What is avian influenza (bird flu)?
Avian influenza is an infection caused by avian (bird) influenza (flu) viruses. These flu viruses occur naturally among birds. Wild birds worldwide carry the viruses in their intestines, but usually do not get sick from them. However, avian influenza is very contagious among birds and can make some domesticated birds, including chickens, ducks, and turkeys, very sick and kill them.

Infection with avian influenza viruses in domestic poultry causes two main forms of disease that are distinguished by low and high extremes of virulence. The “low pathogenic” form may go undetected and usually causes only mild symptoms (such as ruffled feathers and a drop in egg production). However, the “highly pathogenic” form spreads more rapidly through flocks of poultry. This form may cause disease that affects multiple internal organs and has a mortality rate that can reach 90–100 percent, often within 48 hours.

How does avian influenza spread among birds?
Infected birds shed influenza virus in their saliva, nasal secretions, and feces. Susceptible birds become infected when they have contact with contaminated excretions or with surfaces that are contaminated with excretions or secretions. Domesticated birds may become infected with avian influenza virus through direct contact with infected waterfowl or other infected poultry or through contact with surfaces (such as dirt or cages) or materials (such as water or feed) that have been contaminated with the virus.

Do avian influenza viruses infect humans?
Bird flu viruses do not usually infect humans, but as of April 2006, close to 200 confirmed cases of human infection with bird flu viruses have occurred since 1997. The World Health Organization (WHO) maintains situation updates and cumulative reports of human cases of avian influenza A (H5N1).

How do people become infected with avian influenza viruses?
Most cases of avian influenza infection in humans have resulted from direct or close contact with infected poultry (living or dead, domesticated chicken, ducks, and turkeys) or surfaces contaminated with blood, secretions and excretions from infected birds. The spread of avian influenza viruses from an ill person to another person has been reported very rarely, and transmission has not been observed to continue beyond one person. During an outbreak of avian influenza among poultry, there is a possible risk to people who have direct or close contact with infected birds or with surfaces that have been contaminated with secretions and excretions from infected birds.

What are the symptoms of avian influenza in humans?
Symptoms of avian influenza in humans have ranged from typical human influenza-like symptoms (fever, cough, sore throat, and muscle aches) to eye infections, pneumonia, severe respiratory diseases (such as acute respiratory distress syndrome), and other severe and life-threatening complications. The symptoms of avian influenza may depend on which specific virus subtype and strain caused the infection.
How is avian influenza detected in humans?
The initial symptoms a patient presents are typical of seasonal flu. A laboratory test is needed to confirm avian influenza in humans.

What are the implications of avian influenza to human health?
Two main risks for human health from avian influenza are 1) the risk of direct infection when the virus passes from the infected bird to humans, sometimes resulting in severe disease; and 2) the risk that the virus – if given enough opportunities – will change into a form that is highly infectious for humans and spreads easily from person to person.

How is avian influenza in humans treated?
Studies done in laboratories suggest that the prescription medicines approved for human influenza viruses should work in treating avian influenza infection in humans. However, influenza viruses can become resistant to these drugs, so these medications may not always work. Additional studies are needed to determine the effectiveness of these medicines.

Does the current seasonal influenza vaccine protect me from avian influenza?
No. Influenza vaccine for the 2005-06 season does not provide protection against avian influenza.

Should I wear a surgical mask to prevent exposure to avian influenza?
Currently, wearing a mask is not recommended for routine use (in public) for preventing influenza exposure. In the United States, disposable surgical and procedure masks have been widely used in health-care settings to prevent exposure to respiratory infections, but the masks have not been used commonly in community settings, such as schools, businesses, and public gatherings.

Is there a risk for becoming infected with avian influenza by eating poultry?
There is no evidence that properly cooked poultry or eggs can be a source of infection for avian influenza.

What is the avian influenza A (H5N1) virus that has been reported in Africa, Asia, Europe and the Near East?
Influenza A (H5N1) virus – also called “H5N1 virus” – is an influenza A virus subtype that occurs mainly in birds, is highly contagious among birds, and can be deadly to them.

Outbreaks of avian influenza H5N1 occurred among poultry in eight countries in Asia (Cambodia, China, Indonesia, Japan, Laos, South Korea, Thailand, and Vietnam) during late 2003 and early 2004. At that time, more than 100 million birds in the affected countries either died from the disease or were killed in order to try to control the outbreaks. By March 2004, the outbreak was reported to be under control.

Since late June 2004, however, new outbreaks of influenza H5N1 among poultry and wild birds have been reported in countries in Africa, Asia, Europe and the Near East. Human cases of influenza A (H5N1) infection have been reported in Cambodia, China, Egypt, Indonesia, Iraq, Thailand, Turkey, and Vietnam. For the most current information about avian influenza and cumulative case numbers, see the World Health Organization website at http://www.who.int/csr/disease/avian_influenza/en/
What are the risks to humans from the current H5N1 outbreak in Africa, Asia, Europe and the Near East?

H5N1 virus does not usually infect people, but as of April 2006, close to 200 human cases have been reported. Most of these cases have occurred from direct or close contact with infected poultry or contaminated surfaces; however, a few cases of human-to-human spread of H5N1 virus have occurred.

