viruses present in Canada's wild bird reservoir, to acquire information needed to assess the biosecurity of Canada's poultry industry, and to monitor viral genes of concern to human and animal health.

From 2006 to 2008, the wild bird influenza survey was continued, with both live bird and dead bird components. The objective of the survey based on birds found dead was vigilance for highly pathogenic virus strains and careful assessment regarding whether or not influenza viruses had caused the death of the birds. The objectives of the live bird survey were to monitor year-to-year variation in viruses present in the wild duck population, to sample in the eastern Canadian arctic to which trans-Atlantic migrant birds might carry the virus from European or African wintering grounds, to sample species that migrate seasonally deeply into Central and South America, and to sample additional species of aquatic birds to better understand the wildlife reservoirs of influenza A viruses.

These Surveys have been highly successful. The importance of wild duck populations as reservoirs for avian influenza viruses, particularly compared with other related bird species, was clarified. The probable precursor virus of Canada's 2004 and 2005 influenza outbreaks in poultry, a low-pathogenicity H7N3 strain, was discovered in wild duck populations. Canada's national *Avian Influenza Virus Laboratory Network* was greatly strengthened through the conduct of the Surveys. New communications challenges associated with responses to important epidemic diseases were identified and protocols were established to overcome them. Collaborations among federal, provincial and territorial agencies responsible for animal health, public health and wildlife, and with Canada's veterinary college wildlife health expertise, were greatly advanced through the planning and conduct of the Surveys, and new tools and methods for complex data management on a national scale were developed, tested and improved. The entire genetic composition of over 100 avian influenza viruses has been sequenced and is now being analysed for evidence of intercontinental virus movement, among other parameters. Through this Survey, Canada participates in Canada-USA-Mexico Tri-lateral collaborations for continental surveillance for avian influenza, and in analysis of the risks posed to commercial poultry by avian influenza viruses in wild birds, collaboratively with the US Department of Agriculture.

Consultation with the Survey Steering Committee: On 8 January 2009, the Steering Committee of the Inter-agency Wild Bird Influenza Survey met by teleconference to review survey options for 2009. There was wide support for continuing and further enhancing surveillance based on wild birds found dead. There also was wide recognition of the value of surveillance based on live birds and concern that live bird sampling also should continue if possible, in 2009. It also was emphasized analysis of survey data collected in 2005-2008 and in 2009 should continue to add maximum value to the national investment in the survey.

Consultation with the Tri-lateral Committee: On 12 February 2008, the Canada-USA-Mexico Tri-lateral committee on wild bird surveillance for avian influenza met in Fort Collins, Colorado to review and plan the continent-wide surveillance program for 2008. Sampling of wild birds found dead was identified as a high surveillance priority, but it also was noted that, overall, small numbers of dead wild birds have been sampled in previous years. Thus, continued sampling of large numbers of live birds, particularly ducks, was identified as of equal priority. The USDA invested \$100,000 in live birds sampling by the Canadian wild bird survey in 2008 in order to secure surveillance information from prairie ducks. A Tri-lateral meeting is to take place in late February 2009 to review national programs and discuss collaborations.

RATIONALE FOR AVIAN INFLUENZA SURVEILLANCE IN WILD BIRDS IN CANADA IN 2009:

Surveillance for Avian Influenza in wild birds serves several important purposes.

- Protection of Canada's export trade in poultry and poultry products
 - Mitigation efforts to minimize the socioeconomic impact of the most recent occurrence of Avian Influenza in poultry in BC (domestic ducks, fall 2005; domestic turkeys January 2009), and Saskatchewan (fall 2007) benefited greatly from background information on virus strains in wild ducks and the evidence of Canada's high level of veterinary infrastructure provided by the wild bird survey. It is predicted that current, credible data on avian influenza strains in wild birds in Canada will similarly reduce the socioeconomic impacts of future outbreaks of Avian Influenza in commercial poultry in Canada. Conversely, absence of such data is an important risk factor for larger socioeconomic impacts. Biosecurity issues for the Canadian poultry industry have been clarified by the Survey.
- Early detection of highly pathogenic Avian Influenza (HPAI) strains
 - Surveillance based on wild birds found dead is a sensitive surveillance method for detection in wild birds of HPAI strains, such as the Eurasian H5N1 strain, irrespective of how these strains may arrive in Canada. Detection of such strains as early as possible upon their arrival or evolution in Canada is one of the most critical mitigation factors in reducing their human health and socioeconomic

impacts.

