

## WHAT PIRBRIGHT IS DOING

### Hope for a universal vaccine

Scientists at The Pirbright Institute are working towards the development of a new universal vaccine that would protect against all strains of flu.

Developing such a vaccine is extremely challenging however, as there are so many different strains of flu virus and new strains are emerging all the time.

A candidate for a universal vaccine called S-FLU, developed by Professor Alain Townsend from the University of Oxford, has been tested at Pirbright in our specialist high-containment facilities.

It was found to decrease the amount of virus in the nose and lungs of pigs and reduce the severity of the disease.



These findings are particularly encouraging since pigs have a similar respiratory and immune system to humans, so there is a possibility it could be adapted to protect against human flu too and be used to help control or prevent a future pandemic.



## Diagnostics

At Pirbright our scientists work on strains of both avian and swine flu to find better ways of preventing and controlling the disease in livestock and helping reduce the risk of these viruses spreading to humans. Researchers study how different species' immune systems fight influenza and use this information to help improve existing vaccines and develop and test new ones.



Prototype penside tests

We explore new ways to make influenza quicker and easier to detect and our researchers, in collaboration with Imperial College London, have developed a prototype penside test that will enable vets to get an instant initial screen for a positive or negative result for the presence of flu in birds. Field testing for these prototypes will take place in countries where the disease is prevalent, before they finally become commercially available.

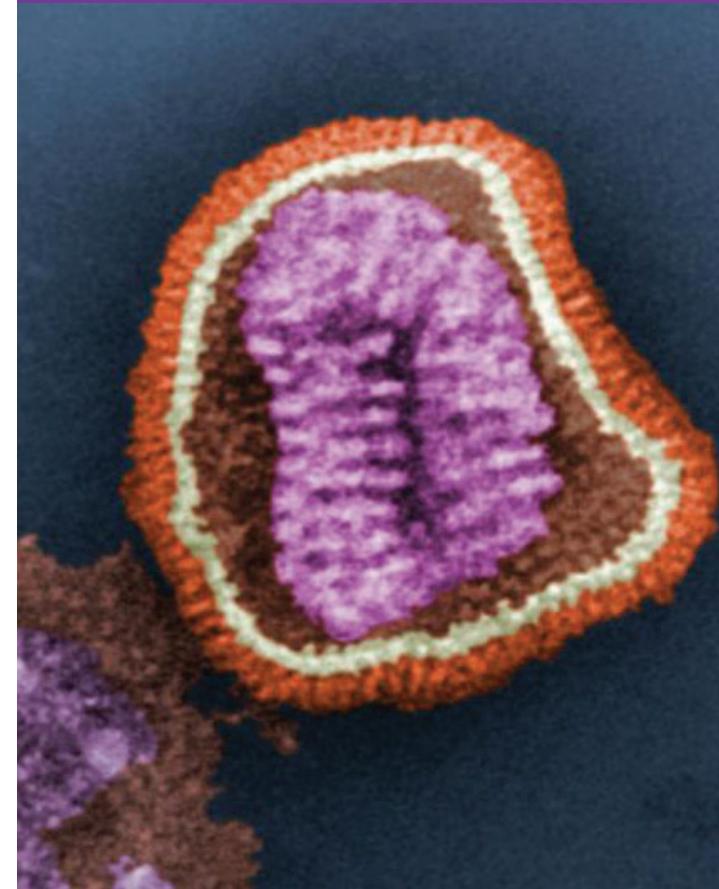
## Social and economic impact

Human flu epidemics (when there is a rapid spread of infection within a population), have a significant economic impact, due to a loss of productivity and high demand for healthcare services and drugs. There are estimated to be about three to five million cases of severe flu and up to half a million deaths a year globally.

Flu epidemics amongst pigs and poultry can cause major social and economic problems and disrupt food supplies. For example, highly infectious avian influenza (or HPAI) strains are especially damaging as they can kill 90-100% of a flock.

Pirbright's work to develop penside diagnostic tests for avian influenza means control measures can be put in place more quickly, before confirmatory testing in a laboratory. This helps to reduce the spread of disease to neighbouring farms which saves animals' lives and helps to limit the social and economic impact of the disease for farmers.

# INFLUENZA VIRUS



# INFLUENZA VIRUS - KEY FACTS

Influenza (or flu) is a contagious disease caused by influenza viruses, which exist as four types: A, B, C and D. There are many different subtypes of flu virus and these mutate regularly forming new strains.

Influenza A virus infects a variety of animals but wild aquatic birds such as ducks or seagulls are the natural hosts. Human adapted influenza type A and type B infect humans.

There are two main surface proteins in the flu virus that it uses to infect and spread between cells. Flu strains are named after the combination of these two proteins, such as H5N1.

The proteins are:  
• Haemagglutinin (18 known types).  
• Neuraminidase (11 known types).  
Flu viruses are members of the Orthomyxoviridae family of viruses.

Flu can spread by direct contact with infected individuals but can also be transferred by coughing and sneezing which carries the virus in droplets through the air.

Flu occurs all over the world but it is most prevalent during winter in temperate climates, while in tropical regions outbreaks are more sporadic.

## PREVENTION

Prevention is very difficult as migratory birds can carry the flu without any symptoms and droppings from infected wild birds (or dead wild birds), can easily fall into livestock pens. The virus can also be transmitted in surface water, so farmers must be vigilant and avoid carrying the virus into pens on shoes or machinery.



A new vaccine is created each year to protect against current circulating human virus strains. These are given to the young, elderly and higher risk groups such as those with asthma. Potential pandemic virus strains circulating in birds or pigs are also developed into prototype human vaccine 'seeds' just in case.

## CONTROL

Mutations and changes in avian and swine flu strains may enable them to infect people and were implicated in the last three human flu pandemics.

During an outbreak, antivirals can be useful but should not be used as a substitute for vaccination, as they are not always effective and resistance has become a problem with some flu strains.

To control an outbreak more quickly and reduce the risk of a flu strain emerging that poses a danger to humans, susceptible animals, especially those that people work closely with, may be culled.



Flu is easily spread by sneezing or coughing

## CLINICAL SIGNS

All strains of flu cause similar clinical signs, which can vary depending on the animal infected, the immune response and the virulence of the strain.

Particularly severe strains can cause death, though this is mainly in the vulnerable and young.

Signs (or symptoms for humans) can occur 1-4 days after infection.

### Poultry:

Respiratory signs: coughing, sneezing, runny nose, breathing problems.

Swollen combs, wattles, heads and eyes.

Fever, lethargy, loss of appetite and diarrhoea.

Reduced egg production, soft or misshapen shells on eggs.

For highly pathogenic strains: neurological signs such as lack of coordination, paralysis and death.



### Humans:

Fever.

Respiratory symptoms: coughing, sneezing, runny nose, sore throat, breathing problems.

Muscle or body aches, fatigue.

### Pigs:

Respiratory signs: coughing, sneezing, runny nose, breathing problems.

Fever and lethargy.

Loss of appetite.

