Pandemic Plan for the Church

Ministering to the Community in a Time of Crisis

H7N9 Avian Influenza

Influenza A H7 viruses are a group of influenza viruses that normally circulate among birds. The influenza A H7N9 virus is one subgroup among the larger group of H7 viruses. Most H7 viruses identified worldwide in wild birds and poultry are low pathogenic avian influenza (LPAI) viruses, meaning that they usually cause only mild disease in poultry. However, highly pathogenic avian influenza (HPAI) viruses can develop from LPAI viruses.

H7 virus infection in humans is uncommon, but it has been documented in persons who have direct contact with infected birds, especially during outbreaks of the H7 virus among poultry. In the past, LPAI infection in humans have caused only mild to moderate illness.

The first human case of HPAI virus H7N9 was reported February, 2013 in China. Infection with this strain of virus is associated with severe respiratory illness and death. Although the H7N9 is less deadly than the H5N1 avian influenza, the genetic instability of influenzas during replication could lead to a more virulent and deadly form of virus. This is a major concern. Currently infection with the H7N9 is fatal in about 30% of all cases; the H5N1 avian virus has a 60% fatality risk.

Concern for H7N9 Mutations

Analysis of the H7N9 avian virus gives evidence that although it is an avian virus it has mutated to be more adaptable to infect humans, even more adaptable than other avian viruses. As discussed earlier, a virus needs specific receptors to bind to in order to enter the cell and replicate. The H7N9 has a hemagglutinin (H) protein that has mutated to include the ability to bind to receptors on human cells that are located in the lower respiratory tract, and even more alarming, the cells in the upper respiratory tract. It has also become able to replicate in lower temperatures, which are characteristically lower in mammals than in birds. In humans, the temperature is lower in the upper respiratory tract than in the lower airways. These mutations are especially troubling because if the virus can attach and replicate efficiently in the upper respiratory airways of humans and other mammals, it means it is more easily transmissible from human-to-human through coughs and sneezes. This greatly increases the odds of such a virus becoming a pandemic.

Infectious disease experts have found cases of some people who are infected with the strain of H7N9 and they show no symptoms. This means that the virus is probably more widespread than the lab confirmed cases. Without knowing the total number of people infected in the population at large, it's impossible for public health authorities to calculate a fatality rate.

Human-to-Human Transmission and the H7N9 Influenza

So far there have been no reports of sustained human-to human transmission with the H7N9 avian influenza. However, findings from a new study in China report that one strain of the H7N9 virus appears to spread easily between ferrets. Ferrets are used in such studies due to the similarity in respiratory receptors to humans. The study used five strains of H7N9 for this study. All five strains of H7N9 were able to spread through the air between ferrets, but four of the strains did not transmit very well. However, one strain was able to spread very well; it infected 100 percent of the ferrets who were exposed to it through the air. These findings add to growing evidence that the virus likely needs to undergo just a few genetic mutations to develop the ability to spread between people.

Where is the H7N9 Influenza?

Since it was first reported in 2013, there have been 844 laboratory-confirmed cases of human infection with avian A (H7N9) virus, of these 449 people have died. These cases occurred in China, Taipei, Hong Kong and Malaysia.

The earlier reported cases were centered in the city of Shanghai. However, in April, 2013, a seven-year-old girl from Beijing was the first confirmed case in the capital city. This was particularly troubling in that the distance between Shanghai and Beijing is 750 miles. The virus was able to travel this distance without leaving a trail of sick or dead birds. This means that the H7N9 does not seem to cause illness or symptoms in birds, unlike the H5N1 influenza which causes rapid death in infected chickens. Therefore, tracking this strain of virus in birds will be extremely difficult.

The novel H7N9 viruses have genetic characteristics that are of concern for public health officials. The hemagglutinin (H) protein causes the H7N9 to be a low-pathogenic avian influenza A virus. This means that infection of wild birds and domestic poultry would result in asymptomatic or mild illness in the infected birds. Therefore, spread of the H7N9 through wild and domestic birds can go unnoticed; however, still pose a risk to humans.

In October 2013, reports of human infections began to increase. WHO and China reported more new H7N9 cases in China per month relative to the summer months. These cases coincided with the arrival of cooler weather in China and were not unexpected. Most of the cases that were reported had poultry exposure and lived in areas where H7N9 had been found previously. As of January, 2014, cases continued to be reported and the frequency of infections had increased.

The majority of reported human cases are associated with exposure to infected live poultry or contaminated environments, including markets where live poultry are sold. H7N9 viruses continue to be detected in poultry and their environments in the areas where human cases are occurring. Although investigations continue there has been no evidence found that indicates sustained human-to-human transmission.

Pathophysiology of H7N9 Avian Influenza

In an analysis of data collected from circumstances surrounding the first three fatalities, a large team of Chinese researchers found that the patients became ill quickly, first showing symptoms including fever, cough and shortness of breath. Soon they developed very severe pneumonia and upper respiratory distress, and their condition deteriorated very quickly with sepsis and failure of multiple organs. Some patients also developed encephalopathy (brain dysfunction), or infection of the membrane surrounding the brain. One patient had enzymes in her blood indicating a heart attack, very likely due to the difficulty of the heart pumping against the fluids accumulating in the lungs.

Many questions about the virus remain. Researchers are not sure how deadly it is because they do not know how many people have been infected. The worst cases become obvious, but if some people have mild symptoms or none at all, many cases could go undetected. This could lead to a mixing of the virus with human influenza and genetic reassortment.

Signs and Symptoms of Human Infection with H7N9 Flu

Flu infection in people is usually caused by very common seasonal infections with viruses to which we have developed some immunity. This produces classic symptoms that are debilitating but usually do not cause life-threatening illness in healthy people. However, human infection with H7N9 flu virus causes serious respiratory symptoms and can lead to death.

Signs and symptoms include:

- Fever
- Productive cough
- Wheezing
- Headache
- Muscle aches
- Fatigue

Further signs and symptoms may progress to:

- Bilateral pneumonia
- Acute respiratory distress syndrome (ARDS)
- Multi-organ dysfunction (impaired liver or renal function)
- Septic shock
- Rhabdomyolysis (muscle breakdown)
- Encephalopathy (brain disease)
- Lymphopenia (reduced white blood cells)
- Thrombocytopenia (reduced platelet count)

Current Treatment of the H7N9 Influenza

Laboratory testing has shown that the H7N9 virus is sensitive to anti-influenza drugs known as neuraminidase inhibitors (Oseltamivir and Zanamivir). These drugs have proven to be effective against the seasonal influenza virus and the H5N1 avian virus. It is recommended that these drugs be prescribed as soon as possible in people suspected of infection with H7N9. WHO guidance is that the drugs should be given while awaiting laboratory-tested confirmation of the infection, and not held off for the results.

These drugs are not effective in all people infected with H7N9, and even when they are effective, they reduce the severity of the illness rather than cure it. New drugs are being developed against influenza in general and may also prove to be effective against H7N9.