

**Section 12: Highly Pathogenic H5N1 Avian Influenza in
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I. Overview

Avian influenza (AI) viruses are influenza A virus subtypes that primarily affect chickens, turkeys, guinea fowl, migratory waterfowl, and other domestic and wild avian species. AI viruses have been found throughout the world. The virus is shed in the fecal droppings, saliva and nasal discharges of some avian wildlife species and infected domestic poultry. Contaminated water is a common source of infection for birds.

Many different subtypes of AI have been identified. Pathogenicity of AI subtypes in poultry is determined using *in vivo* mortality assay and sequencing of the hemagglutinin (H) protein cleavage site. Many strains of low pathogenic avian influenza (LPAI), including H5 and H7 subtypes, are known to routinely occur in migratory waterfowl and shorebirds in the U.S., including New York. Infected wild birds may spread LPAI viruses to domestic poultry. LPAI may cause minor illness or no signs of disease in infected birds. LPAI strains are not usually considered a threat to human health.

Highly pathogenic avian influenza (HPAI) strains are only associated with H5 or H7 subtypes, although not all H5 or H7 subtypes are highly pathogenic. Infection with a HPAI strain results in high morbidity and mortality in chickens and turkeys. HPAI is considered to be a disease primarily of domestic poultry, and as such, the United States Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS), in conjunction with the New York State Department of Agriculture and Markets (NYSDAM), will have the lead for non-human disease surveillance and control if and when any AI is detected in New York State.

A highly pathogenic H5N1 avian influenza (HPAI H5N1) virus was first isolated from birds in Southeast Asia in 1997. According to the World Health Organization, since 2003 this strain of H5N1 is responsible for the largest epizootic of HPAI ever recorded. HPAI H5N1 is of concern to public health because it has been transmitted from birds to people on multiple occasions. It is considered to have the potential to become pandemic because it is a novel strain for the human population (i.e., no preexisting human immunity). Although it has resulted in severe morbidity and mortality in the diagnosed human cases, HPAI H5N1 has accounted for only a small number of human illnesses in persons having direct contact with infected birds or their waste material. Person-to-person spread of HPAI H5N1 has been documented only very rarely and has not been sustained. To cause a human pandemic, a novel influenza subtype would need to become capable of spreading easily from person to person, a capacity HPAI H5N1 not yet demonstrated.

Since December 2003, HPAI H5N1 infections in birds have been reported in Asia, Africa, the Pacific, Europe, and the Near East. The geographic expansion of the HPAI H5N1 epizootic is thought to be amplified by the movement of birds and bird products by humans from affected areas to adjacent regions. Recent data suggest that HPAI H5N1 is also being spread by migrating waterfowl, some of which may be asymptomatic. Infection has been documented primarily, but not exclusively, in waterfowl and shore bird species.

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There is no evidence that this strain exists in birds or humans at this time in the Americas. Experts advise that historically AI has not been carried by migratory birds from Europe or Asia to the Americas. However, due to the high morbidity and mortality demonstrated in poultry and humans infected with HPAI H5N1, the virus' rapid spread, and the potential economic and trade implications if it were to occur in the United States, both federal and state agencies conduct surveillance for HPAI H5N1 in wild birds.

Information about AI worldwide, including the cumulative number of confirmed human cases of H5N1 HPAI, is available from the World Health Organization at www.who.int/csr/disease/avian_influenza/avian_faqs/en/index.html. Additional AI information from a public health perspective is available from the Centers for Disease Control and Prevention (CDC) at www.cdc.gov/flu/avian/. A summary of human H5N1 HPAI infections can be found in: Writing Committee of the Second WHO Consultation of Clinical Aspects of Human Infection of Avian Influenza A (H5N1) Virus. Update on avian influenza A (H5N1) infection in humans. *NEJM* 2008; 358: 261–73.

This section describes, from a NYS public health perspective, the animal surveillance system, availability of laboratory diagnostic procedures, sharing of information between state agencies and activities by pandemic period and interval in preparation for, and during, an outbreak of HPAI in the U.S. This section focuses primarily on current animal surveillance and response activities during various intervals of an influenza pandemic and does not specifically address surveillance and control of human illness associated with HPAI outbreaks in domestic animals in NYS. In addition, New York State has developed a separate local, state, and federal interagency “*Jurisdictional Outline for Highly Pathogenic Avian Influenza in Animals*” which details roles and responsibilities of local, state and federal agencies including health departments should highly pathogenic avian influenza be detected in NYS.

