



# JOURNAL OF PHARMACEUTICAL SCIENCE AND BIOSCIENTIFIC RESEARCH (JPSBR)

(An International Peer Reviewed Pharmaceutical Journal that Encourages Innovation and Creativities)

## A REVIEW ON SWINE FLU

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### ABSTRACT

Swine flu has been creating a terror effects all round the globe and has been declared epidemic in most part of the world. Swine flu refers to swine influenza or the viral infection caused by any of the several types of swine influenza virus. Only people who used to have direct contact with pigs were observed to get swine flu in the past. But, H<sub>1</sub>N<sub>1</sub> virus is a new swine flu virus and it contains the genetic material of swine, bird and human influenza virus. H<sub>1</sub>N<sub>1</sub> is an Influenza A virus. Swine flu can produce a number of symptoms in both adults and children. In India day by day the graph of infected person has been climbed up so, it is important to take into consideration about this disease as it may prove deadly one. The intensity of this disorder can be lowered by diagnosing and taking proper treatments.

**Keywords:** Swine flu, H<sub>1</sub>N<sub>1</sub>, Pandemic, Transmission

### INTRODUCTION

Swine flu is an emerging viral infection that is a present global public health problem. There are many thousands cases of swine flu in the present day. This new infection can be seen around the world in the present day. This infection is a kind of variant of H<sub>1</sub>N<sub>1</sub> influenza infection (Figure 1). The problematic virus was firstly detected in America in 2009 and this virus is the most widely studied virus in the present day. Due to the nature of

respiratory virus, the transmission of this pathogenic virus is air borne transmission. Hence, the rapid spreading and difficulty in control of this infection can be expected<sup>[1]</sup>.

Swine flu, also called pig influenza, swine influenza, hog flu and pig flu. Swine influenza virus (SIV) or S-OIV (swine-origin influenza virus) is any strain of the influenza family of viruses that is endemic in pigs<sup>[2]</sup>. As of 2009, the known SIV strains include influenza C and the subtypes of influenza A known as H<sub>1</sub>N<sub>1</sub>, H<sub>1</sub>N<sub>2</sub>, H<sub>3</sub>N<sub>1</sub>, H<sub>3</sub>N<sub>2</sub>, and H<sub>2</sub>N<sub>3</sub>. Swine flu viruses have been reported to spread from person-to-person, but in the past, this transmission was limited and not sustained beyond three people. In March/April 2009 human cases of influenza swine fevers (H<sub>1</sub>N<sub>1</sub>) were first reported in California and Texas then later in other states and even in Mexico. In 2009 the media labeled as "swine flu" the flu caused by 2009's new strain of swine-origin A/ H<sub>1</sub>N<sub>1</sub> pandemic virus just as it had earlier dubbed as "avian flu" flu caused by the recent Asian-lineage HPAI (High Pathogenic Avian Influenza) H<sub>5</sub>N<sub>1</sub> strain that is still endemic in many wild bird species in several countries<sup>[3]</sup>.

#### Article history:

Received 13 Jun 2011

Accepted 10 July 2011

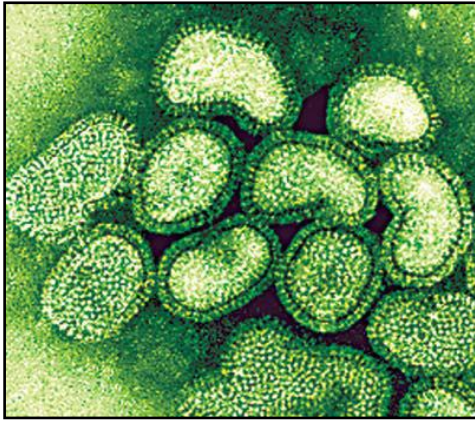
Available online 13 Aug 2011

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Available Online at [www.jpsbr.org](http://www.jpsbr.org)



