

An Integrated Modelling Approach to Assess the Risk of Wind-Borne Spread of Foot-and-Mouth Disease

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Foot-and-mouth disease (FMD) is a highly contagious disease of livestock that has serious consequences for livestock production and trade. Australia invests considerable resources in preparedness and planning for an outbreak of FMD. Part of this includes the development of decision-support tools that would assist priority-setting and resource management in the event of an outbreak. In this paper we describe an integrated modelling approach that uses geographic information system (GIS) technology to identify and prioritise farms at risk of wind-borne infection of FMD and thus enhance outbreak management.

Three operational issues need to be considered to assess the risk of wind-borne spread from a recently identified infected farm: (a) the amount of airborne virus produced on that farm over the period from when it was infected to when it was reported; (b) the area(s) that have been exposed to airborne virus (direction, distance and virus concentrations all need to be assessed); and (c) the probabilities that farms exposed to airborne virus may also have become infected. The approach involves linking three models – an intra-farm virus production model, a wind transport and dispersal model and an exposure-risk model – and, from these, identifying and ranking farms at risk of wind-borne infection of FMD.

The integrated modelling approach provides a range of outputs, including high-quality visual representations of virus plumes and thematic maps of farms at risk. These outputs will assist authorities by enabling potentially limited resources for activities like surveillance and vaccination to be allocated on the basis of risk.