Swine Flu, Fiction or Reality

Nabil A. NIMER

Dept. Biotechnology & Genetic Engineering

Faculty of Science

Philadelphia University
Different species harbour different strains of the flu virus

Bird flu  Swine flu  Human flu
Antigenetic shift in pigs

Flu viruses are able to swap genetic material from:

- pigs
- birds
- humans

New strain

Flu viruses are able to swap genetic material
Electron microscope image of the reassorted H1N1 virus. The viruses are 80–120 nanometers in diameter.
● Also known as Swine influenza, hog flu and pig flu

● ssRNA viruses (segmented genome, 13.5 kilobases)

● Order: *Mononegavirales*, Family: *Orthomyxoviridae*

● Species: Influenza A virus  Serotype: H1N1
neuraminase

8 genes

1. HA  Hemagglutinin gene
2. NA  Neuraminase gene
3. PA  Acidic polymerase gene
4. PB1 Basic polymerase gene 1
5. PB2 Basic polymerase gene 2
6. NP  Nucleoprotein gene
7. M   Matrix gene
8. NS  Nonstructural gene

hemagglutinin
Transmission to humans

Zoonotic swine flu
• Typically influenza is transmitted from infected mammals through the air by coughs or sneezes

• It can also be transmitted by saliva, nasal secretions, feces and blood

• Flu viruses can remain infectious for about:
  ◊ one week at human body temperature
  ◊ over 30 days at 0° C
  ◊ indefinitely at very low temperatures
H1N1
Attaches to receptors in the nose and throat

H5N1
Primarily attaches to receptors deep in the lungs
H1N1 Seasonal flu/swine flu

- Spreads easily through coughing and sneezing
- Less severe symptoms, but can be deadly
H5N1 (avian flu)

- Can mutate rapidly
- Causes severe illness and can trigger pneumonia
- Spreads easily between birds BUT human transmission rare
Symptoms of Swine Flu

Nasopharynx
- Runny nose
- Sore throat

Respiratory
- Coughing

Systemic
- Fever
- Lethargy
- Lack of appetite

Gastric
- Nausea
- Vomiting

Intestinal
- Diarrhea
• Flu viruses can be inactivated easily by disinfectants and detergents

• Swine influenza virus is killed at 70°C
Swine flu treatment:
Oseltamivir
Tamiflu (Roche)

- Is a neuraminidase inhibitor, acting as an analogue
  inhibitor of influenza neuraminidase

  Preventing progeny virions from emerging from
  infected cells
• Early treatment is important since neuraminidase protein inhibition is more effective within the first 48 hours.

(Effectiveness will diminish if the virus has replicated & too many cells are infected)

• Can be used for both treatment and prevention of the new strain.

• Recommended dosage is ten 75 mg pills.
Zanamivir
Relenza
(Glaxo Wellcome)

- Is a neuraminidase inhibitor, acting as an analogue inhibitor of influenza neuraminidase (resulting in that the virus is not able to reproduce itself)

- Licensed for the treatment of influenza A and B

- Can significantly reduce the severity and duration of flu symptoms.
• Zanamivir is a powder that is inhaled (diskhaler), twice a day, through a special inhaler used for five days.

• It can cause bronchospasm in some patients, thus not recommended for people with asthma or chronic obstructive pulmonary disease.

• Why do we need ANTIBIOTICS in a pandemic?
  ◊ To treat possible secondary bacterial infections.
  ◊ To reduce the length of hospitalization.
<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>No animal influenza virus circulating among animals have been reported to cause infection in humans.</td>
</tr>
<tr>
<td>Phase 2</td>
<td>An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a specific potential pandemic threat.</td>
</tr>
<tr>
<td>Phase 3</td>
<td>An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks.</td>
</tr>
<tr>
<td>Phase 4</td>
<td>Human to human transmission of an animal or human-animal influenza reassortant virus able to sustain community-level outbreaks has been verified.</td>
</tr>
<tr>
<td>Phase 5</td>
<td>The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.</td>
</tr>
<tr>
<td>Phase 6</td>
<td>In addition to the criteria defined in Phase 5, the same virus has caused sustained community level outbreaks in at least one other country in another WHO region.</td>
</tr>
<tr>
<td>Post peak period</td>
<td>Levels of pandemic influenza in most countries with adequate surveillance have dropped below peak levels.</td>
</tr>
<tr>
<td>Post pandemic period</td>
<td>Levels of influenza activity have returned to the levels seen for seasonal influenza in most countries with adequate surveillance.</td>
</tr>
</tbody>
</table>
## Chart of influenza pandemics

