Competitive Exams: Science Current Affairs 2009 (Part 4 of 4)

Swine influenza (also called swine flu, hog flu, and pig flu) refers to influenza caused by those strains of influenza virus, called swine influenza virus (SIV), that usually infect pigs. Swine influenza is common in pigs in the midwestern United States (and occasionally in other states), Mexico, Canada, South America, Europe (including the United Kingdom, Sweden, and Italy), Kenya, Mainland China, Taiwan, Japan and other parts of eastern Asia.

Transmission of swine influenza virus from pigs to humans is not common and properly cooked pork poses no risk of infection. When transmitted, the virus does not always cause human influenza and often the only sign of infection is the presence of antibodies in the blood, detectable only by laboratory tests. When transmission results in influenza in a human, it is called zoonotic swine flu. People who work with pigs, especially people with intense exposures, are at risk of catching swine flu. However, only about fifty such transmissions have been recorded since the mid-20th Century, when identification of influenza subtypes became possible. Rarely, these strains of swine flu can pass from human to human. In humans, the symptoms of swine flu are similar to those of influenza and of influenza-like illness in general, namely chills, fever, sore throat, muscle pains, severe headache, coughing, weakness and general discomfort.

The 2009 flu outbreak in humans, known as swine flu, is due to a new strain of influenza A virus subtype H1N1 that contained genes most closely related to swine influenza. The origin of this new strain is unknown, however, the World Organization for Animal Health (OIE) reports that this strain has not been isolated in pigs. This strain can be transmitted from human to human, and causes the normal symptoms of influenza.

Classification

Of the three genera of influenza viruses that cause human flu, two also cause influenza in pigs, with Influenzavirus A being common in pigs and Influenzavirus C being rare. Influenzavirus B has not been reported in pigs. Within Influenzavirus A and Influenzavirus C, the strains found in pigs and humans are largely distinct, although due to reassortment there have been transfers of genes among strains crossing swine, avian, and human species boundaries.

Influenza C

Influenza C viruses infect both humans and pigs, but do not infect birds. Transmission between pigs and humans have occurred in the past. For example, influenza C caused a small outbreaks of a mild form of influenza amongst children in Japan, and California. Due to its limited host range and the lack of genetic diversity in influenza C, this form of influenza does not cause pandemics in humans.

Influenza A

Swine influenza is known to be caused by influenza A subtypes H1N1, H1N2, H3N1, H3N2, and H2N3. In pigs, three influenza A virus subtypes (H1N1, H3N2, and H1N2) are the most common strains worldwide. In the United States, the H1N1 subtype was exclusively prevalent among swine populations before 1998; however, since late August 1998, H3N2 subtypes have been isolated from pigs. As of 2004, H3N2 virus isolates in US swine and turkey stocks were triple reassortants, containing genes from human (HA, NA, and PB1), swine (NS, NP, and M), and avian (PB2 and PA) lineages.

History

Swine influenza was first proposed to be a disease related to human influenza during the 1918 flu pandemic, when pigs became sick at the same time as humans. The first identification of an influenza virus as a cause of disease in pigs occurred about ten years later, in 1930. For the following 60 years, swine influenza strains were almost exclusively H1N1. Then, between 1997 and 2002, new strains of three different subtypes and five different genotypes emerged as causes of influenza among pigs in North America. In 1997 – 1998, H3N2 strains emerged. These strains, which include genes derived by reassortment from human, swine and avian viruses, have become a major cause of swine influenza in North America. Reassortment between H1N1 and H3N2 produced H1N2. In 1999 in Canada, a strain of H4N6 crossed the species barrier from birds to pigs, but was contained on a single farm.

