

# Avian Influenza in Poultry <sup>1</sup>

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Avian influenza is a viral disease affecting the respiratory, digestive, and/or nervous system of many species of birds. Avian influenza virus infection can occur in most, if not all, species of birds, both domestic and wild. Influenza viruses vary widely in their ability to cause disease (pathogenicity) and their ability to spread among birds. Wild species of birds usually do not develop clinical disease, but some influenza viruses cause severe illness or death in chickens, turkeys, and guinea fowl.

## History

A highly pathogenic form of avian influenza was known as “fowl plague”. It first appeared in Italy more than 100 years ago (around 1878). Pathogenic avian influenza was first recognized in the United States in 1924–1925. It occurred again in 1929. It was eradicated both times.

A major epidemic of highly pathogenic avian influenza occurred in the northeastern United States in 1983–1984. It took more than 2 years to eradicate, at a cost of more than 70 million dollars. Approximately 17 million birds had to be destroyed during the eradication effort.

In 1996–1997, a number of table-egg farms in Lancaster and Lebanon Counties, PA tested positive for H7N2 avian influenza. The avian influenza virus, which was detected by serologic means and/or virus isolation, was characterized as nonpathogenic to chickens, but the outbreak had devastating effects on the local poultry industry. Between

the first week of December 1996 and June 6, 1997, nine flocks were depopulated. The Pennsylvania Agricultural Department imposed a quarantine on a 75-square-mile area, restricting movement of poultry or poultry products on or off operations in the area of the quarantine. This outbreak was eliminated. Additional outbreaks of avian influenza occurred in the United States in 2015 and 2016 in the Midwest and Northeast. Both of these outbreaks were eliminated at considerable cost.

## Clinical Signs

The severity of the disease ranges from inapparent (mild) to rapidly fatal. Lethal strains of the virus can strike so quickly, particularly in young chickens, that there may be no clinical signs other than sudden death.

Avian influenza viruses of low to moderate pathogenicity are identified regularly in the United States in the domestic poultry populations. Avian influenza virus is reintroduced into domestic poultry by migratory waterfowl, which are carriers of the influenza virus.

Clinical signs vary greatly and depend on many factors including the age and species of poultry affected, husbandry practices, and the inherent pathogenicity of the influenza virus strain. Clinical signs may include:

- ruffled feathers
- soft-shelled eggs

1. This document is PS38, one of a series of the Animal Sciences Department, UF/IFAS Extension. Original publication date April 1998. Revised December 2017. Visit the EDIS website at <http://edis.ifas.ufl.edu>.

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- depression and droopiness
- sudden drop in egg production
- loss of appetite
- cyanosis (purplish-blue coloring) of wattles and comb
- edema and swelling of head, eyelids, comb, wattles, and hocks
- diarrhea
- blood-tinged discharge from nostrils
- incoordination, including loss of ability to walk and stand
- pin-point hemorrhages (most easily seen on the feet and shanks)
- respiratory distress
- increased death losses in a flock

The clinical signs of avian influenza are similar to those of other avian diseases. Avian influenza may be confused with infectious bronchitis, infectious laryngotracheitis, fowl cholera, and the various forms of Newcastle disease.

Typical history, signs, and lesions may be suggestive of mild forms of avian influenza. Confirmation of a diagnosis is by serologic testing and virus isolation and identification. Because virulent strains of avian influenza are considered exotic to the United States, they are reportable to the USDA. Virulence level is evaluated by virus isolation and controlled laboratory challenge of experimental chickens and virus sequencing.

## Postmortem Lesions

Lesions vary greatly depending on pathogenicity of the virus, age of the bird, type of poultry, etc. Lesions may include swelling of the face and area below the beak. Removing skin from the carcass will show a clear straw-colored fluid in the subcutaneous tissues.

Blood vessels are usually engorged. Hemorrhage may be seen in the trachea, proventriculus, beneath the lining of the gizzard, and throughout the intestines. The lining of the gizzard may be easily removed.

Other areas likely to show swelling and hemorrhages include the muscle along the breastbone as well as in the heart, gizzard fat, and abdominal fat.

Young broilers may show signs of severe dehydration with other lesions less pronounced or absent entirely.

## Serotypes

There are many different strains (serotypes) of the avian influenza virus. Some of the highly virulent strains evolved from milder strains following repeated chicken-to-chicken passages. The avian influenza virus has been shown to mutate at an extremely high rate as it serially infects poultry. Chickens are not the normal host for avian influenza, so the virus they pick up from other birds has a tendency to mutate and become pathogenic. In 1994, an avian influenza outbreak in Mexico started out mildly, but mutated into a “killer” virus that decimated many poultry flocks. This same scenario had occurred in the northeastern United States in the mid-1980s. Today, extreme biosecurity precautions prevent the spread of the virus to the United States and neighboring countries in Central America. Current research efforts on avian influenza are directed toward understanding why and how mildly pathogenic viruses become highly pathogenic.

