WHAT PIRBRIGHT IS DOING

Breakthrough vaccine for FMDV

Pirbright scientists, in collaboration with Diamond Light Source (the UK's national synchrotron facility) and the University of Oxford, have developed an innovative approach to producing FMDV vaccine which is a major breakthrough in the control of the disease.

Researchers created a synthetic version of the virus' outer shell (capsid) which means FMDV vaccine can now be produced without using live virus; making it much safer and cheaper. The synthetic shells are engineered to be stronger, meaning they can survive in temperatures up to 56°C and for long periods of time at room temperature; reducing the need for continuous refrigeration. This makes storage and transportation simpler and more affordable and helps ensure vaccine availability in the event of an outbreak, particularly in hot climates.

Clinical trials of the new vaccine on cattle have shown it is as effective as other vaccines currently available. Although a commercial product is still several years away, the new approach is already helping other researchers, in collaboration with Pirbright scientists, develop similar vaccine strategies for polio virus which is related to FMDV.

Diagnostics and surveillance

Pirbright is a world-leading centre of research and expertise on FMDV, providing information and advice to the UK government and other international governments and health organisations. The Institute is home to the World Reference Laboratory (WRL) for FMDV, where samples from across the world are tested for signs of the virus and to determine the virus serotype and genetic makeup. The data collected is used to monitor global patterns of disease distribution and select the appropriate vaccine to use in outbreaks. This work helps ensure the UK and other countries are able to respond rapidly in the event of an outbreak.

Social and economic impact

FMDV has a huge social and economic impact worldwide; costing up to £13 billion a year. For FMDV-free countries, outbreaks can cause extensive losses, such as the 2001 outbreak in the UK which cost the economy £8 billion. FMDV also has a major impact on food security, especially in low and middle income countries, where sources of milk and meat are limited. Here animals are also relied on for transport and cultivating land, so the impact on the livelihoods of farmers and owners can be severe.

Sharing expertise in Tanzania

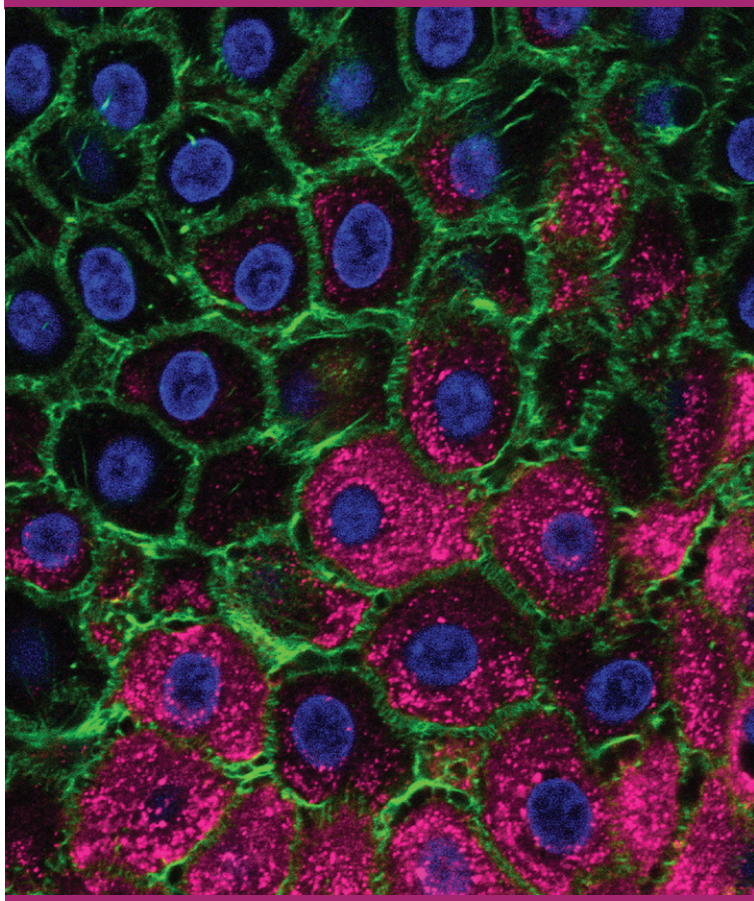
Pirbright scientists regularly visit countries where FMDV is prevalent such as Kenya and Tanzania, to share expertise. For example, they helped organise community-based workshops in Tanzania to discuss how scientists and local farmers can work together to improve surveillance and prevention of FMDV. This engagement work helps farmers reduce the number of outbreaks and improve the health of their animals, and also provides vital knowledge and experience in the field for our scientists.

THE Pirbright INSTITUTE

BBSRC bioscience for the future

www.pirbright.ac.uk/fmdv

FOOT-AND-MOUTH DISEASE VIRUS



THE Pirbright INSTITUTE

Preventing and controlling viral disease

FOOT-AND-MOUTH DISEASE VIRUS - KEY FACTS

Foot-and-mouth disease (FMD) is a highly contagious viral disease that infects cloven-hoofed (two-toed) mammals such as cattle, sheep, goats, pigs and various wildlife species. It does not infect humans.

There are seven types (serotypes) of foot-and-mouth disease virus (FMDV) that can mutate rapidly and generate new strains of the virus.

FMDV is an RNA virus belonging to the *Picornaviridae* family of viruses and is categorised as an *Aphthovirus* within that family.

FMDV is spread by direct contact with infected animals or contact with contaminated feed and objects such as vehicles, clothing, footwear or bedding.

The virus can also be airborne (the breath of infected animals), and travel large distances, including over expanses of water.

FMDV occurs in parts of Africa, the Middle East, Asia and parts of South America and outbreaks can cause huge economic losses.

PREVENTION

FMD-free countries including the UK, control the movement of livestock and livestock products across their borders to prevent the importation of infected animals or material that would infect animals. Vaccines are available for FMDV but these are serotype specific, meaning a vaccine that protects against one serotype won't necessarily provide protection against another. It is therefore vital to continually test viruses from FMDV outbreaks globally in case new strains emerge that existing vaccines may be ineffective against.

CONTROL

There is no treatment available for FMDV and in countries where the disease is persistent vaccination is the only control option, but in many countries vaccines are not available. Animals are not routinely vaccinated in the UK or in the rest of the EU. If an outbreak occurs in the UK, all susceptible animals are humanely culled at the infected premises and two zones put in place around it:

- **Protection zone:** movement of livestock, equipment and vehicles stopped; susceptible livestock checked by veterinary inspectors.
- **Surveillance zone:** subject to movement restrictions; livestock checks not required.

Depending on veterinary assessment, emergency vaccination may be used to control an outbreak. Regular surveillance is carried out until it is clear from samples that there is no longer FMDV present in the area.

CLINICAL SIGNS

The seven types (serotypes) of FMDV all cause similar clinical signs, which can occur 2-14 days after an animal is infected. It is rarely fatal but can kill young animals and cause abortion.

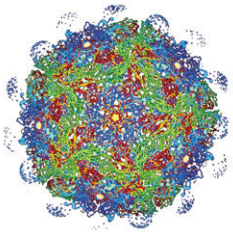
FMD is a notifiable disease and should be reported. Please see the Defra website for advice on how to spot and report the disease: www.gov.uk/guidance/foot-and-mouth-disease

Pirbright is home to the World Reference Laboratory for FMDV.

Clinical signs include:

Blisters on the nose, muzzle, teats and in the mouth causing salivation.

Fever and reduced appetite due to painful blisters in the mouth, causing weight loss and reduced milk production.



FMD virus

Blisters on the feet causing lameness.

Front cover image shows pig tongue cells infected with FMDV