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Swine Flu - Emerging Threat

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ABSTRACT

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A swine influenza virus (SIV) is any strain of the influenza family of viruses that is usually hosted by pigs. Swine flu is common throughout pig populations worldwide and this infection causes outbreaks of influenza in pigs resulting in high levels of illness and low death rates in swine population. Transmission of swine influenza virus from pigs to humans is not common and results in production of antibodies and does not always cause human illness. The meat of the animal poses no risk of transmitting the virus when properly cooked. If transmission does cause human influenza, it is called zoonotic swine flu.

Keywords: Swine flu, Human transmission, Zoonosis

*See End Note for complete author details

INTRODUCTION

Swine influenza (also called swine flu, hog flu and pig flu) is an infection of a host animal by any one of several specific types of swine influenza virus. A swine influenza virus (SIV) is any strain of the influenza family of viruses that is usually hosted by pigs. Of the three genera of influenza viruses that cause human influenza two also cause influenza in pigs, As of 2009, the known SIV strains are the influenza C virus and the subtypes of the influenza. A virus known as H1N1, H1N2, H3N1.H3N2 and H2N3. Influenza virus B has not been reported in pigs.[1] Swine flu is common throughout pig populations worldwide and this infection causes outbreaks of influenza in pigs resulting in high levels of illness and low death rates in swine population. Transmission of swine influenza virus from pigs to humans is not common and results in production of antibodies and does not always cause human illness. The meat of the animal poses no risk of transmitting the virus when properly cooked. If transmission does cause human influenza, it is called zoonotic swine flu.

It is found that the influenza virus has been circulating as a human pathogen since the 16th century. The influenza pandemics are caused by new strains of Influenza viruses that evolve due to genetic reassortment of the different strains already circulating in the population. These genetically reassorted viruses wreak havoc since the population may not have immunity against this particular strain. The most important pandemic outbreak was in 1918-1919 and this resulted in about 50 million deaths and was reportedly caused by H1N1 stain of Influenza A virus. The descendants of this particular strain have persisted in humans for more than 90 years contributing to the normal seasonal epidemics of influenza.[2]

The current outbreak is due to a "novel" H1N1InfluenzaA virus which is a new influenza virus first detected in Mexico in April, 2009. The Influenza A H1N1 virus characterized in this outbreak have not been previously detected in pigs or humans. Swine flu is basically a misnomer. This was originally referred to as "swine flu" because laboratory testing showed that many of the genes in this new virus were very similar to those found in pigs in North America. Further on, it was reported that this new virus has gene segments from the swine, avian and human flu virus genes, but subsequent analysis suggested it was a reassortment of just two strains, both found in swine.[5] The scientists call this a 'quadruple reassortant" virus.

Global Scenario

On June 11, 2009, the WHO signaled that a global pandemic of novel influenza A (H1N1) was underway by raising the worldwide pandemic alert level to Phase 6.[3] This alert was due to spread of the new H1N1 virus and not because of the severity of illness caused by the virus. At the time, more than 70 countries had reported cases of novel influenza A (H1N1) infection and there were ongoing community level outbreaks of novel H1N1 in multiple parts of the world. The United States continues to report the largest number of novel H1N1 cases of any country worldwide. The last WHO

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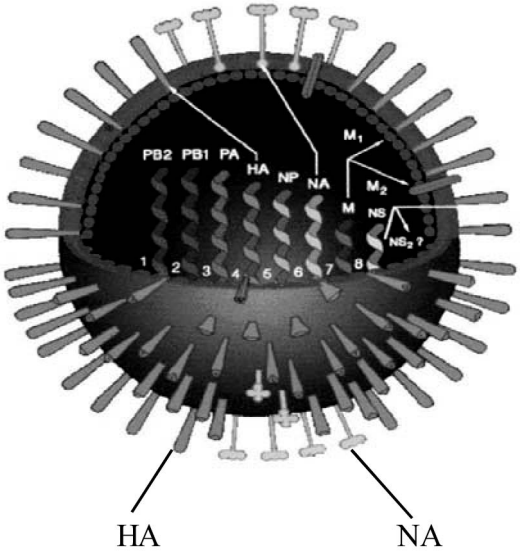

Figure 1. **H1N1Influenza A virus**

update, issued on July 6, showed 94,512 confirmed cases in 122 countries, with 429 deaths. At first sight, the data seem to imply that this new virus is relatively mild, with case fatality ratios around 0.5%, similar to the upper range of that seen for seasonal influenza[1] and relatively low hospitalization ratios. However, the case fatality ratio seems to vary substantially between countries, and deaths have occurred in much younger people than is the case for seasonal influenza.[6,7] But it is uncertain whether this trend will persist, as the virus spreads more extensively; any changes could have a considerable impact on the aggregate population level case fatality ratio.[8]

The reason for the alert is that the majority of human population has no immunity to this new strain of virus and the probability that this virus has the potential to further mutate to a lethal novel Influenza virus.