<table>
<thead>
<tr>
<th>Epidemics (avail. data)</th>
<th>Year</th>
<th>People infected</th>
<th>Deaths</th>
<th>Mortality %</th>
<th>Death rate/1,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish flu (worldwide est)</td>
<td>1918-19</td>
<td>500 million</td>
<td>50 million</td>
<td>10%</td>
<td>100</td>
</tr>
<tr>
<td>Asian flu (U.S.)</td>
<td>1957</td>
<td>45 million</td>
<td>70,000</td>
<td>0.16%</td>
<td>1.6</td>
</tr>
<tr>
<td>Hong Kong flu (U.S.)</td>
<td>1968-69</td>
<td>50 million</td>
<td>33,000</td>
<td>0.07%</td>
<td>0.7</td>
</tr>
<tr>
<td>Avian flu (worldwide)</td>
<td>1990-today</td>
<td>421</td>
<td>257</td>
<td>61%</td>
<td>610</td>
</tr>
<tr>
<td>SARS (worldwide)</td>
<td>2002-03</td>
<td>8,096</td>
<td>774</td>
<td>9.6%</td>
<td>96</td>
</tr>
<tr>
<td>General flu (U.S.)</td>
<td>yearly average</td>
<td>50 million</td>
<td>36,000</td>
<td>0.08%</td>
<td>0.8</td>
</tr>
<tr>
<td>Swine flu (worldwide) &quot;confirmed&quot;</td>
<td>As of 10/5 2009</td>
<td>4379</td>
<td>50</td>
<td>1.45%</td>
<td>14.5</td>
</tr>
</tbody>
</table>
The question is:

Is Swine flu PANIC or PANDEMIC?

FICTION or REALITY?
What is swine flu?

Swine influenza is a disease that pigs get. The virus currently spreading among people is now generally referred to as swine flu, although the origin of the disease is still under investigation. There is no evidence of this strain of the disease circulating in pigs.

There are regular outbreaks of swine flu in pigs worldwide. It does not normally infect humans, although this does sometimes happen, usually in people who have had close contact with pigs.

Swine flu viruses are usually of the H1N1 sub-type. The swine flu that has spread to humans is a version of this virus.
Which people are most vulnerable from swine flu?

Those who are more at risk from becoming seriously ill with swine flu are people with:

- chronic (long-term) lung disease, including people who have had drug treatment for their asthma within the past three years,
- chronic heart disease,
- chronic kidney disease,
- chronic liver disease,
- chronic neurological disease (neurological disorders include motor neurone disease, Parkinson's disease and multiple sclerosis),
- suppressed immune systems (whether caused by disease or treatment),
- diabetes,
- pregnant women,
- people aged 65 or older, and
- young children under five.
How long does the virus live on surfaces?

The flu virus can live on a hard surface for up to 24 hours, and a soft surface for around 20 minutes.
Is the new swine flu virus contagious?
The Health Protection Agency (HPA) says the new swine flu virus is highly contagious and is spreading from person to person. Swine flu spreads in the same way as ordinary colds and flu. The virus is spread through the droplets that come out of the nose or mouth when someone coughs or sneezes. If someone coughs or sneezes and does not cover it, those droplets can spread about one metre (3ft). If you are very close to them you might breathe these in. If someone coughs or sneezes into their hand, those droplets and the virus within them are easily transferred to surfaces that the person touches, such as door handles, hand rails, phones and keyboards. If you touch these surfaces and touch your face, the virus can enter your system and you can become infected.
What is the incubation period for swine flu?

