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Avian Influenza Presents Range of Risks

Although in its current form, the bird flu virus rarely infects people, public health authorities believe that, if the virus is not brought under control in birds, it eventually might mutate into a highly contagious form of human influenza.

FSF Editorial Staff

Avian influenza (bird flu) is a form of the flu that typically infects birds but is related to some forms of the flu virus that infect humans, causing respiratory infection, fever, aches and pains. Bird flu presents two risks to humans: the relatively rare risk of infection from direct contact with birds that have the disease, and the risk that the virus might change (mutate) into a form that can be transmitted from one person to another.

As of December 2005, representatives of the aviation industry and public health authorities were developing guidelines on how the industry should respond in the event that bird flu changes into a highly contagious human disease. Crewmembers and passengers have been advised to comply with standard precautions to limit the spread of contagious disease (see "Controlling Infectious Diseases," page 2) and to avoid direct contact with poultry in areas where bird flu outbreaks have occurred[1]; otherwise, few specific recommendations have been issued regarding bird flu.

Although some species of wild waterfowl probably have carried avian influenza viruses for centuries without suffering any ill effects, bird flu was identified only about 100 years ago in Italy. It occurs worldwide among birds of all species, although some species are more susceptible to harm than others. Bird flu is caused by the type A influenza virus; researchers have identified 15 or 16 subtypes of the bird flu virus (see "Types of Influenza Viruses," page 4).[2]

Among birds, the infection causes a variety of symptoms, "ranging from mild illness to a highly contagious and rapidly fatal disease resulting in severe epidemics," the United Nations World Health Organization (WHO) said. "The latter is known as 'highly pathogenic avian influenza.' This form is characterized by sudden onset, severe illness and rapid death, with a mortality that can approach 100 percent." (The milder form of bird flu is described as "low pathogenic," with symptoms that typically include nothing more than ruffled feathers and a decrease in egg production).[3]

Bird flu typically does not spread from birds to humans; nevertheless, when a human becomes infected — usually through direct contact with infected birds or their droppings — the disease can be fatal.

Since mid-2003, a series of outbreaks of bird flu caused by a virus categorized as H5N1 have infected poultry in more than one dozen countries, mostly in Asia and Eastern Europe, and have resulted in the culling of at least 150 million birds from flocks in those countries in attempts to limit the spread of the virus.[4] WHO said that, as of November 2005, more than 100 cases in humans had been confirmed in five countries — Cambodia, China, Indonesia, Thailand and Vietnam.[5]

"Of the few avian influenza viruses that have crossed the species barrier to infect humans, H5N1 has caused the largest number of cases of severe disease and death in humans," WHO said. "Unlike normal seasonal influenza, where infection causes only mild respiratory symptoms in most people, the disease caused by H5N1 follows an unusually aggressive clinical course, with rapid deterioration and high fatality. Primary viral pneumonia and multi-organ failure are common. In the present outbreak, more than half of those infected with the virus have died."[6]

Controlling Infectious Diseases

Public health specialists recommend the following actions to limit the spread of infectious diseases, including any type of influenza:[1]

- Avoid traveling while ill;
- Cover the mouth and/or nose with a tissue or a hand when coughing or sneezing. Discard used tissues in a wastebasket; and,
- Wash hands with soap and water (or an alcohol-based hand gel) immediately after coughing or sneezing; before preparing food, eating or touching one's face; after handling used tissues or other soiled materials; and after using a toilet.♦

— FSF Editorial Staff

Note

1. U.S. Centers for Disease Control and Prevention. *Interim Guidance for Airline Flight Crews and Persons Meeting Passengers Arriving From Areas With Avian Influenza (Updated)*. <www.cdc.gov>.

The people who have become infected with the H5N1 virus typically have been residents of rural areas where family poultry flocks are common. In many of these places, the birds roam freely, often in homes or children's play areas, and their close proximity to people provides many opportunities for human contact with the virus, either through exposure to the droppings of infected birds, or during the slaughter of the birds or the preparation of the birds for cooking.

