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Avian Influenza: A Booklet for Health Workers in Georgia

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I. What is "bird flu"?

Avian influenza ("bird flu") is an infectious disease of birds caused by various subtypes of type A influenza virus.

Sixteen subtypes of type A influenza virus are known to infect birds. To date, all outbreaks of the highly pathogenic form have been caused by subtypes H5 and H7.[1]

Description of the disease in birds

Influenza infections occur naturally among birds worldwide.

Infection causes a wide spectrum of symptoms in birds, ranging from mild illness to a highly contagious and rapidly fatal disease resulting in severe epidemics. 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%.

[1] The subtypes differ based upon proteins on the surface of the virus: The Hemagglutinin or "H" protein governs entry of virus into cells; immunity to the "H" subtype prevents infection. The Neuraminidase or the "N" protein governs release of new virus into the body; immunity to the "N" subtype reduces severity of the disease.

The current outbreaks of highly pathogenic avian influenza, which began in Southeast Asia in mid-2003, are the most widespread and severe on record. Never before in the history of this disease have so many countries been simultaneously affected, resulting in the loss of so many birds. The causative agent, the H5N1 virus,[2] has proved to be especially tenacious: despite the death or destruction of an estimated 150 million birds, the virus has continued to spread and is now considered epizootic in many parts of Indonesia, Viet Nam, Cambodia, China, and Thailand.

Migratory waterfowl – most notably wild ducks and geese – are the natural reservoir of avian influenza viruses, and these birds are also the most resistant to infection. Direct or indirect contact of wild migratory waterfowl with domestic flocks (e.g., through droppings from infected wild birds) has been implicated as a frequent cause of epizootics.

The disease spreads from bird to bird when the virus is inhaled. Contaminated equipment, vehicles, feed, cages, or clothing can carry the virus from farm to farm. The virus can also be carried on the feet and bodies of animals, such as rodents, which act as “mechanical vectors”.

Some species are more resistant to infection than others. Domestic poultry, including chickens and turkeys, are particularly susceptible to epidemics of rapidly fatal influenza.

[2] The H5N1 virus is also of particular concern for human health, as explained below.

II. The history and significance of transmission to humans

At the present time, the risk to humans is generally low because avian influenza viruses do not *usually* infect humans.

Outbreaks of human infection with a new avian influenza virus were documented in Hong Kong in 1997, when the H5N1 strain was found to have caused severe respiratory disease in 18 humans, 6 of whom died. Investigation of that outbreak determined that close contact with live infected poultry was the source of the human infection. Studies at the genetic level further determined that the virus had jumped directly from birds to humans.

Rapid destruction within 3 days of Hong Kong's entire poultry population, estimated at around 1.5 million birds, reduced opportunities for further direct transmission to humans, and may have averted a pandemic.

That event alarmed public health authorities worldwide, as it marked the first time that an avian influenza virus was transmitted directly to humans and caused severe illness with high mortality.

Several instances of human infections and outbreaks of avian influenza have been reported since 1997. To date, human infections have not resulted in sustained human-to-human transmission. However, the epidemic of highly pathogenic avian influenza caused by H5N1 that began in 2003 has affected humans in several Southeast Asian countries (see table on next page).

Cumulative number of laboratory-confirmed human cases of avian influenza A (H5N1) reported to the World Health Organization, December 2003-October 2005

Indonesia		Viet Nam		Thailand		Cambodia		**TOTAL**	
Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	**Cases**	**Deaths**
5	3	91	41	18	13	4	4	**118**	**61**

Of the 16 avian influenza virus subtypes, H5N1 is of particular concern for several reasons.[3] H5N1 mutates rapidly and has a documented propensity to acquire genes from viruses infecting other animal species. Its ability to cause severe disease in humans has been documented on a number of occasions.

The longer the current H5N1 strain circulates, the greater the possibility that people will be infected with H5N1, and the greater the risk of pandemic.

The spread of infection in birds increases the likelihood of human contact with infected birds. If more humans become infected over time, the likelihood increases that humans, if concurrently infected with human and avian influenza strains, could serve as the "mixing vessel" for a novel strain with sufficient human genes to be *easily* transmitted from person to person. Such an event would mark the start of an influenza pandemic, because there is little or no immune protection against such virus subtypes in the human population. Moreover, existing vaccines, which are developed each year to match presently circulating strains and protect humans during seasonal epidemics, would be ineffective against a new virus.

[3] In addition to H5N1, two avian influenza strains (H9N2 and H7N7) have caused illness in humans, but the outbreaks were not as severe as those caused by the H5N1 strain.

Evidence indicates that H5N1 virus is now endemic among the bird population in parts of Asia, having established a permanent ecological niche in poultry. Evidence further suggests that H5N1 virus is expanding its mammalian host range. For example, the virus has recently been shown to cause severe disease and deaths in mammalian species, including tigers and experimentally infected domestic cats, not previously considered susceptible to disease caused by any influenza A virus.