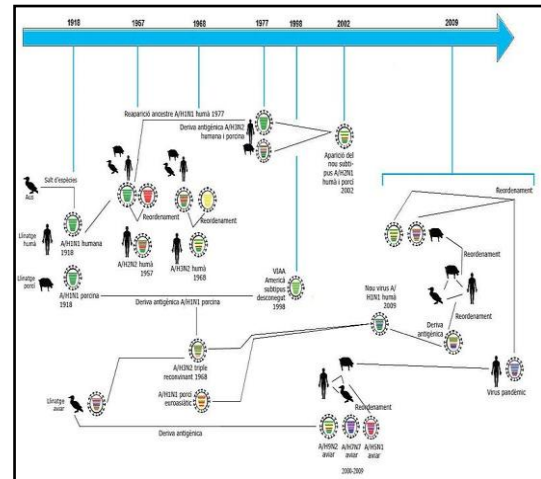
**Figure 1** Electron microscope image of the reassorted H<sub>1</sub>N<sub>1</sub> influenza virus

## HISTORY

Swine influenza was first proposed to be a disease related to human flu during the 1918 flu pandemic, when pigs became sick at the same time as humans<sup>[4]</sup>. The first identification of an influenza virus as a cause of disease in pigs occurred about ten years later, in 1930<sup>[5]</sup>. For the following 60 years, swine influenza strains were almost exclusively H<sub>1</sub>N<sub>1</sub>. 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, H<sub>3</sub>N<sub>2</sub> 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 H<sub>1</sub>N<sub>1</sub> and H<sub>3</sub>N<sub>2</sub> produced H<sub>1</sub>N<sub>2</sub>. In 1999 in Canada, a strain of H<sub>4</sub>N<sub>6</sub> crossed the species barrier from birds to pigs, but was contained on a single farm<sup>[6]</sup>. (Figure 2)

The phylogenetic origin of the flu virus that caused the 2009 pandemics can be traced before 1918. Around 1918, the ancestral virus of avian origin, crossed the species boundaries and infected humans as human H<sub>1</sub>N<sub>1</sub>. The same phenomenon took place soon after in America, where the human virus was infecting pigs; it led the emergence of the H<sub>1</sub>N<sub>1</sub> swine strain, which later became the classic swine flu. The new human H<sub>1</sub>N<sub>1</sub> flu strain of avian origin, was kept transmitting among human populations until around 1957, when there was a co infection between this strain and the avian H<sub>1</sub>N<sub>1</sub> in humans. There was a reassortment event leading to the development of a new strain (H<sub>2</sub>N<sub>2</sub>). New events of reassortment were not reported until 1968, when the avian strain H<sub>1</sub>N<sub>1</sub> infected humans again; this time the virus met the strain H<sub>2</sub>N<sub>2</sub>, and the reassortment originated the strain H<sub>3</sub>N<sub>2</sub>. This strain has

remained as a stable flu strain until now. The critical moment for the 2009 outbreak was between 1990 and 1993. There was a triple reassortment event in a pig host. The reassortment of North American H<sub>1</sub>N<sub>1</sub> swine virus, the human H<sub>3</sub>N<sub>2</sub> virus and avian H<sub>1</sub>N<sub>1</sub> generated the swine H<sub>1</sub>N<sub>2</sub> strain. Finally, the last step in S-OIV history was in 2009 when the virus H<sub>1</sub>N<sub>2</sub> coinfects a human host at the same time as the euroasiatic H<sub>1</sub>N<sub>1</sub> swine strain. This led to the emergence of a new human H<sub>1</sub>N<sub>1</sub> strain which caused the 2009 pandemic<sup>[7]</sup>.



**Figure 2** H<sub>1</sub>N<sub>1</sub> Virus Pandemic History

## HOW IT SPREAD?

Like most viruses, it enters the body through the mucous membranes - the eyes, the nose or the mouth. Swine flu is spread just like the regular seasonal flu spreads. It goes from person to person through close contact and direct touch, indirect touch, or respiratory droplets that carrying the virus. Infected person may be able to infect others beginning one day before symptoms develop and up to seven or more days after becoming sick. Infected people may be able to infect others beginning 1 day before symptoms develop and up to 7 or more days after becoming sick.

People with swine influenza virus infection should be considered potentially contagious as long as they are symptomatic and possible for up to 7 days following illness onset. Children, especially younger children, might potentially be contagious for longer periods. Swine influenza viruses are not transmitted by food. Any person cannot get swine influenza from eating pork or pork products. Eating properly handled and cooked pork and pork products are safe. Cooking pork to an internal

temperature of 160°F (72°C) kills the swine flu virus as it does other bacteria and viruses<sup>[8]</sup>.