(Nevertheless, even in areas where outbreaks of bird flu are occurring, consumption of poultry and poultry products is safe, provided that guidelines are followed. These guidelines require that poultry meat and eggs are fully cooked; that liquid from raw poultry and poultry products does not contact other foods; that cooking surfaces, food-preparation surfaces and utensils are disinfected; and that people involved in food-preparation wash their hands.)[7]

Although bird flu outbreaks to date may have involved a few cases in which the virus spread from one human to another, the virus has not acquired the ability to spread from one person to another in a sustained manner. Nevertheless, medical specialists are concerned that changes in the virus could allow for such transmission.[8]

"Flu viruses have a history of changing their genetic plans through mutations, shifting their characters from one year to the next," a Harvard Medical School health publication said. "In some years, these mutations have created a 'monster' influenza virus that has been both very contagious and very severe. Because history repeats itself, we can expect that the bird flu virus will indeed become more contagious."[9]

The National Institute of Allergy and Infectious Diseases (NIAID) at the U.S. National Institutes of Health said, "If avian [influenza viruses] and human influenza viruses were to simultaneously infect a person or animal, the two viruses might swap genes. The result could be a new virus that is readily transmissible between humans and against which humans would have no natural immunity. Such an event could trigger a worldwide influenza pandemic."[10]

A pandemic is an outbreak of disease that infects an unusually large percentage of the population over a wide geographic area.

"A pandemic can start when three conditions have been met: A new influenza subtype emerges; it infects humans, causing serious illness; and it spreads easily and sustainably among humans," WHO said. "The H5N1 virus amply meets the first two conditions: It is a new virus for humans … , and it has infected more than 100 humans, killing over half of them. No one will have immunity should an H5N1-like pandemic virus emerge."[11]

Because the H5N1 virus has become well-established among poultry in Asia, more human cases are likely. As the number of human cases increases, opportunities increase for the virus to become more transmissible — one of the conditions for development of a pandemic. The likelihood of new human cases also increases as the virus spreads to waterfowl and poultry in previously unaffected areas.

As the number of outbreaks — among birds as well as among people — increases, so does the probability of a pandemic, WHO said. Specialists cannot predict the timing or the severity of a pandemic; in some earlier pandemics, as much as 35 percent of the total population was infected. WHO projected that if a pandemic develops from the current bird flu outbreaks and causes mild disease, the result could be between 2 million and 7.4 million deaths worldwide (Table 1, page 3).

Disease-fighting Strategies

Public health authorities already have begun developing strategies to limit the spread of a pandemic that might develop from the bird flu outbreaks.

One strategy involves the use of antiviral medications, such as oseltamivir (Tamiflu) and zanamivir (Relenza), that already are administered to treat influenza. These medications reduce the severity and duration of flu symptoms, if they are taken within two days of the onset of flu symptoms, and medical researchers believe that they also may help prevent new infections. Although manufacturing capacity for these medications has quadrupled, the manufacturing process is time-consuming,

Table 1
Seasonal Influenza vs. Pandemic Influenza

Seasonal Influenza	Pandemic Influenza
Outbreaks occur in predictable seasonal patterns, usually annually, during winter and in temperate climates.	Outbreaks occur rarely (three times during the 20th century).
Affected population typically has some immunity because of previous exposure.	Absence of previous exposure results in little or no pre-existing immunity.
Healthy adults typically are not at risk for serious complications.	Healthy adults may have an increased risk of serious complications.
Health systems typically can meet needs of patients and the public.	Health systems may not be able to meet needs.
Vaccines are developed and available for the annual flu season.	Vaccine probably would be unavailable during a pandemic's early stages.
Supplies of antiviral medication typically are available.	Supplies of effective antiviral medications may be inadequate.
Symptoms include fever, cough, runny nose, muscle aches and pains. Deaths may result from complications, including pneumonia.	Symptoms may be more severe than for seasonal flu, and complications may be more frequent.
Outbreaks typically have modest impact on society; for example, sick employees are encouraged to stay home, and some schools may close.	Outbreaks may have a major impact on society, with widespread travel restrictions, closing of schools and businesses, and cancellation of large public gatherings. The United Nations World Health Organization estimates that deaths could total from 2 million to 7.4 million worldwide.
Effects on national economies and world economy are manageable.	Effects on national economies and world economy might be severe.