II. Objectives

- Summarize current capacity and responsibilities for non-human animal surveillance and laboratory testing for HPAI.
- Summarize anticipated non-human animal disease control activities.

III. Surveillance for Non-Human Animal Infection

AI surveillance may be instituted in domestic birds (e.g., poultry), wild free-ranging birds, captive birds, and mammals during different pandemic influenza and/or AI plan intervals. The types of surveillance and areas of responsibility are outlined below. In addition, special situations such as importation (legal and illegal) of animals or animal products are described. Confidentiality of animal owners, those reporting disease, and certain detailed address information must be maintained with all non-human animal surveillance systems while still allowing for communication and control activities.

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A. Surveillance in Domestic Birds (e.g., poultry)

State and federal programs currently conduct surveillance for AI among selected domestic poultry, including testing for H5N1. See www.usda.gov/wps/portal/usdahome. Specific types of poultry surveillance are conducted at the state level. In New York, NYSDAM is responsible for domestic bird (e.g., poultry) AI surveillance and control. Periodic sampling is done at live bird markets in the NYC area. In addition, all poultry farms either within or outside New York that have permits to provide poultry to live markets in New York must document that they are free of AI. NYS domestic flocks, regardless of whether they are associated with live bird markets, have ill or dead birds tested by veterinarians for AI when there is any clinical, epidemiologic, or pathologic suspicion of AI. See www.agmkt.state.ny.us/AI/AvianFlu.html. Testing is conducted by the New York State Veterinary Diagnostic Laboratory (NYSVDL) at Cornell University's Animal Health Diagnostic Center, with confirmatory testing done by USDA. Results are reported to NYSDAM and the sample submitter. Any domestic bird owners or their veterinarians with concerns about AI in their birds should contact NYSDAM at 518-457-3502 to discuss the need for testing. In New York City, the New York City Department of Health and Mental Hygiene should also be contacted at 212-788-4160 (see www.nyc.gov/html/doh/html/cd/cd-hcp-h5n1.shtml).

The NYSDOH Zoonoses Program has access to the NYS Animal Incident Notification and Tracking system (NYSAINTS) managed by the New York State Department of Agriculture and Markets (NYSDAM). The NYSDAM established NYSAINTS to collect reports of illness in animals from animal healthcare providers. In addition, plans are being made to have the NYSAINTS system interface with the NYSDOH Commerce system.

B. Surveillance in Wild (Free-Ranging) Birds

Multiple free-ranging wild bird species in Asia and Europe have been shown to have clinical disease and/or mortality associated with naturally acquired HPAI H5N1 infection. The majority of these cases have reportedly occurred as isolated instances, involving small numbers of animals from a limited number of species, and primarily in areas with pre-existing widespread poultry infection. While exact numbers and species are not always known, species with confirmed HPAI H5N1 infection include grey herons, little egrets, tree sparrows, pigeons, peregrine falcons and unspecified crow and magpie species. In addition, there was a large die-off involving multiple waterfowl species at a lake in China during 2005. The species affected in this large outbreak included bar-headed geese, brown-headed gulls, great black-headed gulls, ruddy shelducks and greater cormorants. A list of animal species affected by HPAI H5N1 can be found at: www.nwhc.usgs.gov/disease_information/avian_influenza/index.jsp.

The possibility for bird mortality in other species is unknown at this time. Wild birds are collected nationally for many government-agency and university-sponsored research studies. Collection of samples specifically for AI surveillance has been enhanced due to the risk of introduction of H5N1 into this hemisphere. Attention is being focused on the West Coast and

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Alaska where, it is believed, migratory birds may carry the virus into the United States from Asia and Russia. With this increased attention, more cases of LPAI in wild birds are being reported, including LPAI H5N1 in Canada and the United States (unrelated to the HPAI H5N1 strains in Asia and Europe). Additional information is available from the National Wildlife Health Center (including guidance for people handling wild birds) at www.nwhc.usgs.gov/disease_information/avian_influenza/index.jsp.

The New York State Department of Environmental Conservation (NYSDEC) and USDA Wildlife Services are jointly responsible for enhanced wild bird surveillance for AI in NYS. Surveillance data from wild birds is routinely disseminated electronically to NYSDAM and NYSDOH. More information about the national surveillance plan for AI in wild birds can be found at <http://wildlifedisease.nhii.gov/ai/>. Positive results from wild bird surveillance are also posted on this website. To date, only LPAI strains have been found in wild birds in the U.S., including in NYS.