### WHAT IS THE SWINE FLU INCUBATION PERIOD?

Every virus, bacteria or pathogen of any time has a certain incubation period. This period is the time it takes after the pathogen enters the body, for the symptoms to appear. Like all influenza pathogens the average incubation period is two days. However, studies have shown individual periods to range between one day to seven days, over all. As such, there is quite a dispute all over the world about the incubation period. Hence, as a suggestion it would be wise to keep an eye out for approximately 10 days to be sure of the infection. Most US cases have shown the incubation period to be between two to seven days<sup>[9]</sup>.

### WHO ARE PRONE TO INFECTION WITH SWINE FLU?

- Older age group >65 yr<sup>[9]</sup>
- Pregnant woman
- Individuals with chronic lung disease
- Individuals with congestive heart failure
- Individuals with renal failure
- Immunosuppressant
- Hematological abnormalities
- Individuals with Diabetes mellitus
- Individuals with chronic hepatic disease
- Socially unable to cope
- Individuals with asthma

### SIGNS AND SYMPTOMS

#### In Swine

In pigs influenza infection produces fever, lethargy, sneezing, coughing, difficulty breathing and decreased appetite<sup>[10]</sup>.

#### In Humans

Symptoms include fever, cough, sore throat, body aches, headache, chills and fatigue<sup>[11,12]</sup>. The 2009 outbreak has shown an increased percentage of patients reporting diarrhea and vomiting<sup>[13]</sup>. The 2009 H<sub>1</sub>N<sub>1</sub> virus is not zoonotic swine flu, as it is not transmitted from pigs to humans, but from person to person<sup>[14]</sup>. (Figure 3)

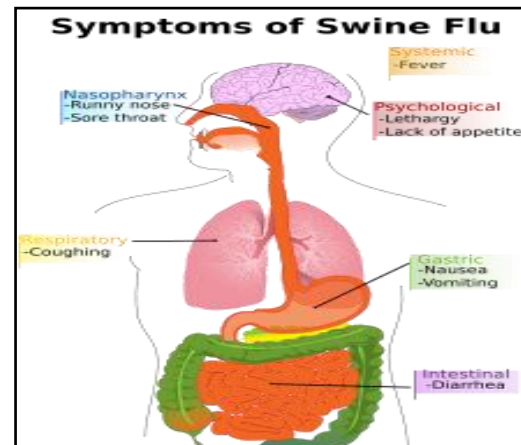


Figure 3 Main symptoms of swine flu in humans

### DIAGNOSIS

For diagnosis of swine influenza A infection, respiratory specimen (nasopharyngeal swab, throat swab nasal aspirate, nasal washing) would generally need to be collected within the first 4 to 5 days of illness (when an infected person is most likely to be shedding virus).

Most of the tests can distinguish between A and B types. The test can be negative (no H<sub>1</sub>N<sub>1</sub> infection) or positive for type A and B. If the test is positive for type B, the flu is not likely to be swine influenza (H<sub>1</sub>N<sub>1</sub>). If it is positive for type A, the person could have conventional influenza strain or swine influenza (H<sub>1</sub>N<sub>1</sub>)<sup>[15]</sup>.

**Sample Collection:** It should be labeled clearly and include patient's complete information and should be sent to NIV, Pune or NICD, Delhi within 24 hours for further investigations. Laboratory biosafety measures should be followed for collection, storage, packaging and shipping of influenza samples.

#### Available Laboratory Tests:

- Rapid Antigen Tests: not as sensitive as other available tests.
- RT-PCR: In this detection and quantification of mRNA is done. This test detects the viral load in an individual.
- Virus isolation: The throat swab is generally taken to culture virus from the suspected cases. Though if it is not detected doesn't rule out the disease.
- Virus Genome Sequencing<sup>[16]</sup>

### PRECAUTIONS

According to World Health Organization, swine flu has been declared as a pandemic disease. The

following are the WHO safety precautions to be taken against swine flu:<sup>[9]</sup>

- The nose and mouth must be covered with disposable tissues while coughing or sneezing.
- The used tissues must be disposed off immediately after using them.
- Hygiene and cleanliness must be maintained by washing hands frequently with soap and water.
- Touching the eyes, nose or mouth without washing hands must be totally avoided.
- A doctor must be consulted immediately, in case flu-like symptoms are observed.
- In case of flu-like symptoms, the patient must be quarantined.
- One should stay at home from work, school and crowded places in case flu-like symptoms are observed.
- Face masks and gloves must be used when moving out in crowded places or nursing any ill patient. If a person is ill, then he or she should avoid contact with other people and stay isolated. Visit an authorized swine flu treatment hospital or doctor for further treatment. One should keep their surroundings clean and maintain hygiene.
- Avoid unnecessary traveling and crowded areas.