So far, spread of H5N1 virus from person to person has been rare and has not continued beyond one person. Nonetheless, because all influenza viruses have the ability to change, scientists are concerned that H5N1 virus one day could be able to infect humans and spread easily from one person to another. Because these viruses do not commonly infect humans, there is little or no immune protection against them in the human population.

If H5N1 virus were to gain the capacity to spread easily from person to person, an influenza pandemic (worldwide outbreak of disease) could begin. No one can predict when a pandemic might occur. However, experts from around the world are watching the H5N1 situation in Africa, Asia, Europe and the Near East very closely and are preparing for the possibility that the virus may begin to spread more easily from person to person.

How does H5N1 virus differ from seasonal influenza viruses that infect humans?

Of the few avian influenza viruses that have crossed the species barrier to infect humans, H5N1 virus has caused the largest number of reported cases of severe disease and death in humans. In the current situation, more than half of the people infected with the virus have died. Most cases have occurred in previously healthy children and young adults. However, it is possible that the only cases currently being reported are those in the most severely ill people and that the full range of illness caused by the H5N1 virus has not yet been defined.

Unlike seasonal influenza, in which infection usually causes only mild respiratory symptoms in most people, H5N1 infection may follow an unusually aggressive clinical course, with rapid deterioration and high fatality. Primary viral pneumonia and multi-organ failure have been common among people who have become ill with H5N1 influenza.

How is infection with H5N1 virus in humans treated?

Most H5N1 viruses that have caused human illness and death appear to be resistant to amantadine and rimantadine, two antiviral medications commonly used for treatment of patients with influenza. Two other antiviral medications, oseltamivir and zanamavir, would probably work to treat influenza caused by H5N1 virus, but additional studies are needed to demonstrate their current and ongoing effectiveness.

Is there a vaccine to protect humans from H5N1 virus?

There currently is no commercially available vaccine to protect humans against the H5N1 virus that is being detected in Africa, Asia, Europe, and the Near East. However, vaccine development efforts are taking place. Research studies to test a vaccine that will protect humans against H5N1 virus began in April 2005, and a series of clinical trials is under way.
The results of one trial reported in March 2006 indicate that a candidate vaccine had produced an immune response, but extremely high doses were required to do so. Work continues at the National Institute of Allergy and Infectious Diseases to develop a vaccine that will be effective in the event of pandemic emergence.

**What does the U.S. government recommend regarding H5N1 virus?**

In February 2004, the Centers for Disease Control (CDC) provided U.S. public health departments with recommendations for enhanced surveillance (detection) of H5N1 influenza in the country. Follow-up messages, distributed via the Health Alert Network, reminded U.S. public health departments about recommendations for detecting (domestic surveillance), diagnosing, and preventing the spread of H5N1 virus. The alerts also recommended measures for laboratory testing for H5N1 virus.

As part of the national strategy, the U.S. government is issuing a series of targeted and specialized preparedness plans to help businesses, churches, communities and other institutions consider the impact pandemic influenza might have on their activities, and urge the development of appropriate readiness strategies. Those plans are available at http://pandemicflu.gov.

**What changes are needed for H5N1 or another avian influenza virus to cause a pandemic?**

Three conditions must be met for a pandemic to start: 1) a new influenza virus subtype must emerge; 2) it must infect humans and causes serious illness; and 3) it must spread easily and sustainably (continue without interruption) among humans. The H5N1 virus in Africa, Asia, Europe and the Near East meets the first two conditions: it is a new virus for humans (H5N1 viruses have never circulated widely among people), and it has infected close to 200 humans, killing over half of them.

However, the third condition, the establishment of efficient and sustained human-to-human transmission of the virus, has not occurred. For this to take place, the H5N1 virus would need to improve its transmissibility among humans. This could occur either by “reassortment” or adaptive mutation.

Reassortment occurs when genetic material is exchanged between human and avian viruses during co-infection (infection with both viruses at the same time) of a human or pig. The result could be a fully transmissible pandemic virus—that is, a virus that can spread easily and directly to humans. A more gradual process is adaptive mutation, where the capability of a virus to bind to human cells increases during infections of humans.

**Good health habits to help prevent the flu**

**Avoid close contact.** Avoid close contact with people who are sick. When you are sick, keep your distance from others to protect them from getting sick too.

**Stay home when you are sick.** If possible, stay home from work, school, and errands when you are sick. You will help prevent others from catching your illness.

**Cover your mouth and nose.** Cover your mouth and nose with a tissue when coughing or sneezing. It may prevent those around you from getting sick.

**Clean your hands.** Washing your hands often will help protect you from germs.

**Avoid touching your eyes, nose, or mouth.** You can catch disease when you touch something that is contaminated with germs and then touch your eyes, nose, or mouth.
Scientists around the world are working to understand how the bird flu virus works and which components of the flu may be the best targets for drugs. By April 2006, the World Health Organization confirmed close to 200 human cases of bird flu and 107 deaths since December 2003.

By 2006, the H5N1 virus had spread and human cases were reported in Africa, the Near East, Asia and Europe. The virus has resulted in the deaths of millions of birds in more than 30 nations.

