



AMERICAN JOURNAL OF PHARMTECH RESEARCH

Journal home page: <http://www.ajptr.com/>

H1N1 FLU: A Comprehensive Review

Ankita Sharma^{1*}, Yakub Sheikh², Tabassum Yusuf³

1. Department of pharmacy, Dev Bhoomi Group of Institutions, Chakrata Road, Navgaon, Manduwala, Dehradun, Uttarakhand, India- 248007.

2. Medical scribe department, IDS infotech. Pvt. Ltd., C-138, Phase 8 Industrial area, Sahibzada Ajit Singh Nagar, Punjab, India- 160071

3. Department of chemistry, Ethiraj College for women, 70, Ethiraj Salai, Egmore, Thousand Lights, Chennai, Tamil Nadu, India- 600008

ABSTRACT

Swine flu, also known as Hog or Pig flu, or H₁N₁ is a highly contagious viral infection caused by influenza A viruses of the family orthomyxoviridae. The term “influenza” derived from Italian word “influence” was coined in 1357 AD as the disease was thought to be caused by influence of stars, It was first isolated from Pigs in 1930 in USA. It is a viral respiratory disease caused by viruses that infects pigs, resulting in nasal secretions, barking cough, decreased appetite, & listless behavior. Swine virus consist of eight RNA strands, one strand derived from human flu strains, two from avian (bird) strains, and five from swine strains. Swine flu spreads from an infected person to a healthy person by inhalation or ingestions of droplets contaminated with virus while sneezing or coughing. Antiviral drugs effective against this virus are Tamiflu and Relenza, while rapid antigen testing (RITD), DFA testing, viral culture, and molecular testing (RT-PCR) are used for its diagnosis in laboratory.

Keywords: swine flu, H₁N₁, Influenza virus.

*Corresponding Author Email: ankee.sharma26@gmail.com

Received 04 January 2018, Accepted 10 January 2018

Please cite this article as: Sharma A *et al.* : A Comprehensive Review. American Journal of PharmTech Research 2018.

INTRODUCTION

The swine flu virus, an influenza (H1N1), virus was first isolated from pigs in 1930. Swine flu is an infectious disease, also known as communicable, contagious or transmissible disease resulting from the infection, presence and growth of pathogenic biological agents in an individual host organism.

Influenza viruses infect the respiratory tract of pigs which results in nasal secretions, barking like cough, decreased appetite, and listless behavior. The influenza virus mainly affects that people who are in close proximity to pigs (for e.g. farmers). Swine flu viruses cause high level of illness, but low death rates in pigs. Like all influenza viruses, swine flu viruses change constantly. The most common symptoms of influenza virus are cough and fever. Swine flu is caused by influenza A virus which is designated as H1N1. It is mainly identified through its surface antigens by immunological techniques. This virus is transmitted from person to person either by inhalation or by ingestion of droplets when the infected person sneezes and coughs, but it cannot be transmitted by eating cooked pork. Although, the virus was first discovered in 1930 the disease was not observed much until it came into lime light after the pandemic 2009 which affected almost all countries in the world. Since then, researches have worked very hard on the virus and have discovered several vaccines and non vaccine measures which can ensure lesser spread of virus and lesser chances of such a pandemic in future.

History:

Swine influenza was first proposed to be a disease related to human flu during the 1918 pandemic flu, when pigs became sick at the same time as humans. In 1930 it was first observed in pigs. In between 1997 to 2002 three different subtypes & five different gene type were emerged as major cause of swine influenza in North America. In 1997-1998 H3N2 emerged as a result of reassortment between H1N1 and H3N2 produced H1N2. Before 1998, there was no new event of any reassortment or genetic change in the virus. When the avian strain H1N1 infected human again; this time virus met the strain H2N2 & the reassortment originated the strain H3N1. Currently, H1N1 type strain is responsible for life threatening swine flu.

Lifecycle:

Lifecycle of swine flu virus, H1N1 can be initiated very effortlessly, because it can live outside human body for 2-48 hours and it can attach itself to any surface like towel, cloths, table, door knob or anything touched by an infected person. The swine flu life cycle mainly has seven phases:

1. The Swine flu virus antigens attached to the surface of cells in the nose, throat and lungs.

2. The cell engulfs the virus.
3. The virus is able to penetrate the bubble of cell membrane that encloses it and release its RNA into it.
4. In the nucleus, replicas of the viral RNA are made.
5. Viral mRNA causes the cell to prepare viral proteins.
6. These proteins and RNA migrate to the cell's surface where they are amassed into novel virus particles.
7. Novel virus start budding off from the cell surface.

Classification:

The three genera of influenza viruses that cause human flu are Influenza A, Influenza B, and Influenza C virus. The strains found in pigs and human are quite different, but due to the reassortment, there have been transfer of genes among strains crossing swine, avian & human species boundaries.

Influenza A:

Swine influenza is known to be caused by influenza A subtypes H1N1, H1N2, H2N3, H3N1 and H3N2. In pigs, three influenza A virus subtype (H1N1, H1N2 and H3N2) are the common strains world wide. In united state, the H1N1 subtype was prevalent among swine population before 1998. However, since late August 1998, H3N2 subtype have been isolated from pigs. In 2004, H3N2 viruses isolated in US swine and turkey stocks were of triple reassortants, containing genes from human (HA, NA, and PB1), swine (NS, NP, and N), and avian (PB2 and PA) lineages.

The National center for Immunization and Respiratory Diseases (NCIRD), on the basis of two proteins on the surface of virus, the influenza A viruses divide into two subtype: the hem agglutinin (H) and the neuraminidases (N).