In August 2005, highly pathogenic H5N1 avian influenza was confirmed in poultry in parts of the Siberian region of Russia and in adjacent parts of Kazakhstan. Both countries have reported deaths of migratory birds in the vicinity of poultry outbreaks. In October 2005, the presence of highly pathogenic H5N1 avian influenza was confirmed in samples taken from domestic birds in Turkey, Romania, Greece, and Western Russia. These events mark the first detection of highly pathogenic H5N1 avian influenza in these 5 countries. No human cases have been reported in conjunction with any of these newer outbreaks.

Pandemic influenza viruses in the 20th century

1918-19	H1N1, “Spanish flu”	40 million deaths
1957-58	H2N2, “Asian flu”	2 million deaths
1968-69	H3N2, “Hong Kong flu”	1 million deaths

Influenza pandemics have been documented since the 16th century. They have occurred at intervals ranging from 10 to 50 years. During a pandemic, an estimated 25% to 30% of the world population may get ill and up to 1% of the population may die. All previous pandemics have been caused by H1, H2, or H3 viruses. The H5 virus

has never circulated among humans, so it meets the requirement of a novel virus.

Two of three prerequisites for a pandemic are already in place

1(+)	A novel virus subtype must emerge
2(+)	The virus must be able to replicate in humans and cause serious disease
3(-)	The virus must be efficiently transmitted from one human to another

So far, spread of H5N1 virus from person to person has been rare and limited to family members. Currently, there is no evidence that wider transmission in the community has occurred.

How human infection might occur

As mentioned above, avian influenza viruses do not usually infect humans. Nevertheless, several instances of human infections and outbreaks of avian influenza have been reported since 1997.

Direct contact with infected poultry, or surfaces and objects contaminated by their droppings, is considered the main route of human infection. Exposure risk is considered highest during slaughter, de-feathering, butchering, and preparation of poultry for cooking.

Food Safety

There is no evidence that *properly cooked* poultry or poultry products, such as eggs, can be a source of infection. Normal cooking (temperatures above 70^0C) will inactivate the virus.

Because influenza viruses in general have the potential to change and gain the ability to spread easily between people, monitoring for human infection and person-to-person transmission is important.

III. Clinical course and diagnosis of human cases of H5N1 avian influenza

The incubation period for influenza A (H5N1) infection in humans is 2-4 days.

The reported symptoms of avian influenza in humans have ranged from typical influenza-like symptoms (e.g., fever, cough, sore throat, and muscle aches) to eye infections (conjunctivitis), viral pneumonia, and acute respiratory distress. Clinically apparent pneumonia with chest X-ray changes was seen in most patients, although the X-ray changes were nonspecific. Common laboratory findings were lymphopenia ($<1 \times 10^9$/litre) and slightly or moderately raised alanine aminotransferase and aspartate transaminase.

In fatal cases, the illness rapidly progressed to respiratory distress and subsequent respiratory failure within 1 week of the onset of symptoms, despite ventilator support.

Clinicians in Georgia should suspect avian influenza in a patient with above clinical symptoms **and** history of travel during the 7 days before the onset of symptoms to a country or territory with reported highly pathogenic avian influenza activity due to influenza A (H5N1) virus in the animal populations **and** one or more of the following:

- contact (within 1 meter) with live or dead domestic fowl or wild birds in any setting;
- contact (within touching or speaking distance) with a confirmed human case of influenza A/H5 infection;

- contact (within touching or speaking distance) with a person with an unexplained acute respiratory illness that later resulted in death.

Any suspected human case of avian influenza requires laboratory confirmation. A ***confirmed case of influenza A/H5 infection*** is an individual with an acute respiratory, febrile illness for whom laboratory testing demonstrates one or more of the following:

- positive viral culture for influenza A/H5;
- positive polymerase chain reaction (PCR) for influenza A/H5;
- positive immunofluorescence antibody (IFA) test to H5 antigen using H5 monoclonal antibodies;
- 4-fold rise in H5-specific antibody titer in paired serum samples.

Rapid and reliable tests are available for diagnosing all influenza strains of animals and humans. ***Report any suspected case to the NCDC and/or your rayon CPH office within 1 hour to arrange investigation and laboratory testing.***

Treatment of human cases of H5N1 avian influenza

Two classes of antiviral medications are typically used in the treatment of human influenza:

M2 inhibitors	Amantadine and Rimantadine; and
Neuraminidase inhibitors	Oseltamavir (Tamiflu) and Zanamavir (Relenza)

Currently available evidence suggests that Tamiflu, if administered within 2 days after the onset of symptoms, may be effective in the treatment of H5N1 infections in humans; however, further studies are needed to confirm this.

The H5N1 virus that has caused human illness and death in Asia is already resistant to Amantadine and Rimantadine.