Sources: U.S. Department of Health and Human Services, United Nations World Health Organization

and WHO said in November 2005 that it will take about 10 years to produce enough oseltamivir for just 20 percent of the world population.[12]

Older antiviral medications such as amantadine and rimantadine might be effective in a pandemic, but they already are ineffective against some strains of H5N1 virus, and resistance to these medications can develop rapidly; therefore, their use might be limited.

Antibiotics would be useful in treating bacterial pneumonia that sometimes occurs among people infected with flu viruses, and WHO and other health authorities recommend that countries ensure that they will have adequate supplies of antibiotics in the event of a pandemic. If pneumonia were caused by the virus, however, antibiotics would be ineffective.

Testing 'Investigational' Vaccines

Another strategy involves development of a vaccine against the H5N1 virus. The vaccines administered annually against seasonal influenza would be ineffective in the event of an H5N1 pandemic.

Several clinical trials were under way in late 2005 to test "investigational" vaccines to evaluate their likely effectiveness.

NIAID, which was conducting two of the clinical trials, said that the trials are designed to determine what dosage of vaccine will generate the best response from the human immune system.[14]

"The immune response is determined by measuring levels of infection-fighting antibodies in those vaccinated, to see whether the antibodies reach a level that scientists think should be able to provide protection," NIAID said. "We know that flu viruses change over time … . However, in response to the increasing number of … cases reported in early 2004, public health officials deemed it critical to move ahead quickly and select one of the available human H5 viruses for vaccine production. If a distinct H5N1 virus should suddenly emerge, an additional new vaccine against that strain may be needed. Ultimately, the experience gained by manufacturers in producing the current H5N1 vaccine should make us better prepared for the next time."

WHO said that vaccines probably would not be widely available until several months after a pandemic began.

Planning a Response

Aviation specialists and public health authorities are developing detailed guidelines on how the industry should respond in the event of a pandemic. Other guidelines, based on standard infection-control practices and published by authorities such as WHO and the U.S. Centers for Disease Control and Prevention (CDC), recommend that flight crewmembers who become ill and who believe that they were exposed to avian flu avoid traveling while ill.

The CDC guidelines include the following recommendations:[15]

- "Limiting contact with others as much as possible can help prevent the spread of an infectious illness. If crewmembers and ground personnel must travel (e.g., to seek medical care), they should wear a paper or gauze surgical mask to decrease the possibility of transmitting the illness to others;

- "If crewmembers and ground personnel become ill while traveling away from home, their employer should be notified and assistance should be requested in locating a health care provider. Employees should let their employer know if they are concerned about possible exposure to avian influenza, and ask about all available health care options … ;

- "Before crew and personnel visit a doctor's office, clinic or emergency room, the health care provider should be warned in advance about possible exposure; [and,]

- "If illness onset occurs after [returning] home, employees should contact a health care provider. Before going to the doctor's office or emergency room, the medical staff should be told about the employee's symptoms, the countries visited and whether the employee had contact with poultry."

CDC also issued recommendations for identifying passengers who may have avian flu, including the following:[16]

- "Although experience with human infection [by avian influenza] is limited, persons infected with avian influenza would likely have fever and respiratory symptoms (cough, sore throat, shortness of breath). The cause of a febrile respiratory illness in persons who have traveled in areas where avian influenza is present is more likely to be a common respiratory illness, but such persons should be evaluated by a health care provider to be sure;

- "If flight crewmembers or other personnel are concerned that a passenger with symptoms of avian influenza [and] traveling from an area with avian influenza may be infected, they should try to keep the ill passenger separated from the other passengers as much as possible (three [feet] to six feet [one meter to two meters]);

- "If the ill passenger can tolerate a mask, provide a paper or gauze surgical mask to reduce the number of droplets coughed into the air;

- "If a surgical mask is not available, provide tissues and ask the ill person to cover his or her mouth and nose when coughing and to put the used tissues into a wastebasket or bag;

- "If an ill passenger is unable to wear a surgical mask, personnel may wear surgical masks when working with the ill person; and,

