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MODELLING OF FMD OUTBREAKS IN THE NETHERLANDS: VACCINATION AND REGAINING THE STATUS 'FREEDOM OF INFECTION'

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To limit the impact of Foot and Mouth Disease (FMD) epidemics on animal welfare and economics, control measures and end screening should be applied as effectively as possible. Here we study this for The Netherlands using an individual-based stochastic model. It describes virus transmission between animals and between farms, and takes differences between animal species into account (cattle, sheep, pigs). The effect of vaccination is included at the individual level, making a comparison between control strategies possible at the livestock area level. The results for individual animals indicate how many infected animals escape clinical detection during the epidemic (i.e. undetected minor outbreaks), enabling a comparison between end screening scenarios.

Our model results show that the minimal control measures required by the EU suffice in sparsely populated livestock areas (ca 2 farms per km²), but ring culling or vaccination is required in addition to curb epidemics in densely populated areas (>3 farms per km²). According to the model, 2 km ring vaccination is less effective than 1 km ring culling in terms of size and duration of the epidemic, but the difference is small when comparing with the minimal control strategy. 5km vaccination and 1 km culling are equally effective, although the vaccination strategy yields higher and later epidemic peaks. Excluding pig farms from vaccination does not drastically reduce the effectivity of vaccination strategies (for the studied virus strain O/NET/2001), because of the relatively low pig farm numbers (compared to cattle) and their low susceptibility for FMD.

The infected farms that escape clinical detection during the epidemic are mainly vaccinated cattle and sheep farms and unvaccinated sheep farms. Therefore, compared to the screening required by the EU, the relative risks are not markedly reduced in screening strategies in which more effort is placed on unvaccinated cattle and pig farms and, likewise, not markedly enhanced when less effort is placed on vaccinated pig farms.