

Highly Pathogenic Avian Influenza Virus H5N1 and Wild Birds

Prepared by:
Southeastern Cooperative Wildlife Disease Study
Department of Population Health
College of Veterinary Medicine
The University of Georgia
www.scwds.org

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What are avian influenza viruses?

- Avian influenza viruses (AIV) are Type A influenza viruses that are associated with avian species. They have been isolated from more than 100 species of free-living birds world-wide.
- Classification of these viruses is based on their hemagglutinin (H) and neuraminidase (N) subtypes. There currently are 16 H and 9 N recognized subtypes, and all of these subtypes are represented in viruses isolated from wild birds.
- Wild birds represent the historic source for Type A influenza viruses affecting both domestic bird and mammalian species.
- The host adaptation that occurs after the movement of these viruses from wild birds to domestic animals to humans often results in the evolution of “new” viruses that can become adapted to the new host population. These “new” viruses (which include human Type A influenza viruses) differ from the original viruses detected in wild birds and are no longer associated with wild avian populations.
- The movement and adaptation of Type A influenza viruses from wild birds to new host species (especially mammals) is not a common event, which is evident from the limited number of human type A influenza viruses.

What is a Highly Pathogenic Avian Influenza (HPAI) virus?

- Highly pathogenic avian influenza viruses are influenza viruses that cause high mortality in domestic poultry.
- Highly pathogenic avian influenza viruses are associated with the H5 and H7 subtypes.
- **Not all H5 and H7 subtypes are highly pathogenic.** In fact, there are H5N1 subtypes that are not highly pathogenic.

What is “Bird Flu” and what is “HPAI H5N1”?

- “**Bird Flu**” is a nonscientific term that was coined to describe the HPAI H5N1 viruses that have been present in Asia since 1997. This term has caused a great deal of confusion because it is often used as a synonym for avian influenza.
- **HPAI H5N1** is a highly pathogenic H5N1 virus that has persisted in Asia at least since 1997. It is established in domestic poultry populations in Asia (primarily chickens and domestic ducks) and has subsequently spread to parts of Europe and Africa.
- In 1997, a human death resulting from **HPAI H5N1** virus infection in Hong Kong was reported; since then there have been nearly 200 human cases with 109 fatalities since that time. All human cases have occurred in Asia, eastern Europe (Turkey) and Africa (Egypt), and almost all of these cases have been linked to direct contact with infected poultry.
- In 2002/2003, wild bird mortality in Hong Kong was attributed to infection with **HPAI H5N1** virus. Wild bird mortality associated with HPAI H5N1 has continued through 2006; the current distribution **strongly suggests** movement of this virus via migratory birds.

What do we know about avian influenza viruses in wild birds?

- Our knowledge regarding the epidemiology of avian influenza in wild birds is extensive but not complete.
- Most AIVs have been isolated from birds that are associated with water, with most isolations originating from species in the Anseriformes (ducks, geese, and swans) and Charadriiformes (gulls, terns, and shorebirds).
- In ducks, the prevalence of AIV peaks in late summer and early fall. Outside of this period, infection rates often are lower than 1%.
- In gulls and shorebirds, peak infection rates are associated with spring migration but these rates differ greatly between species and location and are generally low. To date, a high prevalence of AIV in shorebirds has only been reported from areas surrounding Delaware Bay and most of these isolations have been recovered from ruddy turnstones.
- These temporal patterns result in consistent spatial patterns. For example, avian influenza viruses can be isolated from ducks on wintering grounds but the prevalence of infection is very low.
- Viruses recovered from wild birds include all of the H and N subtypes but these subtypes are not equally represented. In North America, viruses representing the H5 and H7 subtypes are present but these are not HPAI viruses and they are not common.
- ***None of these naturally occurring North American AIVs from wild birds have been associated with mortality or morbidity in any wild bird species.***
- Prior to 2002, when the HPAI H5N1 was linked to wild bird deaths in Asia, there was only one historic case of any wild bird mortality associated with AIV infection (an H5N3 in South Africa in the 1960s caused mortality in common terns). This HPAI virus may have spilled over from infected poultry flocks and it did not persist in wild bird populations.
- Thousands of influenza isolates have been made from ducks and other birds in North America during the last 30 years. Despite this ongoing surveillance, ***there is no indication that any HPAI viruses exist in North American wild bird populations.***

Is HPAI H5N1 present in North America?

- ***There is no evidence to suggest that an HPAI H5N1 virus is present anywhere in North America.***

Is there currently a public health risk associated with HPAI H5N1 in wild birds?