C. Surveillance in Captive (Zoologic or Privately Owned) Birds

Captive wild birds have been clinically affected by HPAI H5N1 in Europe and Asia, most notably in an outbreak at a zoo in Thailand during the 1990s. This is the only reported outbreak in captive wild birds to date. Affected species included raptors (Grey-headed fish eagle, Serpent eagle, Hawk eagle, Spotted wood owl, Brown fish owl, Spotted bellied eagle owl, and Buffy fish owl), songbirds (Scaly-breasted munia and Black drongo) and Grey heron. HPAI H5N1 was also confirmed in a psittacine bird (Pionus parrot) and multiple southeast Asian mesias (finches) during quarantine in the United Kingdom.

Association of Zoos and Aquariums (AZA) institutions conduct veterinary and pathologic assessment of animal deaths on their premises, including submission of appropriate diagnostic samples for AI testing when indicated. Testing specifically for AI on these specimens in NY is conducted at the NYSVDL at Cornell University with legal authority for this surveillance vested in the NYSDAM. Confirmatory testing is conducted by USDA. The NYSDOH Zoonoses Program would receive verbal communications regarding any confirmed diagnosis of AI in captive or privately owned birds from NYSDAM.

D. Surveillance in Mammals

Naturally occurring H5N1 infections have been confirmed in several feline species, Owston's palm civets, and a stone (beech) marten. There have been two outbreaks of HPAI H5N1 in felids housed in zoos in Thailand and a few cases in felids at a national park in Vietnam. In Thailand during December 2003, two tigers (*Panthera tigris*) and two leopards (*Panthera pardus*) showed clinical signs of a respiratory disease and died unexpectedly. Virus isolation and RT-PCR confirmed the presence of the H5N1 virus that was currently circulating among poultry flocks in the area. The animals had been fed fresh chicken carcasses from a local slaughterhouse. A second, larger outbreak occurred

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at the end of 2004 at the biggest tiger zoo in Thailand. A total of 147 tigers died or were euthanized due to H5N1. In this case, although the outbreak was initiated by feeding contaminated carcasses to the animals, it appears to have been maintained by horizontal transmission of the virus between the animals (specific transmission mechanism currently unknown).

Occasionally, other mammals have tested positive for HPAI H5N1 following contact with infected birds. In Thailand, a dog was fatally infected with HPAI H5N1 after eating an infected duck carcass in 2004. In Germany, three dead domestic cats (*Felis domestica*) and an ill stone marten (*Martes foina*) were confirmed to be infected with H5N1 virus. All four animals were from an area of the country heavily affected by HPAI H5N1 where multiple species of wild birds had been confirmed to be infected with the virus. The cats and the marten were presumed to have been infected after feeding on infected birds.

The Erasmus Medical Center in the Netherlands has published some research showing that: 1) domestic cats inoculated intra-tracheally with an H5N1 strain isolated from a Vietnamese man who died of the disease became symptomatic and showed gross lesions characteristic of H5N1 infection, and the virus was re-isolated from the cats' tissues, 2) horizontal transmission of the same virus occurred between domestic cats in the laboratory setting, and 3) feeding infected chicks to domestic cats produced clinical symptoms in the animals with subsequent viral shedding.

Ferrets are often used as a research model in influenza studies. Laboratory work has demonstrated that infection of ferrets with human derived H5N1 virus strains is fatal. However, infection of ferrets with avian derived strains of H5N1 did not result in fatal disease. The possibility of natural infection in other species of mustelids (e.g., otters, badgers, weasels) has not been documented.

Without additional evidence of HPAI risk to domestic or free-ranging mammals in the U.S., mammals will not be prioritized at this time for early detection and disease surveillance. However, in the event that a HPAI outbreak occurs in New York, veterinarians should be alert for compatible illness in domestic animals following exposure to potentially infected birds and take appropriate measures to rule out HPAI infection in such animals, especially swine, dogs, cats, and ferrets. Testing for HPAI in mammals is available, when indicated, through the NYSVDL at Cornell University. Confirmed HPAI infections in mammals would be reported to NYSDAM and subsequently to NYSDOH.

E. Importation

All legally imported birds are tested before they leave their country of origin according to country-specific requirements. Once they arrive in New York State, they are immediately quarantined at a federal facility in Newburgh, New York, for one month. AI testing of these birds is routine, and any bird testing positive for AI is euthanized and appropriately disposed of. For more information on importation requirements, contact the USDA-APHIS Veterinary Services New York office at 518-869-9007.

