

A National Surveillance Program for Influenza A viruses
in Wild Birds in Canada,
2005-2010

Background Avian influenza is a major global concern to human and animal health. No Canada-wide surveillance for Influenza A viruses has been undertaken to date. Wild birds, especially wild ducks, are the ultimate reservoir of Influenza A viruses. Although virus strains highly pathogenic to humans or to poultry have never been detected in wild birds and probably are not maintained in wild bird populations, wild birds may become infected with highly pathogenic strains from contact with poultry and may be capable of transporting those strains for short periods of time during migration. Furthermore, influenza virus strains with the potential to become highly pathogenic through minor genetic alterations do circulate among wild birds. In 2003, data from regular wild bird surveillance permitted Dutch scientists to identify a low pathogenicity strain of Influenza A in wild ducks as the source of a low pathogenicity strain that infected the poultry industry, developed into a highly pathogenic strain within poultry barns, and became a major multi-nation outbreak in poultry and humans. Events around the 2004 avian Influenza outbreak in British Columbia highlighted the absence of any clear agency mandates to undertake Influenza virus surveillance in wildlife, as well as Canada's ignorance of the Influenza A viruses that are present in Canadian wild birds.

On 20 December 2004, a teleconference among federal and provincial agencies representing public health, agriculture and wildlife was organized by the Canadian Cooperative Wildlife Health Centre at the request of participating federal agencies. At this teleconference, participants agreed that a survey of Influenza A viruses in wild birds, broadly across Canada, should be undertaken beginning in 2005, and they agreed on the general approach and participation in the survey set forth in this proposal. The Canadian Cooperative Wildlife Health Centre agreed to coordinate the planning and conduct of the survey, beginning with drafting and refining a operational proposal that would include objectives, methods, costs, and communications.

General Objectives:

1. To make an inventory of the Influenza A viruses that occur in wild birds, especially wild ducks, in Canada.
2. To characterize Influenza A viruses in Canadian wild birds sufficiently that it will be possible to determine whether or not Influenza A viruses highly pathogenic for humans or domestic animals, which may be recognized in Canada in the future, have arisen in whole or in part from Influenza A viruses transmitted to humans or domestic animals from wild birds.

3. To monitor Canadian wild bird populations for the presence of particular Influenza A viruses, or their genetic components, which are of national or international concern to human or animal health.
 - To investigate the antigenic subtypes, and changes in the frequency of different subtypes and genotypes, present in different regions of Canada from year to year.
 - To monitor the progress of antigenic drift, which is known to occur rapidly.
 - To monitor the occurrence of viruses antigenically related to human strains.
 - To identify influenza A viruses with the potential to cross species barriers.
 - To monitor re-assortment events between avian influenza strains and influenza A strains being isolated from humans and swine.
 - To maintain data on serotypes and genetic composition of novel influenza A strains.
4. To establish an archive of Influenza A virus strains from wild birds in Canada to permit rapid retrospective analysis in response to disease outbreaks and contribute to rapid epidemiological assessment.
 - To provide these virus reference strains and typing reagents to public health and veterinary testing laboratories including, WHO, FAO, OIE and national reference laboratories, in regard to pandemic preparedness or in the event of newly emerging epidemic influenza A.
 - To maintain this virus collection as a resource for development of potential pandemic vaccine strains.
5. To build and maintain the integrated, multi-agency field, laboratory, regulatory and communications capacity within Canada rapidly to carry out Influenza A virus sampling, identification, and molecular characterization on large volumes of samples under emergency conditions, in any species.

Specific Objectives:

- A. To sample six populations of wild ducks in the summer and fall of 2005 and 2006, and to characterize all Influenza A viruses detected in these samples.
- B. To design and implement, as of 2007, a surveillance program for Influenza A viruses in Canadian wild birds that meets Canada's requirements, including its international obligations. Frequency and locations of sampling, degree of virus characterization to be undertaken, and potential new components of the program (e.g. additional or different bird species or populations) will be decided based on analysis of results obtained in 2005 and 2006.

Anticipated Participants:

It is intended that this surveillance program will build health management capacity in Canada through collaboration among public health, agriculture and wildlife agencies within federal and provincial/territorial governments, and with universities.