- Maintenance and improvement of national laboratory and surveillance capacity for Avian Influenza viruses
 - Analysis of wild duck samples in 2005 identified many weaknesses in Canada's national capacity to manage Avian Influenza in any species, but the survey also produced many solutions and improvements to national capacity. These were further tested in subsequent surveys and were further improved. Continuation of the wild bird survey will play a critical role in maintaining national Avian Influenza surveillance capacity, including field, laboratory, and communication components, and contributions to the evolution of government policies.
- Risk analysis and risk communication
 - The risk factors posed by Avian Influenza viruses in wild birds in Canada to the poultry industry, human health, other human economies and natural resources can only be assessed on the basis of correct information about the range of Avian Influenza virus strains, their distribution among species and regions, their variation among years, regions and species, and the extent of interchange with pools of virus strains in Asia, Europe, Central and South America. Wild bird Avian Influenza surveillance is the only means of obtaining this information.
- International contributions and obligations
 - In the current climate of concern regarding potential pandemic Avian Influenza, Canada is obliged to contribute to the global understanding of Avian Influenza virus strains in wild birds, since wild birds are the ultimate global reservoir of the Avian Influenza gene pool. Canada is geographically situated such that early detection of foreign virus strains arriving in the Americas via transatlantic bird migration can best be achieved by surveillance conducted in Canada. Canada also must consider potential routes of virus transfer from the Americas northward into Canada and from Canada southward into the Americas.

OBJECTIVES OF THE 2009 SURVEY

1. To achieve a high level of vigilance for the early detection of highly pathogenic (HP) strains of avian influenza virus, particularly the Asian/European/African strains of highly pathogenic H5N1 virus, through enhanced detection, collection and examination of wild birds found dead in all parts of Canada. The national target for this part of the Survey is to examine and test 3275 dead birds between 1 April 2009 and 31 March 2010.
2. To continue analysis of the composite Survey data, including risk analysis with

respect to the poultry industry.

3. To maintain and expand Canada's national archive of avian influenza virus strains.
4. To sample healthy live wild ducks in specific regions of Canada, in collaboration with the US Department of Agriculture (APHIS) and the U.S. Department of Interior (USGS).

ANTICIPATED PARTICIPANTS:

It is intended that this Survey will continue to build and enhance health management capacity in Canada through collaboration among public health, agriculture and wildlife agencies within federal and provincial/territorial governments, with universities and with international collaborators.

Primary Federal Participants:

- Canadian Food Inspection Agency
- Environment Canada
- Public Health Agency of Canada

Primary Provincial Participants:

- Provincial/Territorial Departments responsible for Agriculture (animal health)
- Provincial/Territorial Departments responsible for Wildlife
- Provincial/Territorial Departments responsible for Public Health

Primary Non-government Participants:

- Canadian Cooperative Wildlife Health Centre (Canada's veterinary colleges)
- Centre for Coastal Health (Vancouver Island University, Nanaimo)
- Ducks Unlimited Canada

International Participants:

- United States Department of Agriculture
- United States Department of Interior
- J. Craig Venter Institute
- United States National Institute of Allergy and Infectious Diseases

SURVEY GOVERNANCE

Steering Committee: All participating Canadian groups and agencies will be members of the Survey Steering Committee. This Committee met by teleconference on 8 January 2009 to discuss the Survey in 2009. The Steering Committee will receive and comment on all relevant documents, and will meet by teleconference as necessary.

Executive Committee:

This Committee will consist of members representing the primary federal and provincial/territorial participant groups. There will be one member each from the Canadian Food Inspection Agency, the Public Health Agency of Canada, Environment Canada, from each of the provincial/territorial committees of Chief Veterinary Officers, Chief Medical Officers of Health, and Wildlife Directors, and the CCWHC.

Survey Coordination:

The Canadian Cooperative Wildlife Health Centre will coordinate program design, and will implement and coordinate the surveillance program itself, in accordance with direction from the Steering Committee and the Executive Committee.

Communications:

- Policies on communications will be established by the Survey Executive Committee.

- Regular updates on the status of the 2009 Survey in terms of samples collected and analysed will be provided to the Survey Executive Committee and to others as directed by the Survey Executive Committee.

