

**H1N1 SWINE FLU
PANDEMIC**

▣ Pandemic H1N1 Swine flu

- ▶ A novel influenza A H1N1 virus emerged from Mexico in April 2009 and spread so rapidly that the World Health Organisation declared a global flu pandemic on 11 June.
- ▶ Symptoms can include: fever, fatigue, lack of appetite, coughing and sore throat and, in about one quarter of cases, vomiting and diarrhoea.
- ▶ A programme of vaccination is underway in many countries including the UK and antiviral drugs are available to treat the infection.

Artwork of a global flu pandemic



▣ Overview

Flu viruses circulate widely in the human and animal environment. Different strains cause disease in humans, birds and pigs; each type of virus is adapted to cause infection in its host. If flu viruses are passed back and forth between hosts (e.g. through close human contact with infected animals) the mixing can lead to development of a novel strain. As the human population has not encountered the virus before, it has little or no immunity to a novel strain which can easily cause infection and spread from person to person.

▣ The novel H1N1 strain

The virus is a new strain of influenza A, that has been named [Pandemic \(H1N1\) 2009](#) by the World Health Organisation (WHO). Although termed [swine flu](#) in the media, the novel pandemic H1N1 strain has not been identified in pigs in Mexico. True swine flu, a respiratory disease of pigs, only occasionally affects humans and then after close contact with infected animals. The H1N1 strain was initially named swine flu because first analysis showed genetic similarities with existing pig viruses.

☐ Who is affected?

The pandemic H1N1 strain does not spread outside the respiratory tract. The vast majority of reported cases of pandemic H1N1 flu in the UK have been mild and patients have recovered fully. Most cases have been in young people under 25, in contrast to seasonal flu that predominantly affects the elderly. A small number of people infected with pandemic H1N1 flu have developed serious complications and have died. The fatality rate is estimated to be 26 per 100,000 cases, which is similar to that of seasonal flu and is lower than in previous influenza pandemics. The most common complication that can occur following pandemic H1N1 infection is a bacterial chest infection which may develop into pneumonia. Secondary bacterial infections such as this can be treated with antibiotics. Some groups have an increased risk of contracting and suffering from such complications from pandemic H1N1. These include the elderly, people with long-term health conditions including asthma and diabetes, women in the later stages of pregnancy and those with weak immune systems.

☐ The spread of disease

H1N1 infection spread rapidly in June and July 2009 and the number of new cases each week started to double and peaked at 100,000 per week in England. In October the number of new cases per week started to increase again and a second, smaller peak of infection occurred. It was predicted that the second wave would coincide with peak seasonal flu season at the end of December/beginning of January; however the number of new H1N1 cases did not reach the figures that were expected. New cases are now no longer tested by laboratory analysis and some people who are infected with the virus do not get ill. These factors mean it is difficult to know exactly how many people have been affected, although some estimates suggest one in four of the UK population were infected with pandemic H1N1 during the first wave.



☐ Treating illness

The normal recommended treatment for flu for healthy individuals is bed rest and a high fluid intake. Remedies containing paracetamol or ibuprofen will help ease symptoms such as a high temperature and muscle pain. Aspirin is not recommended. Antibiotics are NOT effective against viruses such as influenza but can be prescribed to treat secondary bacterial infections that arise as complications.

Patients who are deemed to be at high risk from pandemic or seasonal flu strains are prescribed antiviral medication to reduce their risk of developing serious complications. Antiviral medications do not cure illness but they can reduce the length of symptoms by about a day and usually lessen their severity. Antivirals work by blocking the virus from replicating inside human cells or blocking the spread of virus from one infected cell to the next. They must be taken quickly to be effective, ideally within 12-48 hours of onset of symptoms.

