Midge-hunting scientists tackle spread of devastating bluetongue virus

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Scientists at the BBSRC-funded Institute for Animal Health (IAH) are stepping up the battle against the devastating and economically damaging bluetongue virus. By combining ingenious ways to trap and monitor midges with cutting edge computer modelling and weather predictions the IAH team are gaining an understanding of how the insects spread the disease so that they can improve surveillance methods and advise farmers how and when to protect their animals.

The scientists are collecting data on midge numbers and biting behaviour from midge-hunting expeditions in southern England. They incorporate this with meteorological data from Met Office colleagues to develop complex mathematical models that can be used to establish under what weather conditions the midges are mostly likely to be flying around and when they are most likely to be giving disease-spreading bites to farm animals. This will allow the team, led by Dr Simon Carpenter, to advise farmers when it is safest to move susceptible animals and also examine how stabling of animals can be used where logistically possible to reduce the chance of infectious midge bites. They will also use this data to establish best practice for use of insecticides and timing of vaccination of animals against this economically important and difficult to control disease.

Lead researcher Dr Simon Carpenter said: "These experiments are vital – it's about knowing your enemy. Last year, in northern Europe, bluetongue cost over £95 million in direct losses alone. And while indirect losses in the UK last year were considerable, we have yet to

experience the full effects of a BTV outbreak as has been seen on the continent. A major 2008 outbreak could bring huge hardship both to directly affected farmers and, if vaccination coverage is poor, to those living in neighbouring movement restriction zones. Hence it is vital that, firstly, as many farmers vaccinate their stock as possible and secondly, we collect basic data to understand how these outbreaks occur and what can be done to slow their progress. We have to think to ourselves: "when are the midges going to be active and what can we do to put a barrier between our livestock and these midges?" We will use our models to advise on best practice for measures such as stabling, insecticide use and vaccination, to control the spread of bluetongue virus."

The team has developed two methods to monitor the flying and biting behaviour of the Culicoides midge that spreads the disease, under particular weather conditions. The first uses a large net of known volume mounted on top of a 4x4 truck, which is driven through grazing land. By driving at a constant speed of 20mph over a known distance the scientists can precisely calculate the volume of air passing through the net and therefore calculate the number of Culicoides midges per cubic metre of air. All of the insects caught in the net are taken back to the lab to sort out the Culicoides midges from other insects, including different midge species.

The second method focuses on the biting rate of the midges and uses a large muslin tent, the walls of which are lowered around a penned grazing sheep after an exposure period of ten minutes. The scientists then enter the tented area and collect any midges that have landed on the walls and ceiling of the tent as well as examining the sheep for any further biting individuals. These midges can then be analysed in the lab to establish which species is carrying out the biting.

Dr Carpenter continued: "The benefit of these techniques is that, until very recently, midge surveillance relied upon the use of light traps that

sometimes do not represent what is happing on animals particularly well. Using these two techniques we can more easily understand the relationship between weather conditions and both background midge activity and biting attacks, and also predict the level of risk at different times of the year. These models can then be used along with weather forecasting to advise farmers as to when Culicoides populations are most active and to develop best practice for controlling the spread of the midges and the virus itself.

"All of this work contributes to the aims for better knowledge about Culicoides that were set out in the European Food Safety Authority's 'Scientific Opinion on Bluetongue' published a couple of weeks ago."

Kevin Pearce, National Farmers Union, said: "Bluetongue is a terrible disease of ruminant livestock. Our farmers have worked hard to contain this virus in the infected areas of the south east and East Anglia through vaccination and vigilance but we know that we couldn't have achieved this without the effort and knowledge of the scientists at IAH. Bluetongue shares its transmission vector - the midge - with other exotic, but equally serious, diseases such as African Horse Sickness so any knowledge and understanding of the midges' behaviour and breeding patterns are welcome. We wish the experts at IAH success in their endeavours with this project."

Source: Biotechnology and Biological Sciences Research Council

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