The various health authorities all over the world have developed action plans to deal with the current situation. This includes steps for surveillance, early diagnosis, treatment and development of strategies to prevent transmission.

CASE DEFINITIONS

Influenza surveillance system uses standardized case definitions to enable comparisons between different areas within a country as well as between countries. The two case definitions by Influenza Surveillance System include:[4]

Influenza Like Illness (ILI) is defined as sudden onset of fever over 38 degree C & cough or sore throat and an absence of other diagnosis.

Severe Acute respiratory Infection (SARI):

For those above 5 Yrs. (WHO protocol on rapid response)

Sudden onset of fever over 38 degree C, AND Cough or sore throat AND Shortness of breath or difficulty in breathing AND Requiring hospitalization.

For children below five years

Clinically suspected of having pneumonia or severe/ very severe pneumonia and requiring hospitalization Case definitions for Human H1N1 Influenza A

A confirmed case of H1N1 infection is defined as a person with an acute febrile respiratory illness with laboratory confirmed H1N1 infection at WHO approved laboratories by one or more of the following tests:[4]

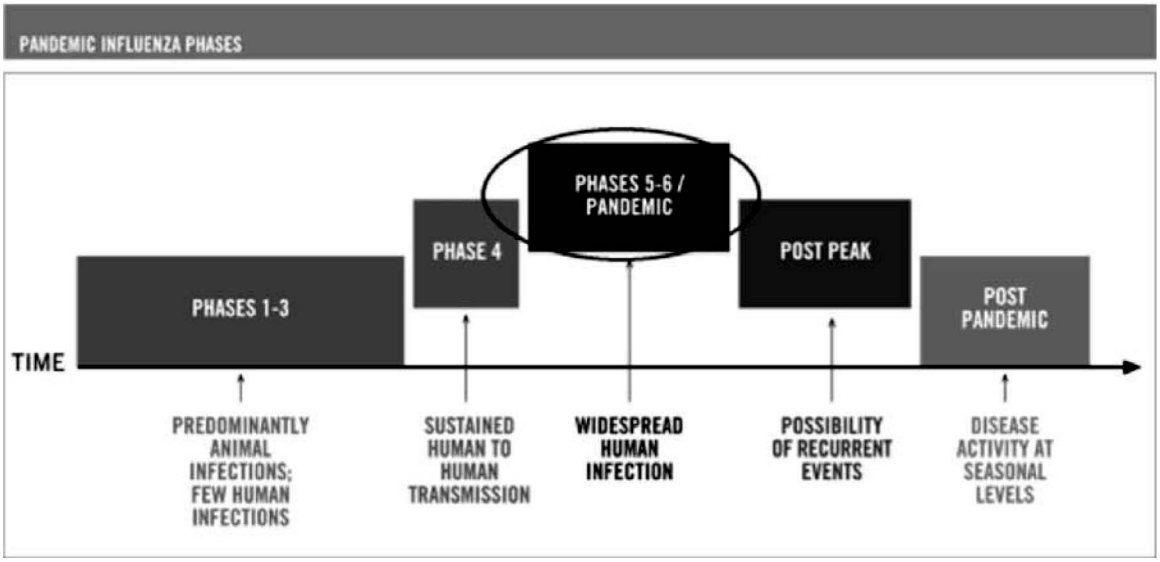

Figure 2. **Pandemic Influenza Phases**

- real-time RT-PCR
- viral culture
- Four-fold rise in swine influenza A (H1N1) virus specific neutralizing antibodies.

A probable case of H1N1 infection is defined as a person with an acute febrile respiratory illness who is positive for influenza A, but negative for H1 and H3 by influenza RT-PCR[4]

A suspected case of H1N1 infection is defined as a person with acute febrile respiratory illness with onset.[4]

- within 7 days of close contact with a person who is a confirmed case of H1N1 infection, or
- within 7 days of travel to a community where there are one or more confirmed cases of H1N1 infection, or
- resides in a community where there are one or more confirmed cases of H1N1 infection.

Other definitions include:

Close contact: is defined within 6 feet of an ill person who is a confirmed, probable or suspected case of swine influenza A (H1N1) virus infection during the infectious period.

