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Fast-track bluetongue vaccine could save millions for the European economy

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Scientists have developed a faster method of producing an effective vaccine for the devastating animal disease caused by Bluetongue virus (BTV); a virus that has infected and killed thousands of livestock throughout the world.

BTV is spread to cattle, sheep and some other wild ruminants by a type of midge. Infected animals experience a range of symptoms, which are fatal in some cases. There are also indirect impacts including weight loss and reduced milk production.

Previous prevention measures have included the culling of animals along with the use of inactivated vaccines. Inactivated vaccines contain viruses that have been killed by chemical methods. They have been a major tool in the strategy to control BTV outbreaks across Europe during the past 10 years, helping to limit and eventually stop the BTV epidemics.

However, despite being effective, they only offer protection against a specific strain of the virus. There are at least 26 distinct different strains ("serotypes") of BTV, meaning that often when a new strain of BTV emerges, a new vaccine is required. This is a lengthy process and past outbreaks were able to spread for as much as two years before a new vaccine was available.

In a study published in the *Journal of Virology*, scientists from the University of Glasgow, in collaboration with Merial Animal Health describe a new and cost effective method that allows the production of a

reliable type of inactivated vaccine using a "synthetic biology" approach. This method doesn't rely on the use of live, infectious virus and could mean that it is safer than other types of vaccines.

"Synthetic" viral particles are created rapidly in the laboratory using sequence information from the genetic material of the virus. Bluetongue virus contains 10 distinct genome segments in each viral particle. Only one of the 10 genomic segments encodes for the protein used by the virus to infect cells.

This is the part of the viral genome that is most variable between the 26 different serotypes and is neutralised by the immune system of vaccinated animals. Synthetic viruses are made readily in the laboratory using the most appropriate mixture of genomic segments needed for the newly emerging virus strain.

Synthetic vaccines offer many benefits compared to the vaccines traditionally used to control BTV, but perhaps the most important is the speed with which they can be designed and produced – around 6 months faster. This breakthrough means that a reliable product could become available more quickly following the detection of an outbreak caused by a newly emerging BTV strain.

Professor Massimo Palmarini, Director of the MRC University of Glasgow Centre for Virus Research and lead researcher on this study said: "Our findings demonstrate a clear advantage for the use of synthetic vaccine technology when compared with more traditional options. Overall, this vaccine platform can significantly reduce the time taken from the identification of newly emerging BTV strains to the development and production of new effective vaccines.

"They can be brought to the market more quickly but with the same level of quality and reliability as traditional vaccines. This is a big step

towards a more sustainable, effective and rapid method of disease prevention."

It is estimated that the outbreak of BTV-8 in 2008 in Holland resulted in the loss of €80 million in direct and indirect costs for the Dutch economy alone. This gave rise to expensive surveillance, monitoring and prevention measures, including temporary export restrictions on livestock throughout the European Union.

In the event of a new disease outbreak, the time saved using a synthetic vaccine would significantly reduce the spread of this virus and its impact on the economy.

More information: jvi.asm.org/content/88/21/12222.full

Provided by University of Glasgow