New foot-and-mouth vaccine signals huge advance in global disease control

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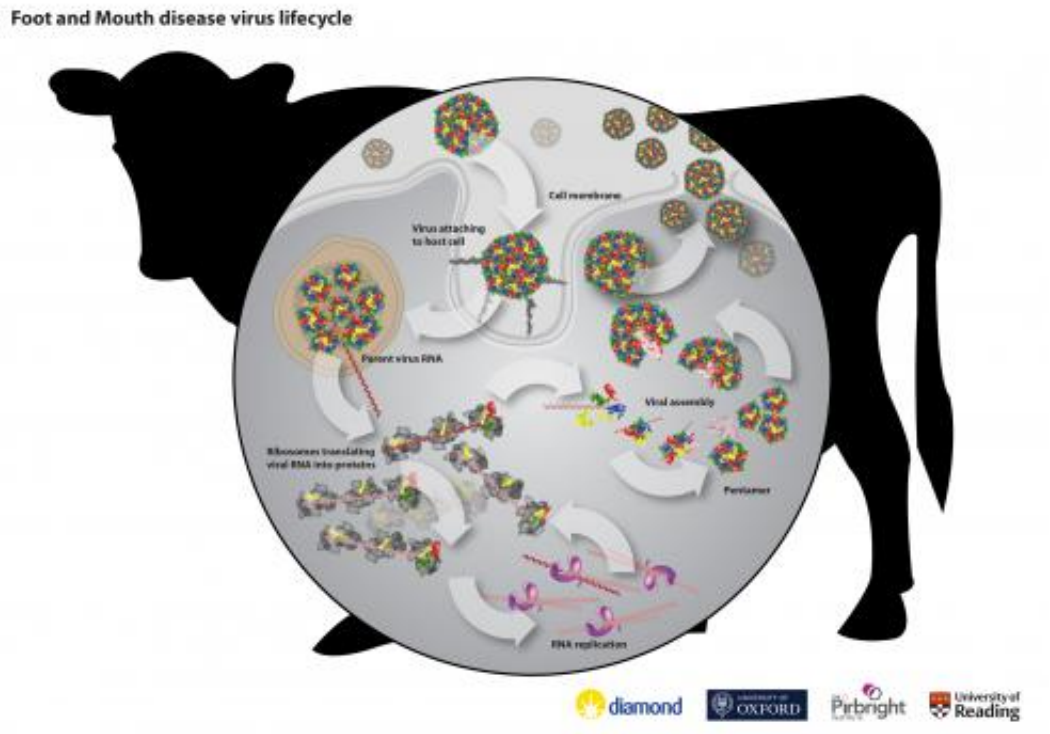

(Medical Xpress)—A new vaccine against foot-and-mouth disease that is safer to produce and easier to store has been developed by scientists from the University of Oxford and The Pirbright Institute.

They have used a new method to produce a vaccine that doesn't rely on

inactivating the live, infectious virus which causes the disease – and is therefore much safer to produce.

Instead the vaccine consists of empty virus shells that have been produced synthetically, and are designed to produce an immune response that protects against the disease.

Furthermore, the empty shells have been engineered to be more stable, making the vaccine much easier to store because the need for the vaccine to be refrigerated is reduced.

The 2001 foot and mouth outbreak in Britain was devastating and cost the economy billions of pounds in control measures and compensation. One recommendation in a Royal Society report following the epidemic recommended the development of new approaches to control the virus.

An improved vaccine against the disease would also be important in countries where the disease is endemic, which are often in the developing world.

The research was led by Professor David Stuart, professor of structural biology at the University of Oxford and life science director at Diamond Light Source, and Dr Bryan Charleston of The Pirbright Institute. The findings are published in the journal *PLOS Pathogens*.

'What we have achieved here is close to the holy grail of foot-and-mouth vaccines. Unlike the traditional vaccines, there is no chance that the empty shell vaccine could revert to an infectious form,' says Professor Stuart.

Dr Charleston adds: 'The ability to produce a vaccine outside of high containment and that does not require a cold storage chain should greatly increase production capacity and reduce costs. Globally there is an

undersupply of the vaccine due to the high cost of production and this new development could solve this problem and significantly control foot-and-mouth disease worldwide.'

Early clinical trials of the new vaccine in cattle have shown it is as effective as current vaccines. Whilst a commercial product is still several years away, the team hopes that the technology can be transferred as quickly as possible to make it available to a global market.

One of the problems of existing vaccines against foot and mouth disease is identifying which animals have been vaccinated and which haven't.

Dr Charleston says: 'The complete absence of some viral proteins from this new vaccine will also allow companion diagnostic tests to be further refined to demonstrate the absence of infection in vaccinated animals with greater confidence.'

The work on the structure of the virus shells and identification of mutations to improve their stability was carried out by Professor David Stuart and his team at Oxford University using Diamond Light Source, the UK's national synchrotron facility.

Dr Bryan Charleston at Pirbright Institute and Professor Ian Jones at Reading University and their teams incorporated the mutations into the empty virus shells and showed they stimulate protective immunity in cattle.

Together the three groups have developed a system for the production of empty protein shells in commercially viable amounts.

Richard Seabrook, Head of Business Development at the Wellcome Trust, which part-funded the work, says: 'This vaccine still has some way to go before it will be available to farmers but these early results are very

encouraging.'

Nigel Gibbens, the UK's Chief Veterinary Officer, comments: 'There are many more years of work and research to be done to get this vaccine ready for use, but this is undoubtedly an exciting leap forward. Once available, vaccines of this type would have clear advantages over current technology as a possible option to help control the disease should we ever have another foot and mouth disease outbreak.

'This vaccine has been developed using some truly groundbreaking techniques which are a credit to the quality of British scientists working in the field of animal health.'

The scientists involved believe this new approach to making and stabilising a vaccine may also work with other viruses from the same family, including viruses that infect humans such as polio.

'This work will have a broad and enduring impact on vaccine development, and the technology should be transferable to other viruses from the same family, such as poliovirus and hand foot and mouth disease, a human virus which is currently endemic in south-east Asia,' says Professor Stuart.

More information: vimeo.com/62775614

Provided by Oxford University