- All communications surrounding detection of avian influenza viruses classified as H5 or H7 will be managed by the Canadian Food Inspection Agency in consultation with the Provinces and Territories.

- Survey results for viruses that are not classified as H5 or H7 will be reported routinely on the public website of the CCWHC.

PARTICIPANT RESPONSIBILITIES

Collection of Dead Birds:

In general, *provincial and territorial agencies will take the lead* in each province and territory in establishing protocols to assure collection of dead birds and shipment of these to participating laboratories. *Environment Canada* also will be a major participant.

- Each Province and Territory will establish protocols for communications with communities, the public and participating agencies in order to achieve the best possible levels of detection, collection and shipment of dead birds to participating laboratories of dead wild birds.
- All species of birds found dead will be included in the survey, according to protocols established in each province and territory. Experience with H5N1 in Europe has found that it is not possible to determine, in advance of examination and testing, whether or not a bird found dead is of value to the Survey. The public will be asked to be vigilant and report all dead birds. If the number of dead birds detected significantly exceeds the Survey target numbers, triage of specimens to be examined will be done at the level of the provincial/territorial call centre (where such exist), at agency offices where dead birds are received for transshipment to laboratories, or at the laboratories themselves.

In the event that such triage is required, priority for examination and testing will be given to:

- Bird species which use aquatic or wetland habitats
- Mortality events which appear unusual in some way for the region and location
- Mortality events involving more than one species
- Mortality events involving notable numbers of birds

- Government wildlife agencies (Federal, Provincial and Territorial), non-government wildlife organizations (such as Ducks Unlimited Canada) and other field-oriented groups participating in the Survey will urge field staff to be particularly vigilant for dead wild birds during routine field operations, and to collect such dead birds for inclusion in the Survey, as part of their regular field work. If mortality occurs in remote areas where shipment of dead birds to laboratories is impossible, then, whenever feasible, field personnel will collect oro-pharyngeal and cloacal swabs in virus transport medium and will assure their proper handling and transport to a participating laboratory.

- Vigilance is required in all regions of Canada and at all seasons of the year.

- Wildlife rehabilitation stations often are the first to receive reports of dead wild animals from the public. These stations also often function after hours and on weekends, when many calls from the public will be received. As a consequence, these stations will certainly receive notifications and inquiries from the public regarding dead birds and the Wild Bird Influenza Survey, and, thus, each will require specific information on the Survey protocols to be followed in their province or territory. It is recommended that these rehabilitation centres be fully integrated into planning for the dead bird component of the Wild Bird Survey in each province and territory

Examination of Specimens from Dead Birds

Veterinary diagnostic laboratories which participate in Canada's national wildlife disease surveillance program will receive and examine the dead birds collected as part of the Survey. These laboratories are the CCWHC Regional Laboratories at Charlottetown PEI (Atlantic Region), St-Hyacinthe QC (Quebec), Guelph ON (Ontario and Nunavut) and Saskatoon SK (Western and Northern Canada), and Calgary AB, the Animal Health Centre in Abbotsford BC (Ministry of Agriculture, Food and Fisheries), the Alberta Veterinary Surveillance Network (Alberta Agriculture and Food), the Veterinary Services Laboratory in Winnipeg (MB Ministry of Agriculture, Food and Rural Initiatives) and the Veterinary Diagnostic Laboratory of Newfoundland and Labrador (Ministry of Natural Resources).

- Each bird, or a sub-sample of birds from large-scale mortality events from which many specimens are sent to the laboratory, will be tested specifically for Influenza A viruses, regardless of cause of death, and also will be examined to determine cause of death whenever possible. When the number of birds received exceeds the capacity of the diagnostic laboratory to examine them on a priority basis, swab samples for influenza assessment will be taken and processed, and the carcass then will be discarded or frozen and examined for cause of death at a later date.
- For Influenza assessment, two swabs – one from the cloaca with its content, and another from the oropharynx (caudal extremity of the oral cavity beyond the base of the tongue and around the larynx or opening of the wind pipe, and including a pass across or into the choanal cleft) – will be collected in a single vial containing 2.5 ml of virus transport medium, and either passed immediately to a participating virology unit within the laboratory or frozen (-70C preferred when feasible, but -20C is acceptable) and shipped immediately to a participating virology laboratory. Frozen samples will not be permitted to thaw and will be delivered to the virology laboratories in a fully frozen state.
- A complete record of each examination, and all findings with respect to cause of death, will be entered into the national wildlife disease database by the participating diagnostic laboratory on a priority basis, as soon as these data are known.