During a pandemic, antivirals can be used to help limit the spread of infection. They can be administered to infected individuals to reduce the time they are infectious and, in certain situations, can be given to prevent flu in healthy people who are exposed to the virus (prophylactic treatment). The pandemic H1N1 strain has shown to be sensitive to antiviral medications oseltamivir (Tamiflu™) and zanamivir (Relenza™).

| | Oseltamivir (Tamiflu™) | Zanamivir (Relenza™) |
|--------------------------|---------------------------------------------|---------------------------------------------------|
| Safe for use in | adults, pregnant women, children and babies | adults, pregnant women and children over 5 |
| Method of administration | oral | inhaled |
| Formulation | capsule or liquid | dry powder |
| Adult dosage | one 75mg capsule twice a day for five days | two 5mg doses of powder twice a day for five days |
| Child dosage | weight-related | same as adult dosage |
| Common side effects | nausea and vomiting | none |

Influenza strains that were resistant to oseltamivir were first identified several years ago. In December 2009, over 100 cases of oseltamivir-resistant H1N1 influenza had been reported, according to the WHO. Oseltamivir-resistance is not thought to be linked to overuse of antiviral medication and most often occurs in patients who are immunosuppressed, who tend to clear the virus more slowly from their body.

Dealing with the pandemic

Most countries, including the UK, had flu preparedness plans that were put into place as soon as a pandemic looked likely. In Britain, before a pandemic alert was issued by the WHO, preparations were already underway. Enough antiviral medication was stockpiled to treat half the population if necessary. Advance agreements with vaccine manufacturers were in place to quickly develop a vaccine against a new strain of flu should a pandemic occur. The advance agreements meant that enough vaccine would be produced to immunise everybody in the UK. When the pandemic H1N1 strain first emerged public health authorities focused their efforts on containing the spread of infection. As more and more people became infected, efforts were centred on treating the disease to minimise the impact of the pandemic. The UK officially moved from a containment phase to a treatment phase on 2 July 2009.

To ease the mounting pressure on GPs, the National Pandemic Flu Service was launched in the UK at the end of July. This service provides an online or telephone diagnosis of a patient's symptoms and gives them quick access to antiviral medication if necessary. Patients were advised to nominate a 'flu friend' to collect the medication for them to further limit the spread of infection.



| Phase | Containment phase | Treatment phase |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aim | Limit spread of infection | Minimise impact of pandemic |
| Action taken | <p>Suspected cases tested to confirm H1N1 infection</p> <p>Antiviral medication given to confirmed cases</p> <p>Schools closed (where medical advice deemed it appropriate)</p> <p>Prophylactic treatment of close contacts of infected people with antiviral medication</p> | <p>Suspected cases no longer tested to confirm H1N1 infection</p> <p>Fast access to antivirals through National Pandemic Flu Service</p> <p>H1N1 vaccine production fast-tracked</p> <p>Licensed H1N1 vaccine offered to vulnerable groups in order of priority</p> |