The H1N1 form of swine flu is one of the descendants of the strain that caused the 1918 flu pandemic. As well as persisting in pigs, the descendants of the 1918 virus have also circulated in humans through the 20th century, contributing to the normal seasonal epidemics of influenza. However, direct transmission from pigs to humans is rare, with only 12 cases in the USA since 2005. Nevertheless, the retention of influenza strains in pigs after these strains have disappeared from the human population might make pigs a reservoir where influenza viruses could persist, later emerging to reinfect humans once human immunity to these strains has waned.

Swine flu has been reported numerous times as a zoonosis in humans, usually with limited distribution, rarely with a widespread distribution. Outbreaks in swine are common and cause significant economic losses in industry, primarily by causing stunting and extended time to market. For example, this disease costs the British meat industry about £65 million pounds every year.

1918 pandemic in humans

The 1918 flu pandemic in humans was associated with H1N1 and influenza appearing in pigs, thus may reflect a zoonosis either from swine to humans, or from humans to swine. Although it is not certain in which direction the virus was transferred, some evidence suggests that, in this case, pigs caught the disease from humans. For instance, swine influenza was only noted as a new disease of pigs in 1918, after the first large outbreaks of influenza amongst people. Although

a recent phylogenetic analysis of more recent strains of influenza in humans, birds, and swine suggests that the 1918 outbreak in humans followed a reassortment event within a mammal, the exact origin of the 1918 strain remains elusive.

1976 USA outbreak

On February 5, 1976, in the United States an army recruit at Fort Dix said he felt tired and weak. He died the next day and four of his fellow soldiers were later hospitalized. Two weeks after his death, health officials announced that the cause of death was a new strain of swine flu. The strain, a variant of H1N1, is known as A/New Jersey/1976 (H1N1). It was detected only from January 19 to February 9 and did not spread beyond Fort Dix.

This new strain appeared to be closely related to the strain involved in the 1918 flu pandemic. Moreover, the ensuing increased surveillance uncovered another strain in circulation in the US: A/Victoria/75 (H3N2) spread simultaneously, also caused illness, and persisted until March. 26 Alarmed public-health officials decided action must be taken to head off another major pandemic, and urged President Gerald Ford that every person in the USA be vaccinated for the disease.

The vaccination program was plagued by delays and public relations problems. On October 1, 1976, the immunization program began and by October 11, approximately 40 million people, or about 24% of the population, had received swine flu immunizations. That same day, three senior citizens died soon after receiving their swine flu shots and there was a media outcry linking the deaths to the immunizations, despite the lack of positive proof. According to science writer Patrick Di Justo, however, by the time the truth was known. That the deaths were not proven to be related to the vaccine. It was too late. The government had long feared mass panic about swine flu. Now they feared mass panic about the swine flu vaccinations. This became a strong setback to the program.

There were reports of Guillain-Barr's syndrome, a paralyzing neuromuscular disorder, affecting some people who had received swine flu immunizations. This syndrome is a rare side-effect of modern influenza vaccines, with an incidence of about one case per million vaccinations. As a result, Di Justo writes that the public refused to trust a government-operated health program that killed old people and crippled young people. In total, less than 33 percent of the population had been immunized by the end of 1976. The National Influenza Immunization Program was effectively halted on Dec. 16.

Overall, about 500 cases of Guillain-Barr's syndrome (GBS), resulting in death from severe pulmonary complications for 25 people, which, according to Dr. P. Haber, were probably caused by an immunopathological reaction to the 1976 vaccine. Other influenza vaccines have not been linked to GBS, though caution is advised for certain individuals, particularly those with a history of GBS. Still, as observed by a participant in the immunization program, the vaccine killed more Americans than the disease did.

1988 zoonosis

In September 1988, a swine flu virus killed one woman in Wisconsin, and infected at least hundreds of others. 32-year old Barbara Ann Wieners was eight months pregnant when she and her husband, Ed, became ill after visiting the hog barn at the Walworth County Fair. Barbara died eight days later, though doctors were able to induce labor and deliver a healthy daughter before she passed away. Her husband recovered from his symptoms.