## PREVENTION

Prevention of swine influenza has three components namely prevention in swine, prevention of transmission to humans, and prevention of its spread among humans<sup>[17]</sup>.

### In Swine

Methods of preventing the spread of influenza among swine include facility management, herd management, and vaccination. Because much of the illness and death associated with swine flu involves secondary infection by other pathogens, control strategies that rely on vaccination may be insufficient.<sup>[18,19]</sup>

Control of swine influenza by vaccination has become more difficult in recent decades, as the evolution of the virus has resulted in inconsistent responses to traditional vaccines. Standard commercial swine flu vaccines are effective in controlling the infection when the virus strains match enough to have significant cross-protection, and custom (autogenous) vaccines made from the specific viruses isolated are created and used in the more difficult cases<sup>[20]</sup>.

Facility management includes using disinfectants and ambient temperature to control virus in the

environment. The virus is unlikely to survive outside living cells for more than two weeks, except in cold (but above freezing) conditions, and it is readily inactivated by disinfectants. Herd management includes not adding pigs carrying influenza to herds that have not been exposed to the virus. The virus survives in healthy carrier pigs for up to 3 months and can be recovered from them between outbreaks<sup>[21]</sup>.

### In Humans

**Prevention of pig to human transmission:** Swine can be infected by both avian and human flu strains of influenza, and therefore are hosts where the antigenic shifts can occur that create new influenza strains. The transmission from swine to human is believed to occur mainly in swine farms where farmers are in close contact with live pigs. Although strains of swine influenza are usually not able to infect humans this may occasionally happen, so farmers and veterinarians are encouraged to use a face mask when dealing with infected animals. The use of vaccines on swine to prevent their infection is a major method of limiting swine to human transmission. Risk factors that may contribute to swine-to-human transmission include smoking and, especially, not wearing gloves when working with sick animals thereby increasing the likelihood of subsequent hand-to-eye, hand-to-nose or hand-to-mouth transmission.<sup>[22]</sup>

**Prevention of human to human transmission:** Influenza spreads between humans when infected people cough or sneeze, then other people breathe in the virus or touch something with the virus on it and then touch their own face<sup>[23,24]</sup>. 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<sup>[25]</sup>. Chance of transmission is also reduced by disinfecting household surfaces, which can be done effectively with a diluted chlorine bleach solution<sup>[26]</sup>. Experts agree that hand-washing can help prevent viral infections, including ordinary influenza and the swine flu virus and also not touching eyes, nose or mouth with hands helps to prevent the flu.<sup>[27]</sup> Alcohol-based gel or foam hand sanitizers work well to destroy viruses and bacteria<sup>[28]</sup>.

## TREATMENT

Treatment of swine flu can be done by 3 ways:

**Vaccination:** Vaccines have been developed to protect against the virus that causes swine flu. There are two different brands of vaccine Pandemrix and Celvapan. Many people given the Pandemrix vaccine will only need one dose. People who have the Celvapan vaccine will need two doses three weeks apart. The swine flu vaccine is different from the seasonal flu vaccination that's offered every year. The seasonal flu vaccine does not protect against swine flu.

The vaccine is being offered first to pregnant women at any stage of pregnancy, child and people who are most likely to become seriously ill if they catch swine flu.

There are only a few people who cannot have the swine flu vaccine. The vaccines should not be given to anyone who has had a severe allergic reaction to a previous dose of the vaccine or any component of the Vaccine<sup>[29]</sup>.