Acute respiratory illness is defined as illness of recent onset with at least two of the following: rhinorrhoea or nasal congestion, sore throat, cough (with or without fever)

High Risk group for complications of influenza is defined as a person such as:

- Children < 5 years old
- Persons aged 65 years or older
- Children and adolescents receiving long- term aspirin therapy and who might be at risk for experiencing Reye syndrome after influenza virus infection
- Pregnant women
- Adults and children with chronic pulmonary, cardiovascular, hepatic, hematological, neurologic, neuromuscular, or metabolic disorders
- Adults and children who have immunosuppression (including immunosuppression caused by medications or by HIV)
- Residents of nursing homes / chronic-care facilities

Transmission

The secondary attack rate of the strain causing this pandemic is estimated to be 22 to 33 percent, compared with 5 to 15 percent for seasonal influenza

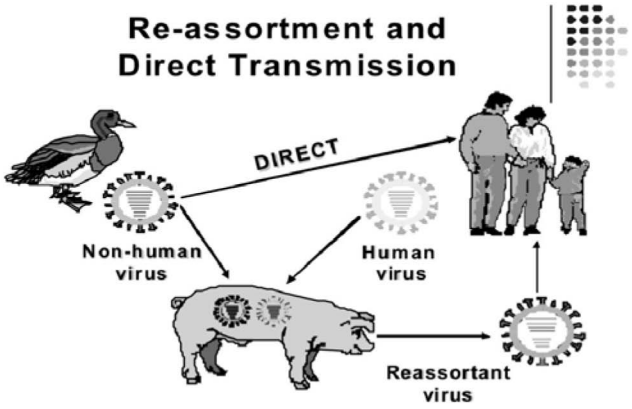

Figure 3. **Re-assortment and Direct Transmission**

Transmission to humans

People who work with poultry and swine, veterinarians and meat processing workers, are at increased risk of zoonotic infection with influenza virus endemic in these animals. Zoonosis andreassortment can occur in the human hosts. Virus is transmitted in ways similar to other influenza viruses.

Seasonal human influenza viruses are thought to spread from person to person primarily through large- particle respiratory droplet transmission (e.g., when an infected person coughs or sneezes near a susceptible person). Transmission via large-particle droplets requires close contact between source and recipient persons because droplets do not remain suspended in the air and generally travel only a short distance (< 6 feet). Contact with contaminated surfaces is another possible source of transmission and transmission via droplet nuclei (also called "airborne" transmission). Cold and dry weather helps the virus to survive longer outside the body. All respiratory secretions and bodily fluids (include diarrhoeal stool) of novel influenza A (H1N1) cases should be considered potentially infectious. The viruses are not transmitted by food and eating properly handled and cooked pork and pork products are safe.

Signs and Symptoms of Human H1N1 Influenza

Incubation period: The estimated incubation period is unknown and could range from 1-7 days, and more likely 1-4 days.

The estimated duration of viral shedding is based upon seasonal influenza virus infection.

In general, persons with novel influenza A (H1N1) virus infection should be considered potentially infectious from one day before to 7 days following illness onset. Children, especially younger children,

might be infectious for up to 10 days.

Patients with uncomplicated disease due to confirmed novel influenza A (H1N1) virus infection have experienced fever, chills, headache, upper respiratory tract symptoms like (cough, sore throat, rhinorrhea, shortness of breath), myalgias, arthralgias, fatigue, vomiting, or diarrhea.

Complications include:

- Upper respiratory tract disease-sinusitis, otitis media, croup
- Lower respiratory tract di seas e- pneumonia, bronchiolitis, status asthmaticus
- Cardiovascular-Myocarditis, pericarditis
- Musculoskeletal- myositis, rhabdomyolysis
- Neurologic- acute and post-infectious encephalopathy, encephalitis, febrile seizures, statusepilepticus
- Toxic shock syndrome
- Secondary bacterial pneumonia with or without sepsis.

Diagnosis

Respiratory secretions should be collected from suspected cases within the first 4 to 5 days of illness when there is maximum shedding of the virus. However some persons particularly children may shed the virus for longer period of upto 10 days or more.[4]

Preferred samples for analysis include

- Nasal swab and Throat swab
- Lower respiratory aspirate
- Posterior pharyngeal swabs
- Nasal washes
- Acute and convalescent serum. Paired serum samples are most useful

Acute sample: Within 7 days after symptom onset

Convalescent sample: More than 21 days after symptom onset at (an interval of 14 days)

Transportation of samples: The samples should be transported to laboratory as soon as possible. This is done on dry ice and in triple packing. The specimens should be stored at 4°C before and during transportation if transported within 48 hours and at -70°C if transported beyond 48 hours.

In India the samples are send to National Institute of Virology, Pune and National Institute of Communicable Diseases, Delhi.

It is to be noted that samples from all cases, once the pandemic starts, are not to be tested.

Prevention

Currently there is no vaccine against Human H1N1 Influenza A.

Prevention of swine influenza has three components:

- prevention in swine,
- prevention of transmission to humans,
- prevention of its spread among humans.