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The federal Department of Homeland Security, Customs and Border Protection, Department of Interior, U.S. Fish and Wildlife Service and the U.S. Department of Agriculture jointly handle the investigation and control of illegally imported or smuggled animals and animal products. Based on known patterns for smuggling, agents inspect for smuggled birds or poultry products. If any birds are found, they are sampled with testing conducted at the NVSL for AI and other foreign animal diseases. Illegally imported poultry products are either returned to the country of origin, or destroyed according to USDA-APHIS policy.

IV. Laboratory Diagnosis for Non-Human Animal Infection

Laboratory testing for all strains of AI, including H5N1, in non-human animals is available from several laboratories. Domestic birds (poultry) are routinely tested by NYSDAM at the NYSVDL, part of Cornell University's Animal Health Diagnostic Center, with confirmatory testing conducted by USDA. The same laboratories are used for the NYSDEC and USDA-APHIS wild bird surveillance program in NYS.

V. Response to HPAI in the United States

Any HPAI virus is considered a foreign animal disease (FAD) and as such the discovery of any HPAI in poultry, wild birds, or captive exotic birds in the United States would result in an immediate state and federal response to control and eradicate the virus.

The USDA-APHIS has primary authority over all FADs found in the United States. NYSDAM would work in conjunction with USDA-APHIS to quarantine and take all necessary measures as needed to eradicate HPAI from domestic birds. Such measures may include culling of potentially exposed or infected animals, and vaccination of animals in adjacent areas.

In NYS, NYSDEC has the legal responsibility for wild birds and game bird breeders, and the U.S. Fish and Wildlife Service (United States Department of the Interior [USDOI]) has responsibility for migratory birds, including migratory waterfowl. Thus, these agencies are involved in cooperative efforts for avian influenza surveillance and control.

In the event such a response is needed for any HPAI strain, WHO and CDC have advised that workers responding to such an outbreak take certain precautions to prevent human infection with HPAI. It is recommended that poultry workers and workers in contact with potentially infected animals or contaminated premises wear appropriate personal protective equipment, receive the currently available human seasonal influenza vaccine (to reduce the possibility of a worker being co-infected with human and avian influenza viruses) and receive prophylactic antiviral medications. These workers would also be prioritized for any human HPAI H5N1 vaccines that are developed, if there is an HPAI H5N1 outbreak in poultry. NYSDOH would provide guidance regarding human vaccination and prophylaxis against infection with novel influenza viruses.

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Federal employees assisting with a response to an outbreak of HPAI in poultry in NY should work with their agency's occupational health providers to be vaccinated and have antiviral medications prescribed as recommended. New York State employees will need to coordinate through NYS occupational health; this may require assistance through the NYSDOH to acquire and provide vaccine and antiviral medication. Non-governmental employees with potential exposure will need to work with their private and occupational health care providers to be vaccinated and have antiviral medications prescribed. LHDs can assist by providing information and triaging questions to appropriate state and federal agencies.

Occupational health issues also will be of concern for persons in contact with potentially infected wildlife. NYSDOH is working with other federal and state agencies to develop and disseminate guidelines for protection, including recommendations already provided to NYSDEC for their workers who are conducting wildlife AI surveillance. Within laboratories, guidelines developed by the NYSDOH Wadsworth Center are recommended for persons handling non-human as well as human samples potentially infected with HPAI (see Section 2: Surveillance and Laboratory Testing).

VI. Activities by WHO Pandemic Period and CDC Pandemic Interval

Interpandemic and Pandemic Alert Periods

Federal agriculture/wildlife agencies (USDA/APHIS, WS; USDO/I/FWS):

- Participate in routine surveillance, testing, and control activities for avian influenza in wild birds. (Investigation, Recognition)
- Participate in collection and testing system for wild birds as part of an enhanced influenza surveillance system. (Investigation, Recognition)
- Provide information about wild bird morbidity/mortality reporting. (Investigation, Recognition)
- For their workers handling birds likely to be infected with AI, provide personal protective equipment and guidance on appropriate infection control. (Investigation, Recognition)
- Coordinate occupational health issues for their workers including availability of human influenza vaccine and antiviral drugs as indicated for workers handling birds likely to be infected in the event that HPAI is detected. (Investigation, Recognition)

State Agriculture Department (NYSDAM):

- Routine surveillance, testing, and control for avian influenza in domestic birds and non-human mammals. (Investigation, Recognition)
- Participate in coordination of testing of wild and captive birds as part of an enhanced influenza surveillance system. (Investigation, Recognition)
- Provide information about wild bird morbidity/mortality reporting.