Types of Influenza Viruses

Influenza is a respiratory infection — typically accompanied by fever and numerous aches and pains — caused by any of a number of viruses. There are three primary types of influenza viruses that can infect humans: type A, type B and type C.[1]

Influenza type A viruses are divided into subtypes, according to two proteins on the virus surface: hemagglutinin and neuraminidase. For example, the subtype of the type A virus associated with avian influenza outbreaks of the past two years is the H5N1 virus.[2]

Only type A viruses can cause pandemics, outbreaks of disease that infect an unusually large percentage of the population over a wide geographic area. Type A viruses infect not only people but also birds, pigs, horses and other animals. Some species of wild waterfowl, are the natural hosts for all type A viruses; they carry the viruses and can transmit them to other birds, including domestic poultry, but do not become ill themselves.

Influenza type B viruses typically are found only in humans. Although type B viruses can cause serious illness and death, they have not caused pandemics.

Influenza type C viruses are associated with mild illness.

Type B viruses and subtypes of type A viruses also are categorized according to strain. New strains of these viruses develop frequently and replace older strains. As a result, influenza vaccines are reformulated annually.♦

— FSF Editorial Staff

Notes

1. United Nations World Health Organization (WHO). *Epidemic and Pandemic Alert and Response (EPR): Avian Influenza Frequently Asked Questions.* <www.who.int>.

2. U.S. Centers for Disease Control and Prevention (CDC). *Influenza Viruses: Types, Subtypes and Strains*. <www.cdc.gov>.

- "Personnel should wear disposable gloves for direct contact with blood or body fluids of any passenger. *However, gloves are not intended to replace proper hand hygiene*. Immediately after activities involving contact with body fluids, gloves should be carefully removed and discarded, and hands should be cleaned. Gloves should not be washed or reused."

In addition, the CDC recommendations say that U.S. law requires the captain of an airliner bound for the United States to "report the illness to the nearest U.S. Quarantine Station prior to arrival or as soon as illness is noted."[17] Quarantine officials arrange for medical care for the passenger after landing; notify local health departments, state health departments and the CDC of the problem; and work with government officials and airline officials on "medical transportation of the patient upon arrival, disease control and containment measures, passenger and crew notification and surveillance activities and airline disinfection procedures."

Some government authorities and some businesses within the aviation industry have developed preliminary plans for handling an influenza pandemic, if one develops from the ongoing outbreaks of bird flu.

For example, CDC has added pandemic influenza to its list of diseases that must be reported and has clarified requirements that airlines maintain passenger manifests from international flights and retain the information for 60 days after a flight's arrival, in the event that passengers must be notified that they were exposed to illness during the flight.[18]

In Australia, the Department of Health and Ageing's *Australian Management Plan for Pandemic Influenza* calls for nurses stationed at international airports to screen travelers for influenza. Incoming travelers identified as "unwell" and believed to have flu symptoms will be issued a surgical mask and escorted to an interview room for evaluation by a nurse. The plan also says that after a passenger with flu symptoms leaves an aircraft, any pillows or blankets that the passenger used should be transported in leak-resistant bags for washing, and cleaning crewmembers should wear personal protective equipment while working in the area.[19]

In Taiwan, news reports said that the Department of Health has asked travelers from several countries where people have been infected with bird flu to monitor their health for 10 days after their arrival in Taiwan and has asked those with flu-like symptoms to complete a health questionnaire and notify quarantine personnel in the airport of their condition. Those with high fevers are required to wear surgical masks and report to local health authorities for help in obtaining medical treatment.[20]

Virgin Atlantic Airways said that it had ordered "a quantity" of the drug Tamiflu "as a purely precautionary measure" in the event of a human influenza pandemic. The airline said, however, that there was "no need to change any advice to passengers … or to alter any of the airline's procedures." Virgin Atlantic operates trans-Atlantic routes between the United Kingdom and the United States, in addition to flights to China, Japan and Malaysia.[21]

Can a Pandemic Be Prevented?

Public health authorities, including WHO, have said that no one knows whether a pandemic could be prevented. Prevention might be possible if the virus could be eliminated from birds, although WHO has said that this is "increasingly doubtful … in the near future."[22]

If public health authorities determine that a pandemic is beginning, widespread use of antiviral medication might help prevent development of a fully transmissible virus or might slow the virus's spread, WHO said. In that event, there would be more time for production and distribution of vaccines. However, this strategy has never been tested, WHO said.