Influenza B: Influenza B viruses are only known to infect human and seals, giving them influenza.

Influenza C: Influenza C viruses infect both human and pigs, but do not infect birds.

Transmission:

Transmission between pigs:- Influenza is common between pigs, about half of breeding pigs have been exposed to the virus in US. Antibodies to the virus are also common in pigs. The main route of transmission is direct contact between infected and uninfected animals. Intensive forming and close contacts during animal transport may increase the risk of transmission. The virus probably occurs either by pigs touching noses, or through dried mucus, while transmitted (air borne) by pig coughing or sneezing.

Transmission to human:- Swine flu transmitted to humans via contact with infected pigs or environment contaminated with swine influenza viruses. Swine flu spreads from infected person to healthy person by inhalation or ingestion of droplets contaminated with virus while sneezing or coughing.

Differences between cold and swine flu:

| Symptom | Cold | Swine flu |
|-----------|---|---|
| Fever | Fever is rare with cold | Fever is usually present with the flu in approximately 80% of all swine flu cases. A temperature of 100°F or higher for 3 to 4 days |
| Coughing | Mucus producing cough | A non productive cough is usually present with the swine flu |
| Chills | Chills are uncommon | 60% of people who have swine flu experience chills |
| Tiredness | Tiredness is fairly mild | Tiredness is moderate to severe |
| Aches | Slight body aches and pains can be part of cold | Severe aches and pains are common |
| Headache | Headache is fairly uncommon | Headache is common and experienced by 80% of cases. |

Diagnosis:

Diagnosis of swine flu influenza A infection is done by laboratory analysis. It can be diagnosed by two approaches.

- i. Presumptive diagnosis: It can be through patient history along with clinical symptoms.
- ii. Definitive diagnosis: It is made through laboratory investigation in following manner.

Quick Tests (e.g. nasopharyngeal swab sample) are done to see if the patient is infected with influenza A or B virus. If test is positive for type B, the flu is not likely to be swine flu (H1N1) and if it is positive for type A, then the person could have swine flu.

Swine flu is diagnosed by detecting the particular antigens associated with the virus type. This test can be performed in specialized laboratory.

Prevention:

Novel swine flu can be prevented with or without vaccines. Prevention without vaccination can be done by avoiding exposure to the virus. WHO safety precautions to be taken against swine flu are:

- The nose & mouth must be covered with disposable tissue while coughing and sneezing. The used tissue must be disposed off immediately after using.

- Washing hands immediately after coughing, sneezing, and contacting a sick person with soap & water, especially before touching the eyes, nose & mouth.
- In case of symptom of swine flu, the patient must be quarantined and a doctor must be consulted.
- Avoid crowded places.
- Stay at home when symptoms of flu are observed.

Vaccination is significant for individuals at high risk for developing influenza or other viral infections. The first respective vaccine was released in October 2009. It was a nasal spray vaccine and was approved for use in healthy individuals in the range of age 2 to 49. The injectable vaccine can be used in age of 6 months or higher and even safe for pregnant women. The clinical trials of both the vaccines proved that vaccines were harmless and effective. As flu shot is made from killed virus particles, so a person cannot get the flu from a flu shot, whereas the nasal spray vaccine comprises of live viruses that have been changed to hamper its ability to replicate in human tissue; so people with suppressed immunity should not get vaccinated with the nasal spray.

The vaccines available for swine flu have some side effects as:

- Flu shot: Tenderness, erythema, mild swelling at the shot site, myalgia, low grade fever and nausea. These symptoms usually last not more than 24 hours.
- Nasal spray: Rhinorrhea, low grade fever, headache, sneezing, cough and sore throat.

Treatment:

Antiviral Drugs for Influenza:

- Oseltamivir: - The neuraminidase inhibitor oseltamivir formulated as capsules or oral suspension (Tamiflu ®) is FDA-approved for the treatment of uncomplicated acute influenza in patients of age 1 year and older who have been symptomatic for no more than 2 days.
- Zanamivir: - The neuraminidase inhibitor zanamivir formulated for oral inhalation (relenza®) is FDA-approved drug for the treatment of influenza in patient 7 years of age and older who, similar to approved uses for oseltamivir, have uncomplicated illness and have been symptomatic for not more than 2 days.
- Peramivir:- A third neuraminidase inhibitor peramivir formulated for intravenous (IV) administration is an investigational product currently being evaluated in clinical trials.

Prescribing pattern for swine flu:

- For stuffy or blocked nose, use saline (or warm water) nose drops followed by nose blowing or suctioning.
- For throat pain, Tylenol or Ibuprofen is useful.
- For cough, try to soothe the throat. For children over age 6, give cough drops. If children are over 1 year give honey.
- Ibuprofen can be given in body-ache including back pain, leg pain, chest pain as well as in headache.
- Tamiflu is antiviral medicine that may be useful for some children.
- Patients should be encouraged to drink adequate fluids in order to prevent dehydration, thin nasal secretions and loosen the phlegm in the lungs.

CONCLUSION:

H1N1 influenza or swine flu is a contagious disease that is caused by influenza virus. Infection with H1N1 influenza virus is severe which includes life threatening complications. Symptoms of swine flu are similar to common flu, and scientist have successfully studied its range of symptoms as well as how it is spread. For healthy people, resting and drinking plenty of fluids usually allow infected people to recover from the flu. While medications and hospitalization may be needed for people having high risk of developing flu. The infection can; however, be prevented by avoiding close contact with sick persons, washing the hands properly after coughing and sneezing, and by taking other hygienic preventive measures.

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