Recommendations to prevent spread of the virus among humans include using standard infection control against influenza. This includes frequent washing of hands with soap and water or with alcohol-based hand sanitizers, especially after being out in public.[3]

Chance of transmission is also reduced by disinfecting household surfaces, which can be done effectively with a diluted chlorine bleach solution. Social Distancing measures like staying away from other people who might be infected - by avoiding large gatherings, spreading out a little at work, or staying home and lying low if an infection is spreading in a community may also be helpful in preventing transmission of infection. Public Health and other responsible authorities have action plans which may request or require social distancing actions depending on the severity of the outbreak[4]

Steps for Infection Control of Ill Persons in a Healthcare Setting

All health care personnel should use personal protection devices when coming into contact with suspected cases. This includes[4]

- Gloves (nonsterile),
- Mask (high-efficiency mask) / Three layered surgical mask,
- Long-sleeved cuffed gown,
- Protective eyewear (goggles/visors/face shields),
- Cap (may be used in high risk situations where there may be increased aerosols),
- Plastic apron if splashing of blood, body fluids, excretions and secretions is anticipated.

Patients with suspected or confirmed case status should be placed in a single patient room with the door kept closed. If available, an airborne infection isolation room (AIIR) with negative pressure air handling with 6 to 12 air changes per hour can be used. Air can be exhausted directly outside or be recirculated after

filtration. For suctioning, bronchoscopy, or intubation, use a procedure room with negative pressure air handling. All the wastes should be treated as infectious waste and decontaminated as per standard procedures

Chemoprophylaxis

Antiviral Chemoprophylaxis should be given to:[4]

- All close contacts of suspected, probable and confirmed cases. Close contacts include household /social contacts, family members, workplace or school contacts, fellow travelers etc.
- All health care personnel coming in contact with suspected, probable or confirmed cases

The Government of India recommends Oseltamivir for both prophylaxis and treatment

Prophylaxis should be provided till 10 days after last exposure (maximum period of 6 weeks)

Body weight	Dose	For infants: <3 months not recommended un less situation judged critical
<15kg	30 mg OD	3-5 months 20 mg OD
15-23kg	45 mg OD	6-11 months 25 mg OD
24-<40kg	60 mg OD	
>40kg	75 mg OD	

MANAGEMENT

Clinical management includes

Infection control: Isolate the patient Implement infection control precautions PPE for HCW and family members

Supportive care: (ICU) Pulmonary: administer oxygen; mechanical ventilation for respiratory failure

Treatment: Antiviral medications (Oseltamivir) Corticosteroid treatment is not recommended

TREATMENT

Antiviral drugs can make the illness milder and make the patient feel better faster and also prevent serious flu complications. For treatment, antiviral drugs work best if started soon after getting sick (within 2 days of symptoms). However, the majority of people infected with the virus make a full recovery without requiring medical attention or antiviral drugs.

The U.S- CDC recommends the use of Tamiflu (Oseltamivir) or Relenza (Zanamivir) for the treatment and/or prevention of infection with swine influenza viruses. The virus isolates in the 2009 outbreak have been found resistant to Amantadine and Rimantadine.

For individual treatment: The recommended dose is 75 mg twice daily for adults. The drug can be used in pregnancy.

For adolescents and pediatric age group

Children below one year

<15kg- 30 mg twice daily for 5 days

15-23kg -45 mg twice daily for 5 days

24-40kg - 60 mg twice daily for 5 days

>40kg - 75 mg twice daily for 5 day

Age <3 mths -12 mg twice daily

Age 3 - 5 mths -20 mg twice daily

Age 6 – 11mths - 25 mg twice daily

Other Supportive Therapy includes:[4]

- IV Fluids.
- Parenteral nutrition.
- Oxygen therapy/ ventilatory support.
- Antibiotics for secondary infection- Prophylatic antibiotics should be avoided
- Vasopressors for shock.
- Paracetamol or ibuprofen is prescribed for fever, myalgia and headache. Salicylate / aspirin is strictly contra-indicated in any influenza patient due to its potential to cause Reye's syndrome.
- Patient is advised to drink plenty of fluids.
- Avoid smoking.
- For sore throat, short course of topical decongestants, saline nasal drops, throat lozenges and steam inhalation may be beneficial.
- Monitor for clinical / radiological evidence of lower respiratory tract infection and for hypoxia.

Adult patients should be discharged 7 days after symptoms have subsided. Children should be discharged 14 days after symptoms have subsided. The family of patients discharged earlier should be educated on personal hygiene and infection control measures at home; children should not attend school during this period.

Human Influenza A (H1N1) Vaccine

Seasonal Influenza vaccine does not protect against Novel H1N1 infection. But in areas where seasonal influenza is circulating this can be given in unvaccinated patients.

Making new influenza vaccines ready to immunize people generally takes five to six months after first identification of the pandemic virus. The very first doses of influenza A (H1N1) vaccine usable to immunize people, from one or more manufacturers, are expected as early as September 2009.

END NOTE

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