In August 2005, WHO warned that a pandemic is more likely now than at any time since 1968, when the most recent flu pandemic occurred, and recommended that all countries develop a response to the threat of a pandemic involving avian flu.[23]

"To date, the main preparedness activities undertaken by countries have concentrated on preparing and rehearsing response plans, developing a pandemic vaccine and securing supplies of antiviral drugs," the WHO recommendations said. "Because these activities are costly, wealthy countries are presently the best prepared; countries where H5N1 is endemic [prevalent] — and where a pandemic virus is most likely to emerge — lag far behind."

About 20 percent of all countries have developed response plans; 23 countries have ordered antiviral medications for national stockpiles; and in fewer than 10 countries, domestic companies are working on pandemic vaccines, the recommendations said.

Nevertheless, WHO said, "the present situation has opened an unprecedented opportunity for international intervention aimed at delaying the emergence of a pandemic virus or forestalling its international spread. Doing so is in the self-interest of all nations, as such a strategy could gain time to augment vaccine supplies. At present capacity, each day of manufacturing gained can mean an additional 5 million doses of vaccine. International support can also strengthen the early warning system in endemic countries, again benefiting preparedness planning and priority-setting in all nations. Finally, international support is needed to ensure that large parts of the world do not experience a pandemic without the protection of a vaccine.

"Pandemics are remarkable events in that they affect all parts of the world, regardless of socioeconomic status or standards of health care, hygiene and sanitation. Once international spread begins, each government will understandably make protection of its own population the first priority. The best opportunity for international collaboration — in the interest of all countries — is now, before a pandemic begins."♦

Notes

1. International Air Transport Association (IATA). *Avian Flu Questions and Answers*. <www.iata.org>.
2. United Nations World Health Organization (WHO). *Avian Influenza: Avian Influenza ("Bird Flu") and the Significance of its Transmission to Humans.* <www.who.int>.
3. Ibid.
4. World Organisation for Animal Health. *Global Meeting to Develop Common Approach on Avian Influenza and Human Pandemic Influenza*. <www.oie.int>.
5. WHO. *Epidemic and Pandemic Alert and Response (EPR): Avian Influenza Frequently Asked Questions.*<www.who.int>.
6. Ibid.
7. Ibid.
8. U.S. Centers for Disease Control and Prevention (CDC). *Guidelines and Recommendations: Interim Guidance for Airline Flight Crews and Persons Meeting Passengers Arriving From Areas With Avian Influenza*. <www.cdc.gov>.
9. Harvard Health Publications. "Bird Flu Explained: What Should You Do?" *HealthBeat*, Oct. 26, 2005. <www.health.Harvard.edu>.
10. U.S. National Institute of Allergy and Infectious Diseases (NIAID). *Questions and Answers: H5N1 Avian Flu Vaccine Trials.* <www3.niaid.nih.gov>.
11. WHO. *Epidemic and Pandemic Alert and Response (EPR): Avian Influenza Frequently Asked Questions.*
12. Ibid.
13. Harvard Health Publications.
14. NIAID.
15. CDC.
16. Ibid.
17. There are 18 quarantine stations in the United States, most of them at major international airports, which are responsible for cases occurring within specific geographic areas.
18. Cetron, Martin. Uncorrected transcript of telephone briefing to news reporters about the CDC modernization of regulations for control of communicable diseases. Nov. 22, 2005. <www.cdc.gov>. Cetron is the director of the CDC Division of Global Migration and Quarantine.
19. Australian Government Department of Health and Ageing. *Australian Management Plan for Pandemic Influenza*. <www.health.gov.au>.
20. "Health Alert Unchanged." *Taipei Times*. Nov. 18, 2005. <www.taipeitimes.com>.
21. Virgin Atlantic Airways. Statement regarding bird flu. Nov. 2, 2005.
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23. WHO. *Responding to the Avian Influenza Pandemic Threat: Recommended Strategic Actions*. WHO/CDS/CSR/GIP/2005.8.

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