

# *Control of foot-and-mouth disease*

Article

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Dear Sir

We refer to the recent paper in Science by Charleston and others (2011) on the relationship between clinical signs and transmission for an infection with foot and mouth disease virus (FMDV) and to the News report of this paper in the Veterinary Record (May 14, 2011, vol 168, p498). The results presented are interesting, and provide welcome support for conclusions derived from careful analysis of the field data from the 2001 epidemic of FMD in the UK (mentioned below), but we feel that they are not the breakthrough seemingly implied in the paper and the media reaction to it. We feel that the results must be interpreted with caution and the conclusions to be drawn are more limited than suggested.

First, the paper reports results using a single strain of FMDV (the strain responsible for the UK outbreak of 2001) to infect only one species of animal (cattle). However, and very importantly, it is well known that FMDV varies significantly between its many strains and between infected species in the dynamics of shedding of the virus by infected animals as well as other characteristics such as virulence and the appearance of clinical signs (for example Kitching, 2005). Results using one strain cannot be extrapolated to all strains of the FMDV. Furthermore, other viruses such as Influenza A or classical swine fever have very different profiles to FMDV. We feel that generalising even to FMDV is dangerous, and to other viruses, inadvisable.

Secondly, the paper reports transmission between pairs of animals kept in close proximity within a highly controlled environment. Transmission directly from one animal to another is important, but in terms of disease spread and control in livestock populations, it is not the critical step. The epidemiological unit in that situation is the farm or herd/flock and it is transmission between these units that results in an epidemic such as occurred in the UK in 2001. The study reported by Charleston and others (2011) does not address the important but poorly understood transmission between units, although it is this that will drive most decisions on control measures.

Farm-to-farm spread has been analysed in several papers published after the FMD epidemic in the UK in 2001 that were based on field data. Among these are papers looking at the temporospatial spread of the disease (Taylor and others 2004. Thrusfield and others 2005b), the impact of control measures (Honhold and others 2004a. Thrusfield and others 2005a) and the ability of risk assessment to select which farms can be safely excluded from pre-emptive measures (Honhold and others 2004b). These papers clearly demonstrated that rapid disease detection and culling of susceptible stock on infected premises are vital for bringing an epidemic under control, reconfirming a requirement known for at least 50 years. Drastic automatic pre-emptive culling, as occurred in 2001, was shown to be unnecessary and ineffective. These previous papers also clearly indicated that most spread between farms was not directly across a common boundary but indirectly through the gate and that this was also the case for contiguous farms (Honhold and others 2004b. Thrusfield and others 2005a).

The authors suggest that tests should be developed that can detect infection before the onset of clinical signs (arguably at least one test, real time RT-PCR has been available for over a decade). Although detecting infected animals before they can spread infection is a laudable aim and one that we fully endorse, there will be significant issues to address

regarding practical realities and problems faced in the field before such tests could become a central part of FMD control.

Group-level samples from bulk milk or the air in animal houses might be taken on a frequent basis and then processed rapidly enough to be of use (although such samples would need to come from all susceptible animals on the unit to be fully effective and even then would not identify individual infected animals as the authors seem to suggest as a goal). It may be possible to sample all animals in a small herd of cattle or sheep. But what do you do on an outdoor pig unit with 5,000 animals, a 10,000 head beef feed lot or a 2,000 head flock of sheep with animals dispersed in several groups? Sampling large numbers of animals requires a very high level of resources in terms of personnel and time. Which animals do you sample? How often can the sampling be repeated? What happens if animals are infected the day after they have been sampled? The tests may be reliable in the laboratory, but their utility in practice would be debatable at best.

Given all of the above, it would be inadvisable to base decisions on control policy for FMD or any other viral infection in livestock on the results in this paper. However, we welcome acknowledgement that control depends on finding and removing infected farms quickly and not on widespread pre-emptive culling.

Yours sincerely

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