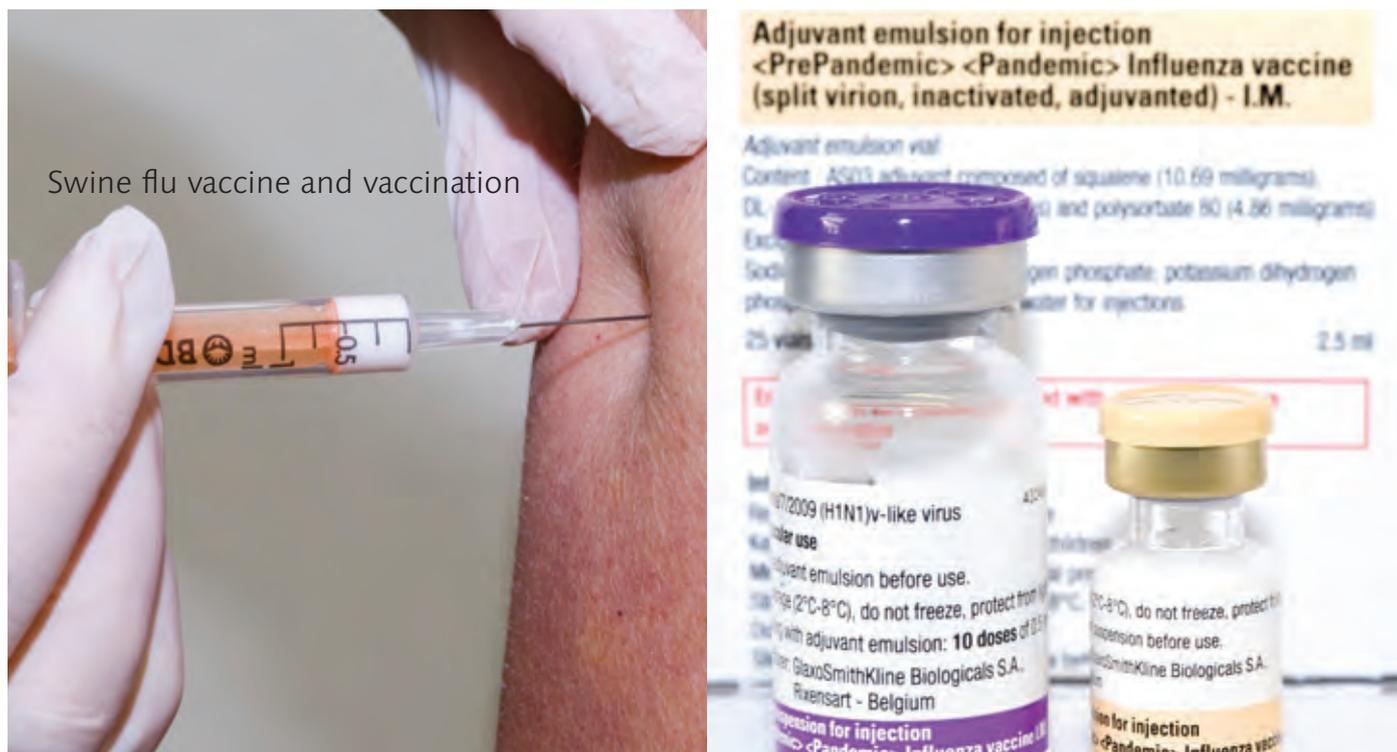
▣ Vaccines

Vaccines for pandemic flu strains are made using the same technology as for seasonal flu vaccines. The genes that code for the molecules on the surface of the pandemic flu virus are recombined with genes from a harmless laboratory virus. This creates a hybrid strain that is grown in large quantities and then inactivated. It can be given as a vaccine as it fools the body into producing antibodies against it by simulating infection without causing flu. If a person is subsequently infected with the real virus, the antibodies will destroy it before it causes illness. Although some people experience a few aches or a mild temperature after vaccination, these symptoms pass very quickly and are an indication that their immune system is responding to the vaccine.

Some vaccines are produced by injecting and growing viruses in eggs, which act as ideal incubation chambers. One of the two vaccines licensed for use in the UK, Celvapan™, is produced in cell cultures instead of eggs, so it is suitable for use in people with egg allergies. Two H1N1 vaccines were developed and put into production for the UK, to increase the

number of doses available and to reduce the chances of delays in manufacturing and/or licensing. Following successful clinical trials of the vaccines in adults and children, the first vaccine Pandemrix™ was authorised for use in September and the second vaccine Celvapan™ shortly after. Both of the vaccines are being used in the national immunisation programme. The vaccines will continue to be monitored to identify any rare side effects not picked up in routine safety trials.





☐ National immunisation programme

Work on a new vaccine against pandemic H1N1 influenza started in May 2009 soon after the strain was identified. After the H1N1 pandemic was declared, vaccine manufacturers switched from working on the annual seasonal flu vaccine to the H1N1 vaccine. By October, the two H1N1 vaccines had been licensed for use in the UK and the national immunisation programme began.

The groups of people who are most at risk from developing serious illness from pandemic H1N1 flu are being offered the vaccine first. These groups are:

- ▶ People aged between six months and 65 years with chronic health conditions
- ▶ All pregnant women.
- ▶ People in close contact with those with compromised immune systems (e.g. AIDS sufferers)
- ▶ People aged 65 and over who normally receive the seasonal flu vaccine.

In addition to these clinically-at-risk groups, front-line health workers are also being offered the vaccine to reduce the risk of them infecting more vulnerable patients. From December 2009 the vaccination programme was extended to children aged six months to five years. Either one or two doses of the vaccine are needed to confer full immunity to the virus in both adults and children, depending on which of the two brands is used.