Influenza-like illnesses were reportedly widespread among the pigs at the farm they had visited, and 76% of the swine exhibitors there tested positive for antibody to SIV, but no serious illnesses were detected among this group. Additional studies suggested between one and three health care personnel who had contact with the patient developed mild influenza-like illnesses with antibody evidence of swine flu infection. However, there was no community outbreak.

1998 US outbreak in swine

In 1998, swine flu was found in pigs in four USA states. Within a year, it had spread through pig populations across the United States. Scientists found that this virus had originated in pigs as a recombinant form of flu strains from birds and humans. This outbreak confirmed that pigs can serve as a crucible where novel influenza viruses emerge as a result of the reassortment of genes from different strains.

2007 Philippine outbreak in swine

On August 20, 2007 Department of Agriculture officers investigated the outbreak (epizootic) of swine flu in Nueva Ecija and Central Luzon, Philippines. The mortality rate is less than 10% for swine flu, unless there are complications like hog cholera. On July 27, 2007, the Philippine National Meat Inspection Service (NMIS) raised a hog cholera red alert warning over Metro Manila and 5 regions of Luzon after the disease spread to backyard pig farms in Bulacan and Pampanga, even if these tested negative for the swine flu virus.

2009 outbreak in humans

The 2009 flu outbreak is due to a new strain of subtype H1N1 not previously reported in pigs. Following the outbreak, on May 2, 2009, it was reported in pigs at a farm in Alberta, Canada, with a link to the outbreak in Mexico. The pigs are suspected to have caught this new strain of virus from a farm worker who recently returned from Mexico, then showed symptoms of an influenza-like illness. These are probable cases, pending confirmation by laboratory testing.

The new strain was initially described as apparent reassortment of at least four strains of influenza A virus subtype H1N1, including one strain endemic in humans, one endemic in birds, and two endemic in swine. Subsequent analysis suggested it was a reassortment of just two strains, both found in swine. Although initial reports identified the new strain as swine influenza (i.e., a zoonosis originating in swine), its origin is unknown. Several countries took precautionary measures to reduce the chances for a global pandemic of the disease.

Transmission between pigs

Influenza is quite common in pigs, with about half of breeding pigs having been exposed to the virus in the US. Antibodies to the virus are also common in pigs in other countries.

The main route of transmission is through direct contact between infected and uninfected animals. These close contacts are particularly common during animal transport. Intensive farming may also increase the risk of transmission, as the pigs are raised in very close proximity to each other. The direct transfer of the virus probably occurs either by pigs touching noses, or through dried mucus. Airborne transmission through the aerosols produced by pigs coughing or sneezing are also an important means of infection. The virus usually spreads quickly through a herd, infecting all the pigs within just a few days. Transmission may also occur through wild animals, such as wild boar, which can spread the disease between farms.

Transmission to humans

People who work with poultry and swine, especially people with intense exposures, are at increased risk of zoonotic infection with influenza virus endemic in these animals, and constitute a population of human hosts in which zoonosis and reassortment can co-occur. Vaccination of these workers against influenza and surveillance for new influenza strains among this population may therefore be a important public health measure. Transmission of influenza from swine to humans who work with swine was documented in a small surveillance study performed in 2004 at the University of Iowa. This study among others forms the basis of a recommendation that people whose jobs involve handling poultry and swine be the focus of increased public health surveillance. Other professions at particular risk of infection are veterinarians and meat processing workers, although the risk of infection for both of these groups is lower than that of farm workers.

Interaction with avian H5N1 in pigs

Pigs are unusual as they can be infected with influenza strains that usually infect three different species: Pigs, birds and humans. This makes pigs a host where influenza viruses might exchange genes, producing new and dangerous strains. Avian influenza virus H3N2 is endemic in pigs in China and has been detected in pigs in Vietnam, increasing fears of the emergence of new variant strains. H3N2 evolved from H2N2 by antigenic shift. In August 2004, researchers in China found H5N1 in pigs.