- ***In the United States there currently is no recognized public health risk associated with HPAI H5N1 and wild bird contact.***
- All human deaths associated with bird-to-human transmission of avian influenza viruses have occurred in Asia, eastern Europe (Turkey), and Africa (Egypt) and all have involved the HPAI H5N1 viruses. Human cases have occurred in connection with extensive infections in domestic poultry.
- Other H5, H7, and H9 avian influenza viruses have been transmitted directly from infected domestic birds to humans. These events have involved HPAI and Low Pathogenic Avian Influenza (LPAI) viruses, but all have involved contact with infected poultry.
- ***There has never been a single documented case of avian influenza virus transmission directly from wild birds to humans.***
- ***There is no indication that wild waterfowl species hunted in North America are infected with HPAI H5N1.***
- Although there currently is no recognized risk associated with hunting waterfowl (or other wild birds) and HPAI H5N1 in North America, basic hygiene is always recommended when handling any wild animals or carcasses. Practices should include hand washing, proper food preparation and clean-up, and thorough cooking.
- With regard to pandemic influenza, the primary public health risk associated with HPAI H5N1 relates to the potential for genetic changes (mutations within the H5N1 or recombination with human influenza viruses) that would allow for efficient human-to-human transmission. If this were to occur, transmission of this “new” virus would no longer require an avian source.

Is there a domestic animal health risk associated with HPAI in wild birds?

- There have been many documented cases of low pathogenic avian influenza virus transmission from wild birds to domestic birds. This is especially true for free-ranging domestic flocks that have direct contact with wild ducks.
- ***In the United States, there are no documented cases of HPAI transmission from a wild bird to domestic birds***, and it is believed that most HPAI viruses evolve after an H5 or H7 virus becomes established in domestic bird populations.
- The recent expansion in distribution of HPAI H5N1 throughout Asia to Europe and Africa **suggests** that domestic flocks are being infected with this virus through contact with migratory wild birds. However, wild birds may not represent the only source of introduction or spread of HPAI H5N1 within these newly affected areas.

What is the possibility of HPAI H5N1 entering North America via migratory wild birds?

- Some migratory bird species move between North America, Asia, and Europe, however, genetic studies of avian influenza viruses from Eurasia and North America suggest that there is very limited exchange of AIVs between continents (even with very common influenza viruses).
- It is not possible to discount the possibility of an HPAI H5N1 introduction, but such an occurrence based on the known epidemiology of other avian influenza viruses would likely be a very low probability event.

What is the possibility of this virus being maintained in wild bird populations?

- We have limited information on which to evaluate this possibility.
- Experimental studies have demonstrated bird-to-bird transmission of HPAI H5N1 in young mallards, but these studies were completed under confinement conditions that are not representative of natural conditions.
- Experimental studies with HPAI H5N1 strains have consistently demonstrated higher respiratory rather than cloacal shedding of virus. In wild birds, low pathogenic avian influenza viruses generally are associated with cloacal shedding, and transmission occurs via a fecal/oral route through contaminated water. It is not clear if the extent of fecal shedding with HPAI H5N1 is consistent with the naturally occurring AIVs that are maintained in wild bird populations.
- It is known that other AIVs can persist for extended periods of time in water. Preliminary information on environmental persistence of HPAI H5N1 in water suggests that these viruses are not as resistant in the environment as the naturally occurring H5 LPAI viruses.
- In experimental trials of mallards with HPAI H5N1, morbidity and mortality were common. Most isolates from wild birds in Asia and Europe also have been associated with sick or dead birds. It is unclear if wild birds can be infected with HPAI H5N1 and remain healthy.
- Most of the isolations of HPAI H5N1 from Asia and Europe have been associated with species in the order Anseriformes. In Europe most isolations have been associated with mute swan mortality.
- The potential for this virus to be maintained in “healthy” wild bird populations has not been demonstrated, and to date, the detection of HPAI H5N1 in wild bird populations has always been associated with wild bird morbidity or mortality. In fact, there have been few if any cases where the presence of HPAI H5N1 was detected through live-bird surveillance.

Is there surveillance for HPAI H5N1 in the United States?

- Surveillance for AIV was taking place in the United States and other North American countries prior to the emergence of HPAI H5N1.
- Wild bird surveillance has and will be expanded to include the entire country with increased surveillance of bird populations in areas of potential introduction, such as Alaska.

Additional information on HPAI can be found at these websites:

Southeastern Cooperative Wildlife Disease Study (<http://www.uga.edu/scwds/avianinfluenzainformation.html>)

The Centers for Control and Prevention (www.cdc.gov/flu/avian)

USDA-APHIS-Veterinary Services (www.aphis.usda.gov/lpa/issues/avian_influenza/index.html)

USGS National Wildlife Health Center (www.nwhc.usgs.gov/research/avian_influenza/avian_influenza.html)