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- For their workers handling birds likely to be infected with AI, provide personal protective equipment and guidance on appropriate infection control. (Investigation, Recognition)
- Coordinate occupational health issues for their workers including availability of human influenza vaccine and antiviral drugs as indicated for workers handling birds likely to be infected in the event of an outbreak of HPAI in NY.
- Communicate information about confirmed HPAI infections in domestic poultry with NYSDOH and NYSDEC. (Investigation, Recognition)

State Environmental Department (NYSDEC):

- Participate in routine surveillance, testing, and control activities for avian influenza in wild birds. (Investigation, Recognition)
- Participate in collection and testing system for wild birds as part of an enhanced influenza surveillance system. (Investigation, Recognition)
- Provide information about wild bird morbidity/mortality reporting. (Investigation, Recognition)
- For their workers handling birds likely to be infected with AI, provide personal protective equipment and guidance on appropriate infection control. (Investigation, Recognition)
- Coordinate occupational health issues for their workers including availability of human influenza vaccine and antiviral drugs as indicated for workers handling birds likely to be infected in the event of an outbreak of HPAI in NY.
- Communicate information about confirmed HPAI infections in wild birds with NYSDOH and NYSDAM. (Investigation, Recognition)

State Health Department (NYSDOH):

- Develop materials and help educate LHDs, healthcare providers, veterinarians, agency employees, and others about human risks and precautions related to HPAI. (Investigation, Recognition)
- Assist partner state agencies (especially NYSDAM and NYSDEC) in providing surveillance, personal protection, and infection control guidance to their personnel and to implement the NYS interagency AI plan. (Investigation, Recognition)
- Partner with other state agencies to update the NYS interagency AI plan and guidelines for surveillance and personal protection. (Investigation, Recognition)
- Provide a NYSDOH call center with scripts and informational messages about HPAI if HPAI is determined to be a risk for or is detected in NY.
- Provide information and guidance to LHDs and healthcare providers about surveillance for and prevention and management of human infections with novel influenza viruses should HPAI be confirmed in domestic, wild, or captive birds. (Investigation, Recognition)

Local Health Departments:

- Using materials developed by NYSDOH and other state and federal agencies, help educate healthcare providers and the public about HPAI and potential risk to humans. (Investigation, Recognition)

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- Triage questions about AI in animals to agriculture and wildlife officials. (Investigation, Recognition)
- Some local health departments may choose to participate with other agencies in avian influenza surveillance, testing, and control activities in birds. (Investigation, Recognition)

Healthcare Providers:

- Follow state guidelines about clinical testing and management of patients potentially exposed to novel influenza viruses either outside of the United States or domestically (see section 5: Clinical Guidelines). (Investigation, Recognition)
- Refer patients with questions about AI in animals to agriculture and wildlife officials. (Investigation, Recognition)
- Follow state and federal guidelines about triage of patients with AI exposure in regards to use of antivirals and vaccinations if HPAI is detected in NY. (Investigation, Recognition)

Pandemic Period

Federal agriculture/wildlife agencies (USDA/APHIS, WS; USDOJ/FWS):

- Activities as in the pre-pandemic interval. (Initiation, Acceleration, Peak, Deceleration, Resolution)

State Agriculture Department (NYS DAM):

- Activities as in pre-pandemic interval. (Initiation, Acceleration, Peak, Deceleration, Resolution)

State Environmental Department (NYS DEC):

- Activities as in pre-pandemic interval. (Initiation, Acceleration, Peak, Deceleration, Resolution)

State Health Department (NYS DOH):

- In the pandemic interval, the primary focus of the NYSDOH will be on person-to-person disease control, not bird to person.
- Activities to control any bird-to-person spread will continue as detailed under the pre-pandemic interval in the event of a concurrent outbreak of AI in NYS.

Local Health Departments:

- In the pandemic interval, the primary focus of LHDs will be on person-to-person disease control, not bird-to-person.
- Activities to control any bird-to-person spread will continue as detailed under the pre-pandemic interval in the event of a concurrent outbreak of AI in NYS.

Healthcare Providers:

- In the pandemic interval, the primary focus of healthcare providers will be on person-to-person disease control, not bird-to-person.
- Obtain a patient history to include exposures to wild or domesticated birds and swine.

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- Obtain appropriate diagnostic samples from patients with a recent history of direct animal contact and influenza-like illness in order to rule out infections with non-pandemic influenza virus strains.