Experts say that it is only a matter of time before the virus mutates into a form that can infect people and be easily transmitted from person to person. Such an outbreak could develop into a global pandemic, potentially taking millions of lives.

**Diseases From Animals**

Bird flu is just one disease that has arisen in animals and mutated to infect people. HIV/AIDS, severe acute respiratory syndrome (SARS), West Nile virus and the Spanish flu of 1918 are just a few examples.

The 1918 Spanish flu was a global disaster, killing up to 50 million people, nearly half of them otherwise healthy adults. Researchers have partially reconstructed the Spanish flu virus and discovered in part what made the virus so lethal. Such information is essential for influenza drug and vaccine research. Researchers say that the Spanish flu virus is related more closely to avian flu viruses than other human flu viruses.

Therapies against a new flu strain would need to disarm parts of the virus that are most damaging to the body.

**Recreating the Spanish Flu**

To learn which virus components would be the best targets for therapies, scientists at the U.S. Centers for Disease Control and Prevention (CDC) recreated the 1918 Spanish flu virus.

Using the virus’s genome sequence, they created a live virus with all eight of the Spanish flu viral genes. The genome sequence information was recovered in fragments and lung tissues from three 1918 flu victims: two U.S. soldiers and a woman who was buried in the Alaskan permafrost.

The virus is contained at CDC, following stringent safety and security conditions designed for flu viruses mandated by the CDC’s Select Agent program.

To make the virus, the researchers used an approach called reverse genetics, which involves transferring gene sequences of viral RNA into bacteria and then inserting combinations of the genes – often after manipulating them – into cell lines, where they combine to form a virus.

Like DNA, RNA is a nucleic acid. One of its main functions is to copy genetic information from DNA and translate the information into proteins. The researchers also produced variations of the virus for comparison, replacing certain
Spanish flu genes with corresponding genes from other flu viruses. They then studied the viruses' effects in mice, chicken embryos and human lung cells, and identified the genes responsible for the Spanish flu virus's extreme virulence.

More research is needed on antivirals and vaccines for a future flu pandemic, but there are encouraging signs. The U.S. Food and Drug Administration-approved flu antiviral drugs oseltamivir (Tamiflu®), zanamavir (Relenza®), and amantadine (Symmetrel®) have been shown to be effective against viruses carrying certain genes from the Spanish flu virus. And vaccines containing other Spanish flu genes were protective in mice.

**Flu Virus Overview**

Influenza A and B are the two kinds of flu viruses that cause epidemic human disease. Since 1977, according to the CDC, influenza A and influenza B viruses have been in global circulation.

In 2001, H1N2 viruses began circulating widely. Bird flu subtype H5N1 is an influenza A virus. Influenza A is a constantly mutating virus; influenza B does not mutate as rapidly.

Two kinds of vaccines protect against the influenza A and B strains that sweep populations during the winter months. Each vaccine contains three flu viruses, representing one of the three groups of viruses that circulate among people in a given year. Each of the three vaccine strains in both vaccines – two A viruses, H3N2 and H1N1 – represent flu vaccine strains that flu experts think will be the dominant strains that year.

The yearly flu shot administered around the world is an inactivated vaccine (containing killed virus) that is given with a needle, usually in the arm. The flu experts formulate their recommendations for the composition of the vaccine each year after much research and some guesswork.

**Confirmed instances of the H5N1 avian influenza virus infecting humans since 1997**

*Hong Kong, 1997:* Avian influenza A (H5N1) infections occurred in both poultry and humans. This was the first time an avian influenza virus had ever been found to transmit directly from birds to humans. During this outbreak, 18 people were hospitalized and six of them died.

*China and Hong Kong, 2003:* Two cases of the A H5N1 virus infection occurred among members of a Hong Kong family that had traveled to China. One person recovered, the other died.

*Thailand and Vietnam, 2004 and through November 2005:* A poultry outbreak of the H5N1 virus began in January 2003; human infection appeared in these two countries in 2004. Thailand and Vietnam have reported the highest numbers of human cases as illness was detected sporadically through 2005 with 92 cases and 42 deaths in Viet Nam and 21 cases and 13 deaths in Thailand.

*Cambodia, China, and Indonesia, 2005:* As poultry outbreaks continue to emerge in the region, so have reports of human disease. While infection has been shared among some family groups, no evidence of a community cluster of disease has been reported, indicating a sustained human transmission. Cambodia has detected five cases, all ending in death. Indonesia has reported 29, with 22 deaths. China has confirmed 16 cases with 11 deaths.

*Turkey, Iraq, Azerbaijan, and Egypt, 2006:* The H5N1 virus spread among wild and domestic birds beyond Asia in 2005. Human cases of infection began appearing in 2006 in other regions. Turkey reported 12 human cases, with four deaths. Azerbaijan had seven cases with five deaths. Iraq detected two cases, both ending in death while Egypt confirmed five cases with two deaths.

In these nations overall, 191 cases of H5N1 have been confirmed by the World Health Organization, resulting in 107 deaths as of April 2006. *Sources: CDC, WHO*