

Avian Influenza A virus: Bird Flu¹

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What is avian influenza?

Influenza is an ancient disease that has plagued humans throughout recorded history. There are three types of influenza virus, A, B and C (CDC, 2005b). All three types of influenza have been found circulating in the human population. However, influenza type A is the influenza virus that mainly infects wild birds. Avian influenza occurs naturally in the intestines of wild birds worldwide, and although most wild birds are asymptomatic, bird flu is very contagious and, if transmitted to domesticated birds, including chickens, ducks (Fig. 1) and turkeys, can make them very sick (CDC, 2005a; 2007a).

The terminology “Avian influenza virus” usually refers to the influenza A viruses found mainly in birds but occasionally found infecting humans. “Human influenza virus” refers to the avian influenza virus subtypes that are wide spread among humans. The three previously known influenza A viruses circulating among humans are H1N1, H1N2, and H3N2. Recently a new virus subtype, H5N1, crossed into humans and has caused the largest number of detected cases of severe disease and death attributed to avian flu viruses in humans (CDC, 2007a, b).



Figure 1. Domesticated birds, including chickens, ducks, and turkeys, can become very sick from avian influenza virus. Credits: Peter H Connelly

Influenza virus is shed in saliva, nasal secretions and feces of infected birds. Other birds may become infected by contact with contaminated secretions or excretions or with contaminated surfaces. Domesticated birds can become infected through direct contact with wild birds or from contact with surfaces, like cages or dirt, or materials, like feed or water, that have been contaminated.

The virus

Influenza viruses are segmented negative-strand RNA viruses that belong to the Orthomyxoviridae family of viruses (IFPMA, 2007a). The segmented

1. This document is ENY751, one of a series of the Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date August 14, 2008. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.

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genome of influenza viruses enables gene re-assortment. Gene rearrangement (antigenic shift) as well as nucleic acid changes in the genes encoding the main surface proteins (antigenic drift) results in modifications in viral surface proteins, thus enabling evasion of host immune mechanisms. While influenza A viruses can infect a wide range of hosts, including humans, swine and birds, B type viruses only infect humans, while type C infects humans and swine (IFPMA, 2007a).

Influenza A can be further categorized into subtypes based on different combinations of two of the viral surface proteins, hemagglutinin (HA) and neuraminidase (NA) (CDC, 2007a). There are 16 HA subtypes and 9 NA subtypes and each combination has been found in the wild bird population. All 16 HA subtypes, including H5, coexist in wild bird populations, with minimal disease outbreaks or changes to the viral genome (CDC, 2007a; IFPMA, 2007b). Once the virus infects a new host, the influenza virus rapidly evolves by changing the HA or NA surface proteins. Type A influenza virus of subtypes H5 and H7 include the viruses that are highly pathogenic. Infections of humans with these subtypes can result in mild disease (H7N3, H7N7) to severe and fatal disease (H7N7, H5N1) (CDC, 2005a; Webster et al., 2006).

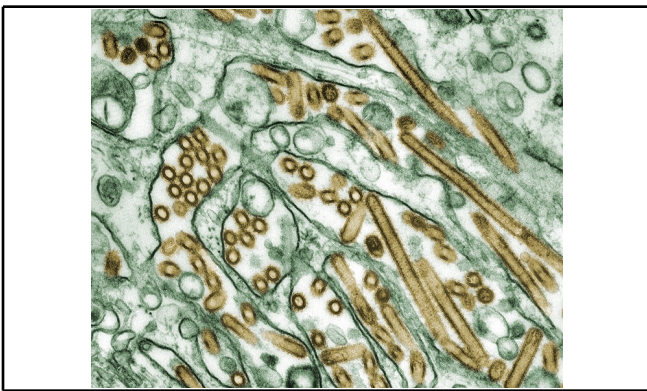


Figure 2. Colorized transmission electron micrograph of Avian influenza A H5N1 viruses (seen in gold) grown in MDCK cells (seen in green). Credits: CDC/Cynthia Goldsmith, Jacqueline Katz, and Sherif R. Zaki

What are the symptoms?

In domestic birds, chickens, turkeys and ducks, low pathogenic strains of influenza A virus can cause mild symptoms, which include ruffled feathers and a drop in egg production. Most avian influenza A

viruses can be classified as low pathogenicity (CDC, 2005a, b). The more pathogenic form of the virus spreads more rapidly through flocks. It may cause a disease that affects multiple organs and may result in 90-100% mortality within 48 hrs (IFPMA, 2007b).

Symptoms of low pathogenic avian influenza virus in humans may be similar to symptoms of human influenza disease, including fever, cough, sore throat and muscle aches. Additional symptoms are eye infections, pneumonia, severe respiratory disease, and include other severe, life-threatening complications. Highly pathogenic strains of the influenza A virus can cause severe and fatal illness in humans (CDC, 2007a, b).

How is it transmitted to humans?

Human cases of avian influenza A infection have resulted from contact with infected poultry or surfaces contaminated with secretions/ excretions from infected birds. Person to person transmission is rare, inefficient and un-sustained (CDC, 2007a, b).

How is it diagnosed?

Avian influenza viruses mainly infect the lower respiratory tracts. Therefore, specimens for identification can be collected by swabs of the throat and nasal-cavity, and from bronchioalveolar lavage and endo-tracheal aspirates. A serological sample can also be used to determine influenza virus infection status. The laboratory diagnosis of avian influenza A virus can detect the virus itself or the viral antigens, and antibodies to the virus. Direct detection methods include the following: 1) virus isolation; 2) detection of viral nucleic acid by polymerase chain reaction (PCR); or 3) the detection of viral antigens by either immunofluorescence (IFA) tests or rapid antigen detection kit. The serological methods for detecting the viral antibodies include the hemagglutination inhibition test (HAI) and the micro-neutralization tests (MT) (WHO, 2007).

What is the cure?

Laboratory studies suggest that avian influenza may be effectively treated with some medicines approved for human influenza virus. In Asia, the H5NI virus that causes sever human illness and death

was resistant to amantadine and rimantadine, two commonly used influenza medications (Webster et al., 2006). The antiviral agent, oseltamivir, has also been recommended for treatment and prevention of human influenza A by the Centers for Disease Control and the World Health Organization. However, some evidence of resistance to oseltamivir has been reported. Other influenza antiviral medications have yet to be tested. Increased anti-viral resistance suggests a need for new treatments for avian influenza A (IFPMA 2007a, b).

Where does it occur?

Influenza A viruses occur in wild birds, world wide. Avian H5N1 has been detected since 2003 in poultry in the Republic of Korea, Vietnam, Japan, Thailand, Cambodia, Lao Peoples Democratic Republic, Indonesia, and China. Additionally, outbreaks have been reported in Malaysia, Russia, Kazakhstan and Mongolia. By late 2005, H5N1 outbreaks had spread to Turkey and Romania (IFPMA, 2007b).

Although avian influenza A viruses rarely infects humans, infections have been reported in humans since 1996. By 2003, 330 confirmed infections with the highly pathogenic H5N1 strain had been reported in 12 countries. Outbreaks of avian influenza A virus have been reported in the United Kingdom, Hong Kong, China, United States of America, Netherlands, Canada, Thailand, Vietnam, Cambodia, Egypt, Azerbaijan, Djibouti, Indonesia, Iraq, Turkey, Lao People's Democratic Republic, Nigeria, Pakistan, and Myanmar. These confirmed instances include infections with high and low pathogenicity viruses (CDC, 2007b; IFPMA 2007b).

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