**Antiviral Therapy:** Two classes of antiviral drugs are available for the prevention and treatment of influenza: neuraminidase inhibitors and adamantanes, which inhibit a viral protein called M2. Influenza A H<sub>1</sub>N<sub>1</sub>, formerly known as swine flu, has been found to be resistant to adamantanes (Amantadine and Rimantadine). Oseltamivir (Tamiflu) and Zanamivir (Relenza) are the two neuraminidase inhibitors currently available by prescription. These drugs reduce the median duration of symptoms by approximately one day and reduce the chance of contracting influenza by 70 to 90 % when used for known influenza exposure. Zanamivir and Oseltamivir are structurally related drugs that have been approved by the United States Food and Drug Administration (FDA) for the prophylaxis and treatment of influenza. In addition to their activity against current influenza A and influenza B strains, they are also active against the strain that caused the 1918 pandemic and against avian influenza A strains<sup>[30-33]</sup>.

**Swine Flu and Ayurveda<sup>[9]</sup>:** Ayurveda promotes the concept that if one's immune system is strong, then even if the body is exposed to viruses, one will not be affected. During a pandemic or an epidemic, Ayurveda emphasizes on the immunity of people living in regions affected by viruses. This branch of medicine promotes the intake of special herbs or decoctions to increase the immunity level of the people. Ayurvedic remedies comprise pure natural herbs which are effective in preventing swine flu. Moreover, the herbs are used to relieve swine flu symptoms, and boost the immune system against the H<sub>1</sub>N<sub>1</sub> virus. Ayurvedic treatment for swine flu involves the use of following herbs:

### Basil

Basil, *Ocimum basilicum* is a great Ayurvedic treatment option for swine flu. Ayurvedic practitioners claim that basil not only keeps the nasty swine flu virus at bay, but it also assists in the fast recovery of an affected person. They claim that basil improves the body's overall defense mechanism, thereby increasing its ability to fight viral diseases. It is also believed to strengthen the immune system of the afflicted person. For the control and prevention of swine flu, basil must be consumed in the fresh form. The paste or juice of a minimum of 25 leaves (medium size) should be consumed twice a day. Moreover, it should be had on an empty stomach. Basil is safe, with no side effects and is great to prevent swine flu from spreading like wildfire.

### Ginger

Ginger, *Zingiber officinalis* is one of the natural remedies for swine flu prevention. It boosts the body's immunity level and helps protect the body. Ginger has been known to fight cold, fever and flu conditions, and is also good to reduce inflammation.

### Garlic

Garlic, *Allium sativum* on the other hand is a powerful natural antibiotic, which features an unusual property of repelling bacteria and viruses.

### Gooseberry

Gooseberry, *Embelica officinalis* is one of the best fruits known to boost the immune system of the body. Since gooseberry is rich in Vitamin C, it helps raise the body's resistance to flu viruses. If fresh gooseberry is not available in the market, then the form of jam or juice is also great.

### Aloe vera

*Aloe vera* is an easily available plant and is also beneficial to boost immunity. One should consume a teaspoon of gel with water on a daily basis.

### Camphor and Eucalyptus Oil

Camphor has great ability to keep different air borne diseases under control. It is available in the form of camphor oil, which can be burnt in the room or office all the time. Inhaling the steam of Eucalyptus oil is also good. Just add a few drops of Eucalyptus oil into lukewarm water and inhale the steam. This helps to clear the nasal track and promotes the health of the respiratory tract.

Thus, it can be seen that while swine flu and Ayurveda both target the immune system, swine flu destroys it and Ayurveda focuses on keeping it

healthy. Besides the above Ayurvedic treatment options for swine flu, there are several other swine flu home remedies that one can try out. People who do not have milk allergy can take a glass of hot milk every night with little turmeric in it. Moreover, plenty of rest, nutritious diet, quitting smoking, and adequate exercise will help the body fight microorganisms. Overall, these alternative medicines for swine flu will help increase the body's resistance, thereby preventing the body from being affected. However, before taking any of these herbs, it is advisable to consult a herbalist.

## CONCLUSION

From the above survey of information it can be well known that the Swine flu is a dangerous disorder which is spreading worldwide and this is a casual thing to be considered that more and more people in India are affected by it and the cases may increase. So, it is important to take into consideration about this disease as it may prove deadly one. And thus the intensity of this disorder can be lowered by diagnosing and taking proper treatments.

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