Some people have been reluctant to receive the H1N1 vaccine, either for themselves or their children. This reluctance has been mainly based on either vaccine safety fears or a belief that pandemic H1N1 flu is not dangerous. Both H1N1 vaccines have been fully tested and met all safety standards despite the remarkable speed with which they were produced. While pandemic H1N1 flu causes only mild symptoms in the majority of cases, it can be fatal - particularly in high-risk individuals. The government is urging everyone in the priority groups being offered the H1N1 vaccine to take it.

Where is the pandemic going?

It is very difficult to predict how flu viruses will behave. Flu viruses are known to be able to mutate very quickly into a new strain. If this happens, people can be re-infected as their immune system can no longer recognise it. Sometimes when viruses mutate they become more dangerous and cause more severe illness. In November 2009, there were reports that the H1N1 strain had mutated in some countries, but there was no evidence to show that the new strain was any more dangerous than the original strain. The WHO is closely monitoring the virus to take the necessary control measures should it mutate further into a more contagious or harmful form. Alternatively, the virus will not become more dangerous and the spread of the virus will naturally slow down and infection rates will be no higher than those for seasonal flu.



Swine flu information

Advice to the public

Since the emergence of the new H1N1 virus in April, the public has been given information about pandemic H1N1 'flu through the media, public health services and government leaflet campaigns. The Health Protection Agency (HPA) advises the following steps to prevent the spread of infection as far as possible:

- ▶ sneezing into a tissue
- ▶ putting dirty tissues in the bin quickly
- ▶ washing hands frequently
- ▶ frequent cleaning of hard surfaces.

Taking it further:

Health Protection Agency
<http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/PandemicInfluenza/H1N1PandemicArchive/>
 World Health Organisation

www.who.int/csr/disease/swineflu/en/

Center for Disease Control and Prevention
www.cdc.gov/h1n1flu/
 National Pandemic Flu Service
www.pandemicflu.direct.gov.uk/

Society for general Microbiology

The Society for General Microbiology (SGM) is a professional body for scientists who work in all areas of microbiology. An important function of the Society is the promotion of the public understanding of microbiology. SGM produces and distributes a wide range of resources to support microbiology teaching in schools and colleges across all key stages and post -16. It also runs training courses in practical microbiology for teachers and technicians and occasional workshops. The Society also offers an information service to teachers and participates in schools competitions and other activities.

School Membership of the SGM offers many benefits including:

- Microbiology Today, the award-winning magazine
- Discounts on SGM INSET courses
- Priority mailings of SGM teaching resources

Contact

SGM, Marlborough House, Basingstoke Road, Spencers Wood, Reading, RG7 1AG, UK

T: 0118 988 1800

F: 0118 988 5656

E: education@sgm.ac.uk

W: www.microbiologyonline.org.uk

Pandemic H1N1 Swine Flu

Written by **Laura Udakis**

Designed by **Dariel Burdass**

Edited by **Janet Hurst**

Acknowledgements

Thanks are due to **Professor Wendy Barclay** (Imperial College London) for her helpful comments on this text. Every care has been taken to ensure that the information is correct, but the author will be pleased to learn of any errors that have remained undetected.

Picture credits

Front cover, PASIEKA / SPL*, p.2 middle, ROGER HARRIS/ SPL, p.3 lower left, MARK THOMAS/ SPL, p.4 lower right, JAMES KING-HOLMES/ SPL, p.5 lower right, TEK IMAGE/ SPL, p.6 upper left, DR P. MARAZZI/ SPL, p.6 upper right, DR P. MARAZZI/ SPL, p.7 middle, MARK THOMAS/ SPL.

*SPL, Science Photo Library

Copyright

Pandemic H1N1 Swine Flu is copyright. The Society for General Microbiology asserts its moral right to be identified under Section 77 of the Design, Patents and Copyright Act, UK (1988).

Educational use: Electronic or paper copies of the resources or individual pages from it may be made for classroom use and bona fide educational resources, provided that the copies are distributed free of charge or at the cost of reproduction and the SGM is credited and identified as copyright holder.