According to the Health Protection Agency, the incubation period for swine flu (the time between infection and appearance of symptoms) can be up to seven days, but it is most likely to be between two and five days. But it is currently too early to be able to provide details on virus characteristics, including incubation period, with total certainty.
How dangerous is it? It is difficult to judge this at the moment. There have been deaths, but for most infected people the symptoms have not been severe. It appears that early doses of antiviral medicines such as Tamiflu are effective in helping people to recover. In the UK we have enough antivirals to treat half the population if they were to become ill. Also, orders of Tamiflu have been placed to increase UK supplies to 50 million doses, enough to treat 80% of the population.
What are the complications of swine flu?
One of the most common complications of any type of flu is a secondary bacterial chest infection, such as bronchitis (infection of the airways).
This can become serious and develop into pneumonia. A course of antibiotics will usually cure this, but the infection sometimes becomes life-threatening.
Other rare complications include:
- tonsillitis,
- otitis media (a build-up of fluid in the ear),
- septic shock (infection of the blood that causes a severe drop in blood pressure),
- meningitis (infection in the brain and spinal cord), and
- encephalitis (inflammation of the brain).
How long are symptoms expected to last?

As with any sort of flu, how bad the symptoms are and how long they last will vary depending on treatment and individual circumstances. Most cases reported in the UK to date have been relatively mild, with affected people starting to recover within a week.
How does swine flu cause death?
Like any other type of flu, people can die from swine flu if they develop complications, such as pneumonia.
What can I do?
You can reduce, but not get rid of, the risk of catching or spreading swine flu by:
Always covering your nose and mouth with a tissue when coughing or sneezing.
Disposing of dirty tissues promptly and carefully.
Maintaining good basic hygiene, for example washing your hands often with soap and warm water to reduce the spread of the virus from your hands to face, or to other people.
Cleaning hard surfaces, such as door handles, often and thoroughly using a normal cleaning product.
Why shouldn't the general public wear facemasks?
There is no evidence to suggest that this is a useful preventative measure.
The virus is spread by people touching infected surfaces, or by someone coughing or sneezing at very close range. So unless you are standing very close to someone with the virus, wearing a facemask will not make a difference.
There are concerns about the risks of not using facemasks correctly. They must be changed regularly as they don't work as well when dampened by a person’s breath. People may infect themselves if they touch the outside of their mask, or may infect others by not throwing away old masks safely.
Finally, wearing a facemask may encourage complacency. It is more important to keep your hands clean, stay at home if you feel unwell and cover your mouth when they cough or sneeze.
Can swine flu be treated?
Testing has shown that the swine flu can be treated with the antiviral medicines oseltamavir (Tamiflu) and zanamivir (Relenza). However, the drugs must be taken at or near the start of the illness to be effective.

What do antivirals do?
Antivirals are not a cure, but they help you to recover by: relieving some of the symptoms, reducing the length of time you are ill by around one day, and reducing the potential for serious complications, such as pneumonia.
How does Relenza work?
To reproduce and spread, a virus has to enter your body, take over healthy cells and force them to make copies of itself. Relenza stops the release of new copies of the virus from infected cells in the lungs. This slows the spread of the virus, reduces the symptoms and length of time that you feel unwell for and makes it harder for the virus to spread to other people.
Relenza should first be taken within 48 hours of symptoms appearing in adults (36 hours in children). It works better the earlier you start taking it.
How does Tamiflu work?
To reproduce and spread, a virus has to enter your body, take over healthy cells and force them to make copies of itself. Tamiflu stops the flu virus entering your cells and blocks the release of new copies of the virus. This slows the spread through your body, reduces the symptoms and the length of time that you feel unwell for and makes it harder for the virus to spread to other people.

Tamiflu should first be taken within 12 to 48 hours of symptoms appearing. It works better the earlier you start taking it.
How effective are Relenza and Tamiflu?
Relenza reduces the duration of flu symptoms by one-and-a-half days on average. Tamiflu reduces the duration of symptoms by up to two days.