- The participating virology laboratories will be the laboratories of the Avian Influenza Virus Laboratory Network and will follow the established protocols for immediate PCR analysis for Matrix Protein gene sequence, followed by PCR for H5 and H7 protein gene sequences if positive for Matrix Protein. (See virology section, below).

_____ Virology:

Initial testing of samples for the presence of Influenza A viruses will be done by laboratories which are participants in Canada's *Avian Influenza Virus Laboratory Network*, administered by the Canadian Food Inspection Agency:

- British Columbia's Animal Health Centre (Ministry of Agriculture and Lands)
- Alberta Veterinary Surveillance Network (Alberta Agriculture and Food)
- Manitoba's Veterinary Services Branch (Ministry of Agriculture, Food and Rural Initiatives)
- Saskatchewan's Prairie Diagnostic Services
- The Animal Health Laboratory at the University of Guelph
- Quebec's INSA - Réseau des laboratoires (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation)
- The Atlantic Veterinary College Diagnostic Laboratory (Kibenge Laboratory)
- The Animal Health Laboratory of Newfoundland and Labrador
- The National Centre for Foreign Animal Diseases (NCFAD)

● *Primary screening* will be via PCR for Matrix protein gene sequence. PCR analysis will be performed as quickly as possible once samples have been received by the laboratory.

● PCR analysis for Matrix Protein gene sequences will be done on all samples. All samples shown to contain influenza A virus(es) by this analysis will immediately be analysed by PCR for H5 and H7 protein gene sequences. All samples thus identified as containing H5 or H7 virus(es) will be shipped immediately to NCFAD for complete identification. Regional laboratories will do no further work on these H5/H7-positive samples.

● During sample processing for PCR screening at regional laboratories, each sample will be thawed and re-frozen only once. A minimum of 1.5 ml of original sample will be re-frozen in the sample vial for further testing by NCFAD if required.

● Results of PCR analysis will be entered immediately into the Survey database

● Samples that are found by PCR analysis to contain one or more Influenza A viruses, but not to contain either H5 or H7 virus strains, will be retained frozen for future reference.

Regional laboratories will hold these samples at -20C or colder until they can be shipped without thawing to a designated holding facility for long-term storage. No routine virus isolation procedures will be carried out on these samples in the 2009 Survey.

- All laboratories will follow identical PCR protocols. NCFAD will establish primary virology protocols and quality assurance procedures through the *Avian Influenza Virus Laboratory Network*, collaboratively with the participating regional laboratories.

Further Analysis:

The NCFAD will undertake the following.

- Isolation and characterization of selected H5 and H7 viruses, including pathogenicity testing if required (requirement determined by CFIA).
- H and N typing of viruses isolated in the 2009 Survey. Only H5 and H7 viruses will be typed.
- Immediate entry of data into the Survey database
- Establishment and maintenance of the primary virology protocols and quality assurance procedures for regional laboratories through the *Avian Influenza Virus Laboratory Network*, collaboratively with the participating regional laboratories.
- Maintenance of an archive of all viruses isolated by NCFAD from the wild bird survey. (See *Avian Influenza Virus Archive*, below)

The National Microbiology Laboratory (NML) will assist NCFAD when surge capacity is required. In addition, NML will:

- Maintain an archive of all viruses isolated in 2005-2009. (See *Avian Influenza Virus Archive*, below)

Environment Canada will collaborate with the CCWHC in survey data analysis and risk assessments.

The CCWHC will coordinate activities among participating laboratories, will monitor completeness of data entry, and will check data for detectable errors. In addition, the CCWHC will:

- Analyse and report on the progress of the survey and its major findings
- Lead and coordinate complete analysis of Survey data, including participation in international collaborations on risk analysis.
- Coordinate international collaborations on Influenza surveillance in wild birds

Avian Influenza Virus Archive

- The national archive established with the Surveys of 2005 to 2008 will remain a permanent national collection of avian influenza viruses, and any viruses available from the 2009 Survey will be placed in this archive, maintained by the National Microbiology Laboratory (PHAC)
- The Survey Executive Committee will establish guidelines for access to these samples by scientists, to assist NML in administration of the archive.
- NCFAD also will maintain an archive of viruses isolated within its biosafety level 3 laboratory and which thus can not readily be moved out of these level 3 conditions. NCFAD will work with other research scientists in various ways, as necessary, to provide access to these viruses, for example by providing RNA extracts of these viruses which can be taken from the level 3 facility.
- To enhance scientific access to viruses identified in the Survey, gene sequence data generated by NCFAD, NML and others will be deposited in GenBank, an open-access gene sequence database, as recommended by the WHO and OIE.