Avian influenza viruses are subdivided into serotypes based on their hemagglutinin (H) and neuraminidase (N) surface antigens. The highly pathogenic serotype of avian influenza responsible for the 1983–1984 outbreak in the United States and the 1994 outbreak in Mexico was H5N2. Historically, serotypes H5 and H7 are able to mutate and become highly pathogenic in poultry. Other H types have not mutated to the highly pathogen form.

## Transmission

Infected birds shed the virus in fecal and oculo-nasal discharges. Even though recovered flocks shed less virus than clinically ill flocks, recovered flocks will intermittently shed and should be considered infected for life.

Waterfowl (wild and domesticated) are the primary natural reservoir of influenza viruses. Wild waterfowl usually do not show clinical signs, but they can excrete the virus for long periods. In addition, waterfowl can be infected with more than one type of influenza virus. Detection is further complicated by the fact that they often do not develop a detectable antibody response after exposure to the virus.

Influenza virus has been recovered from water and organic material from lakes and ponds utilized by infected ducks. Co-mingling of these birds with range-reared flocks is a factor in some outbreaks.

The avian influenza virus can remain viable for long periods at moderate temperatures, and can survive indefinitely in frozen material. As a result, the disease can be spread

through improper disposal of infected carcasses, manure, or poultry by-products.

The disease also can be easily spread by people and equipment contaminated with avian influenza virus. Avian influenza viruses can be transmitted on contaminated shoes, clothing, crates, egg flats, egg cases, vehicles, and other equipment. Any object located on an infected poultry farm must be considered contaminated and should be completely cleaned and disinfected before it is moved from those premises. Clothing worn on an infected farm should be laundered.

Insects and rodents may mechanically carry the virus from infected to susceptible poultry.

Influenza virus has been isolated from turkey eggs, suggesting vertical transmission, although typically the virus kills the embryo. There is little or no evidence of egg-borne infection of poults. However, eggshell surfaces can be contaminated with the influenza virus, and thus are a means of transmission.

Avian influenza viruses have frequently been isolated from clinically normal, imported exotic birds. These infected birds are a potential threat to cage birds, wild birds, and poultry.

Live-bird markets are a reservoir of infection. Such markets serve as a focal point for gathering and housing many species of bird. These facilities are rarely cleaned or disinfected.

## Treatment

There is no effective treatment for avian influenza. However, good husbandry, proper nutrition, and broad-spectrum antibiotics may reduce losses from secondary infections. It must be remembered that recovered flocks continue to intermittently shed the virus.

All buildings should be cleaned and disinfected after an infected flock is removed. The poultry litter or manure should be composted before application to cultivated lands.

## Prevention

A vaccination program, in conjunction with strict quarantine, has been used to control mild forms of the disease in commercial chicken and turkey flocks. With the more lethal forms of the disease, however, strict quarantine and rapid depopulation of infected flocks remain the only effective methods of stopping avian influenza. The success of such

a program depends, of course, on the full cooperation and support of the poultry and allied industries.

With the realization that there is a reservoir of influenza virus in wild waterfowl, every effort must be made to prevent direct or indirect contact between domestic poultry and wild waterfowl. Persons handling wild game (especially waterfowl) must change clothes completely and bathe prior to entering poultry houses.

There is currently a serious and ongoing outbreak of avian influenza in Mexico. H5N2 avian influenza virus entered the Mexican poultry industry in the early 1990s and infection is endemic. According to Mexican authorities, the highly pathogenic H5N2 influenza virus has been eradicated. However, as vaccination is widespread, it is difficult serologically to confirm this report and precautions should be continued. Two additional avian influenza viruses are believed to be circulating in Mexico.

It is very important to prevent the spread of this disease into the United States. It is very easy to spread avian influenza on clothing and through human contact. Do not visit or go near any poultry flocks in Mexico unless proper biosecurity actions are taken prior to returning to the United States and having contact with poultry.

## Conclusions

Specialty or hobby-type flocks have an increased risk for direct or indirect exposure to avian influenza because of their contact with wild birds and other poultry. These flocks are commonly mixed and marketed through a live auction market distribution system where proper sanitation is not always practiced. This system allows intermingling of various types of stressed poultry and has been a key link to avian influenza outbreaks in commercial flocks.

The poultry owner is the first line of defense in identifying outbreaks of avian influenza. If birds develop signs of avian influenza, or if exposure is suspected, immediately notify the state poultry officials. (Florida Department of Agriculture and Consumer Services, Division of Animal Industry, Room 335 Mayo Building, 407 South Calhoun Street, Tallahassee, FL 32399-0800; phone 850/410-0900; fax 850/410-0957 or 850/410-0915; [http://doacs.state.fl.us/ai/main/avian\\_flu\\_main.shtml](http://doacs.state.fl.us/ai/main/avian_flu_main.shtml).)