

Orange County Vector Control District's Information Guide to Avian Flu

Background

The H5N1 strain of avian flu is causing a great deal of concern lately. This disease is caused by one of several influenza "A" viruses that are commonly found in wild birds. Though present in birds worldwide, wild birds rarely get sick from these viruses. Unlike wild birds, domesticated birds, such as ducks, chickens and turkeys, frequently become ill, and often die. There are many subtypes of Type A influenza virus, the subtypes are classified by the presence of certain proteins on the surface of the virus, (hemagglutinin [HA] and neuraminidase [NA]). There are 16 different HA subtypes and 9 NA subtypes allowing for many different combinations. Each of these combinations results in a different subtype of Type A influenza virus.

All of the known Type A subtypes can be found in birds, but only three are known to occur widely in humans, though it is possible for some of the bird viruses to occasionally infect humans. Infected birds shed flu virus in feces, saliva and nasal secretions. It is easy to see how the crowded conditions of a poultry farm would make transmission easy. Most people who have contracted H5N1 bird flu so far, have had close contact with infected poultry and or contaminated surfaces. Occasionally an intermediate host like a pig will be involved in the transmission. Pigs are able to contract both human and avian forms of influenza. In the areas where H5N1 has been detected, it is common for poultry, pigs and humans to be in close contact. While it is unusual for humans to be infected by animals, there are occasional outbreaks of both avian and pig influenza in the human population. These outbreaks are short lived and rarely result in sustained transmission between humans.

Influenza A viruses have eight separate gene segments in their genome thus facilitating the mixing of viruses from different species during reproduction. If a poultry farmer is infected with an avian influenza Type A virus and then became

infected with a human influenza Type A virus at the same time, conditions would be right for a mixing of the genetic material from the two different viruses (reassortment). It is possible that the resulting new influenza A virus would have most of the genes from the human virus and yet contain either a hemagglutinin or neuraminidase from the avian virus (antigenic shift). This new virus could then be easily transmissible from human to human, but have surface proteins which humans have never been exposed to. If this new virus causes sickness in people, an influenza pandemic could occur since humans have not developed any immunity.

History

There were three influenza pandemics during the 20th century; all caused by new subtypes of influenza A viruses. In 1918 and 1919 the "Spanish flu" took a large toll on otherwise healthy young adults, more than 500,000 Americans died, and as many as 50 million may have died worldwide. Although not understood at the time, the virus responsible became known as H1N1. This virus appears to be of avian origin, and killed many victims in a matter of days. H1N1 had spread around the world in less than a year; remember this was 1918, international travel was uncommon and rather slow.

In February of 1957, "Asian flu" was identified in China, and by June, only four months later; the disease was present in the United States. H2N2, as the Asian flu came to be known, killed around 70,000 people in the United States.

The "Hong Kong flu", H3N2, was first detected in Hong Kong in early 1968. Before the end of the year it had spread to the United States. The death toll in the U.S. resulting from Hong Kong flu reached 34,000. Both the Asian flu and the Hong Kong flu were caused by an A influenza virus containing a combination of genes from a human influenza virus, and an avian influenza virus.

In 1997, H5N1 appeared in humans in Hong Kong, 18 people were hospitalized and six died. This outbreak resulted in the destruction of 1.5 million chickens in an effort to eliminate the source of the virus.

Preparations

Because the human to human transmissible form of the virus does not exist yet, the development of an effective vaccine is not possible. In the interim, the most important precaution is to detect the avian virus as soon as possible after it arrives. There is no way of knowing how the virus will be introduced into North America, possibly through migratory birds, or shipments of captive or domestic birds. The virus is very contagious, and bird to bird transmission is very common. Poultry farmers will likely be the first to feel the impact. It is also possible a traveler from an infected area will bring it here. Assuming that the virus remains H5N1, the likelihood of an infected human passing it along to another person is remote, and introducing the disease to the bird population is also relatively small. The real danger lies in the possibility of the person with H5N1 contracting a human form of Type A influenza concurrently. This would provide a site where the two viruses could exchange RNA and produce the mutation that could be both contagious and cause serious illness. This is another reason to encourage people to get a flu shot.

Early detection and containment is critical. It will be very important to know as early as possible that the virus is here. The wild bird surveillance conducted by the Orange County Vector Control District can be easily expanded to search for the presence of avian flu virus along with the other viruses the District is looking for. If requested, and if the proper protocols and reagents are made available to the District, testing can begin. The role of the District would be limited to surveillance, questions about human infection are best answered by California Health Care Services, or the Orange County Health Care Agency.

If the virus mutates before it arrives in North America, the first line of defense will still be to isolate the infected individuals and any others that

have been exposed. This will not be a simple task; for example, if the infected individual is noticed on an airplane, Los Angeles International Airport's plan involves notification by the crew of the suspected victim while still in the air. Once the plane lands, officials will quarantine and treat the infected individual and confine all passengers and crew for a period of time long enough to determine if any of them have contracted the virus. With twenty-six flights from Asia bringing up to 10,000 passengers each day, the challenges are obvious, both politically and logistically. The possibility of travel bans have also been mentioned by the federal government.

Until such time as a vaccine is developed, awareness is the best preparation. It would be best to avoid contact with large concentrations of birds, or even areas where they gather; remember the virus is shed through feces, saliva and nasal secretions. Avoid any activity that encourages congregations of birds, like feeding ducks in the park. Most park ducks do not migrate, but migrating flocks often stop at the ponds found in parks.

It may be that there will be no mutation for years. After all, H5N1 has been circulating and mutating since at least 1997, and has not adapted to human to human transmission. Researchers have differing opinions about whether or not H5N1 will be the cause of the next pandemic. Two things they all do agree on are: first, it is not a matter of *if*, but rather *when* an influenza pandemic will happen, and second, the stakes are so high that any threat must be taken seriously and adequately prepared for.

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