IV. Response actions to prevent and limit human infection

Response efforts to prevent and limit human infection include the following:

Preventing animal infections by improving farming practices to minimize contact between wild and domestic birds, and vaccinating animals to limit infection and transmission

Immediate destruction of all infected or exposed poultry, proper disposal of carcasses, quarantining and rigorous disinfection of farms ***in the event of avian influenza outbreak among poultry*** to limit avian influenza spread and reduce opportunities for human exposure

Minimizing the risk of transmission to humans

a) Using protective gear when working with sick animals and humans;

b) Conducting public awareness campaigns;

c) Isolating human cases;

d) Preventive treatment of contacts;

e) Immunization.

Preparedness for a potential pandemic

a) Planning and interagency coordination;

b) Stockpiling antiviral medicines, personal protective equipment, vaccines;

c) Improving surveillance, development of technical standards/guidelines;

d) Personnel training, etc.

Measures to minimize the risk of transmission to humans and prepare for a potential pandemic are discussed in more detail below.

Protection of personnel working with sick animals

Workers involved in the culling of poultry flocks must be protected by proper clothing and equipment (coveralls or surgical gowns with long cuffed sleeves, an impermeable apron, heavy-duty rubber work gloves that may be disinfected, N95 respirator masks or standard well-fitted surgical masks if N95 respirators are not available, goggles, rubber or polyurethane boots that can be disinfected or protective foot covers that can be discarded) and receive antiviral drugs as a prophylactic measure.

They should also be vaccinated with the current WHO-recommended influenza vaccine to avoid simultaneous infection by human influenza and avian influenza and to minimize the possibility of a re-assortment of the virus genes.

Persons at high risk for severe complications of influenza (e.g. immuno-compromised, over 60 years old, or with known chronic heart or lung disease) should avoid working with affected chickens.

Advice for people living in an area affected by highly pathogenic avian influenza virus

The following recommended actions should be communicated to the population by public health officials and clinicians in case of an outbreak of highly pathogenic avian influenza among poultry in Georgia.

1. Avoid contact with chicken farms, duck farms or any farm where animals have been ill, slaughtered or are thought to harbor avian influenza.
2. If you have had contact with the carcass of any chicken that has died from avian influenza, or if you have had contact with the feces of these chickens, or if you inadvertently come into contact with an environment that has had sick/dead chickens in it – wash hands thoroughly and monitor your temperature for 7 days. If you develop a high fever (>38ºC), respiratory complaints or eye infections – consult your doctor about whether or not you should receive antiviral medication.
3. If poultry have died in your back yard – decontaminate the yard and report the case to the rayon veterinarian office.
    - Wear personal protective equipment – at least cover your face and wear gloves or plastic bags over your hands.
    - Bury the dead poultry at a depth of at least 2.5 meters. This must be away from water supplies.
    - Clean area of all chicken droppings – scrape or use rake and bury the chicken droppings.
    - Clean the chicken shed or area where droppings have been with soap (or bleaching chemicals) and water.

4. Handling of frozen or thawed raw poultry products can be hazardous if the following good hygienic practices are not observed:

   - Separate raw meat from cooked or ready-to-eat foods; do not use the same knife or the same chopping board; do not use raw or somft-boiled eggs in food preparations that will not be heat treated/cooked.
   - Keep clean and wash your hands after handling frozen or soft raw chicken or eggs; wash thoroughly surfaces and utensils that have been in contact with raw meat.
   - Cook thoroughly: ensure that poultry meat reaches 70^0C or that the meat is not pink; egg yolks should not be runny or liquid.

Infection control precautions for influenza A (H5N1)

When a human influenza A (H5N1) case occurs, the following infection control precautions should be undertaken by the health facility to minimize the transmission of the virus.

- Place patient in a single room preferably with hand-washing and toilet/bathroom facilities. Keep doors closed at all times.
- Ensure that anyone who enters the room wears appropriate (#95) or surgical mask, gown, face shield or goggles, and gloves.
- Limit the movement and transport of the patient from the room for essential purposes only and inform the receiving area as soon as possible prior to the patient's arrival. If transport is necessary, minimize dispersal of droplet nuclei by masking the patient.

- All waste generated in the isolation room/area should be disposed of in suitable containers or bags. All waste from a room/area containing patient(s) with influenza A (H5N1) should be treated as clinical (infectious) waste. Liquid waste such as urine or faeces can be safely flushed into the sewer system if there is an adequate sewage system in place. Otherwise they should be disinfected.
- Cleaning and disinfection should be performed with any recommended disinfectant solution. The virus is inactivated by 70% alcohol, formalin, iodine compounds, and chlorine.

Immunization

There currently is no vaccine to protect humans against the H5N1 virus currently in circulation in Asia.

Even though vaccine development efforts are underway, there are a number of constraints to development and mass production. We should not expect that a vaccine immunogenic to the pandemic virus will be available until after several months into the pandemic.

All health care workers who are expected to have contact with influenza A (H5N1) virus or an influenza A (H5N1) patient should be vaccinated with the current WHO-recommended influenza vaccine as soon as possible. This will not protect against influenza A (H5N1), but it will help to avoid simultaneous infection by human influenza and avian influenza and minimize the possibility of re-assortment of the virus genes, which will reduce the risk of the emergence of a new pandemic virus.

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