Primary Federal Participants:

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

Primary Provincial Participants:

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

Primary Non-government Participants:

- Canadian Cooperative Wildlife Health Centre (Canada's veterinary colleges)
- Centre for Coastal Health (Malaspina University, Nanaimo)

Secondary Participants:

- Agriculture and Agri-Food Canada
- There may be others that should be added to this list.

Participant Responsibilities:

Governance: A program Steering Committee, with one representative from each participating agency, will be established as the governing body of this program. The Steering Committee will select a chair and a representative Executive Sub-committee which it will empower to make decisions on its

behalf as needed between meetings of the full Steering Committee. Such an executive committee might consist of one representative each from PHAC, CFIA, EC/CWS, one provincial health and one provincial agriculture representative and one representative from the CCWHC. The CCWHC will serve as secretariat to the Committee. It is anticipated that all meetings of the Committee and executive subcommittee would be by teleconference.

Central Coordination:

The Canadian Cooperative Wildlife Health Centre, as secretariat to the Steering committee, will coordinate program design, and will implement and coordinate the surveillance program itself, in accordance with the Steering Committee's decisions. This central coordination also will include managing the program's communications and the surveillance data generated during the program (see below).

Sample Collection:

The Canadian Wildlife Service (Environment Canada) will take the lead obtaining samples from wild ducks, trapped for banding and other purposes as part of its on-going waterfowl management programs.

Primary Virology:

Initial testing of samples for the presence of Influenza A viruses will be done in a laboratory (agriculture, health, university) that routinely serves the province or region in which the samples are collected. Primary screening will be via PCR, followed by isolation in embryonated SPF hen's eggs of all influenza viruses detected by PCR. Primary virus culture can be performed at biohazard level 2. The PCR protocol to be followed will detect all forms and strains of Influenza A viruses. All laboratories will follow identical PCR and virus isolation protocols. CFIA (National Centre for Foreign Animal Diseases - NCFAD) will be responsible for establishing the primary virology protocols and quality assurance procedures through the *Avian Influenza Virus Laboratory Network*, collaboratively with the participating regional laboratories. Virus isolates will be divided into multiple aliquots and frozen at -70C. A minimum of 5 aliquots will be shipped to the National Microbiology Laboratory (NML) in Winnipeg for further characterization by both NCFAD and NML and for archiving of at least three aliquots.

It is intended that the establishment of PCR and virus isolation protocols between NCFAD and the regional laboratories will result in accreditation of the regional laboratories by CFIA such that these laboratories are certified to participate fully and immediately in responses to outbreaks of pathogenic influenza A viruses.

Further Characterization of Viruses:

NML will undertake virus genome sequencing to characterize virus isolates at the molecular level. NCFAD will identify H and N antigens of all isolates using serological typing and will undertake pathogenicity tests on any viruses that require this under the Health of Animals Act regulations or international conventions.

Specimen Archives and Access:

Multiple aliquots (3 or more) of all Influenza A viruses identified in this surveillance program will be held in an archive from which specimens can be provided to scientists in Canada or elsewhere for research purposes. The archive will be established at the National Microbiology Laboratory. The Executive Subcommittee of the program's Steering Committee will establish guidelines for access to these samples by scientists, to guide NML in administration of the archive.

Data Management:

Data generated by all participants (sample collection data, virus strain data, PCR product sequence data, pathogenicity data, specimen archive data) will be entered into a single database to which all participants will have password-protected access. The database will be developed and managed by the CCWHC in consultation with the survey's Steering Committee.

All genetic sequence data for Influenza A strains identified during this survey will be deposited as quickly as possible in Genbank.

Communication:

The Steering Committee will serve as the central vehicle for communications among the participants in the surveillance program. The Steering Committee will establish a protocol whereby the discovery of virus strains of public health or socio-economic concern will be communicated internally and externally. The communications policies of the participating government agencies will be respected. Communications among participants in the surveillance program will be facilitated by a password-protected website established and maintained on behalf of the Steering Committee by the CCWHC. Access by participants to surveillance data will be through this site.

For communications and citation purposes, the name of this surveillance program shall be: "*Canada's Inter-agency Wild Bird Influenza Survey*" (acronym: CIWBIS)