Data Management:

Data generated by all participants (sample collection data, PCR data, H and N typing data, gene sequence data, pathogenicity data, etc.) will be entered into the Survey database to which participants will have password-protected access. The database will be further developed and managed by the CCWHC, in consultation with participants and the Survey Executive Committee.

Communication of Results

- Policies for communication of results from the 2009 Survey will be established by the Executive Committee (see Survey Governance, above).
- For communications and citation purposes, the name of this surveillance program shall be: “*Canada’s Inter-agency Wild Bird Influenza Survey*”

- The Survey Database will be the mechanism for immediate reporting of all laboratory results (by regional and federal laboratories).

- Open sharing of results among Survey participants, with other government agencies, with the Canadian public and with the international community, consistent with government policies, is a communications principle for the Survey

- Information about the detection of influenza A viruses which are not of the H5 or H7 types will be displayed on a public website as soon as those data are entered into the Survey database. Preliminary detections of H5 and H7 viruses will not be displayed on the public website until such time as these have been confirmed and the viruses identified to the satisfaction of NCFAD, and after affected agencies have completed the internal and external communications that each requires.

- The CFIA will coordinate all communications associated with detection and characterization of H5 or H7 virus strains.

Public and Media Communications, Human Health and Safety Standards and Messages, and Contingency Plans for Possible Detection of Highly Pathogenic Virus Strains

Each Province and Territory, and the Federal Government, will establish and maintain lead agency designations, protocols and procedures that specify:

- The content of avian influenza-related information relevant to public health, hunter safety, Wild Bird Survey personnel safety, and other similar concerns to be disseminated in the province, territory or agency, and the mechanism and responsibilities for its dissemination.

- Contingency plans for actions and communications in response to various possible scenarios of detection of Highly Pathogenic strains of avian influenza viruses, including the Eurasian HP H5N1 strain.

- Communications with politicians, upper government management, the media and the public about the Wild Bird Survey, under routine conditions and under conditions of possible detection of Highly Pathogenic strains of avian influenza viruses in North America.

It is the shared intention among Wild Bird Survey participants that information provided to the public, mechanisms for communications, and contingency action plans be harmonized among federal, provincial, territorial and non-government agencies and groups through advanced planning and appropriate dialogue.

Intellectual Property

Survey participants are encouraged to analyse survey data, perform further work on the isolated viruses, and publish the results. All use of the survey data should cite and acknowledge the source as “Canada’s Inter-agency Wild Bird Influenza Survey .” All use of survey data for analysis and publication must be negotiated on a bi-lateral or multi-lateral basis among those making such use of the data and the individuals and laboratories who have generated the samples and the data, following the norms of ethical scientific practise in Canada.

TARGET SAMPLE NUMBERS:

- Target Sample Size: **3275** (Canada-wide) [Note: These are targets, not quotas]

Major organizational efforts were made in 2007 and 2008 08 to achieve a significantly enhanced flow of dead bird specimens to participating laboratories. Full and expanded use of these organizational and procedural achievements are proposed for the 2009 survey. These are optimistic targets and the Survey may achieve smaller numbers of dead birds

Province or Territory	Target Number	Province or Territory	Target Number
Yukon	25	Ontario	1000
Northwest Territories	25	Quebec	1000
Nunavut	25	New Brunswick	50
British Columbia	300	Prince Edward Island	200
Alberta	50	Nova Scotia	150
Saskatchewan	300	Newfoundland & Labr.	100
Manitoba	50	TOTAL	3275

Samples from Live Wild Birds:

In addition to the core 2009 Canadian wild bird influenza survey, based on birds found dead, collection and testing of apparently healthy live birds will be carried out in Newfoundland and Labrador as a provincial program. Data will be shared with the national wild bird survey. Some other provinces also may elect to carry out some surveys of live wild birds. Investment by the U.S Department of Agriculture and U.S. Department of Interior in live wild bird surveillance in Canada in 2009 is under negotiation and will contribute additional data to the Canadian Survey.