Main symptoms of swine flu in swines. These H5N1 infections may be quite common, in a survey of 10 apparently healthy pigs housed near poultry farms in West Java, where avian flu had broken out, five of the pig samples contained the H5N1 virus. The Indonesian government has since found similar results in the same region. Additional tests of 150 pigs outside the area were negative

Signs and symptoms

In swine

In pigs influenza infection produces fever, lethargy, sneezing, coughing, difficulty breathing and decreased appetite. 14 In some cases the infection can cause abortion. Although mortality is usually low (around 1 – 4%) the virus can produce weight loss and poor growth, causing economic loss to farmers. Infected pigs can lose up to 12 pounds of body weight over a 3 to 4 week period.

In humans

Main symptoms of swine flu in humans

See also: The Centers for Disease Control and Prevention (CDC): Symptoms of Swine Flu in YouTubeDirect transmission of a swine flu virus from pigs to humans is occasionally possible (called zoonotic swine flu). In all, 50 cases are known to have occurred since the first report in medical literature in 1958, which have resulted in a total of six deaths. 61 Of these six people, one was pregnant, one had leukemia, one had Hodgkin disease and two were known to be previously healthy. Despite these apparently low numbers of infections, the true rate of infection may be higher, since most cases only cause a very mild disease, and will probably never be reported or diagnosed.

According to the Centers for Disease Control and Prevention (CDC), in humans the symptoms of the 2009 swine flu H1N1 virus are similar to those of influenza and of influenza-like illness in general. Symptoms include fever, cough, sore throat, body aches, headache, chills and fatigue. The 2009 outbreak has shown an increased percentage of patients reporting diarrhea and vomiting. The 2009 H1N1 virus is not zoonotic swine flu, as it is not transmitted from pigs to humans, but from person to person.

Because these symptoms are not specific to swine flu, a differential diagnosis of probable swine flu requires not only symptoms but also a high likelihood of swine flu due to the person's recent history. For example, during the 2009 swine flu outbreak in the United States, CDC advised physicians to consider swine influenza infection in the differential diagnosis of patients with acute febrile respiratory illness who have either been in contact with persons with confirmed swine flu, or who were in one of the five USA states that have reported swine flu cases or in Mexico during the 7 days preceding their illness onset. A diagnosis of confirmed swine flu requires laboratory testing of a respiratory sample (a simple nose and throat swab).

Treatment

In swine

As swine influenza is rarely fatal to pigs, little treatment beyond rest and supportive care is required. Instead veterinary efforts are focused on preventing the spread of the virus throughout the farm, or to other farms. Vaccination and animal management techniques are most important in these efforts. Antibiotics are also used to treat this disease, which although they have no effect against the influenza virus, do help prevent bacterial pneumonia and other secondary infections in influenza-weakened herds.

In humans

If a person becomes sick with swine flu, antiviral drugs can make the illness milder and make the patient feel better faster. They may also prevent serious flu complications. For treatment, antiviral drugs work best if started soon after getting sick (within 2 days of symptoms). Beside antivirals, palliative care, at home or in hospital, focuses on controlling fevers and maintaining fluid balance. The USA Centers for Disease Control and Prevention recommends the use of Tamiflu (oseltamivir) or Relenza (zanamivir) for the treatment and/or prevention of infection with swine influenza viruses, however, the majority of people infected with the virus make a full recovery without requiring medical attention or antiviral drugs. The virus isolates in the 2009 outbreak have been found resistant to amantadine and rimantadine.

In the US, on April 27, 2009, the FDA issued Emergency Use Authorizations to make available Relenza and Tamiflu antiviral drugs to treat the swine influenza virus in cases for which they are currently unapproved. The agency issued these EUAs to allow treatment of patients younger than the current approval allows and to allow the widespread distribution of the drugs, including by non-licensed volunteers.