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Impact of clinical surveillance during a foot-and-mouth disease epidemic

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Foot-and-mouth disease, clinical surveillance, modelling

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The objectives of this study were to assess, whether the current surveillance capacity is sufficient to fulfill EU and Danish regulations to control a hypothetical foot-and-mouth disease (FMD) epidemic in Denmark, and whether enlarging the protection and/or surveillance zones could reduce epidemic duration, number of infected herds and the economic losses from an epidemic.

The stochastic spatial simulation model DTU-DADS was enhanced to include simulation of surveillance of herds within the protection and surveillance zones and the model was used to model spread of FMD between herds. A queuing system was included in the model, and based on a daily surveillance capacity of 450 herds per day, it was decided whether herds appointed for surveillance would be surveyed on the current day or added to the queue. The model was run with a basic scenario representing the EU and Danish regulations, which includes a 3 km protection and 10 km surveillance zone around detected herds. In alternative scenarios, the protection zone was enlarged to 5 km, the surveillance zone was enlarged to 15 or 20 km, or a combined enlargement of the protection and surveillance zones was modelled. Sensitivity analysis included changing 1) surveillance capacity to 200, 350 or 600 herds per day, 2) frequency of repeated visits for herds in overlapping surveillance zones from every 14 days to every 7, 21 and 30 days, and 3) the size of the zones combined with a surveillance capacity increased to 600 herds per day.

The results showed that the default surveillance capacity is sufficient to survey herds within one week of the zones establishment, as the regulations demand. Extra resources for surveillance did not reduce the costs of the epidemics, but fewer resources could result in larger epidemics and costs. Furthermore, enlarging the surveillance zone may result in shorter epidemic duration, and lower number of affected herds, while enlargements of the protection zone resulted in lower economic losses when epidemics were large. Given the assumptions, enlarging the surveillance zone did not reduce the economic losses.