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The effect of transmission probability on the magnitude and duration of simulated epidemics

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Abstract
To predict the number of infected farms, the time preceding first detection of infection, and the length of CSF epidemics, a Monte Carlo model was constructed. The course of spreading and detection of infection, as the implementation of the official eradication measures were simulated. Effects of a simulation model input conducting probability of CSF virus transmission between farms was studied. Increased transmission probability extended exponentially the magnitude and duration of an epidemic and shortened slightly the time preceding first detection of infection.

Materials and methods

➢ Data on actual pig farms in Finland determined farm structure and contact frequencies between farms
➢ Contacts and transmission probability (Stegeman et al. 2002) defined transmission of virus between farms
➢ Iteration started from infection of one farm and end when all infected farms were initially cleaned
➢ For sensitivity analysis of simulation model, transmission probability was scaled by factors 1 to 4 (0.5 interval)
➢ 10, 000 iterations for each scaling factor were performed
➢ Spread between farms before and after first detection of CSF infection were simulated

Results
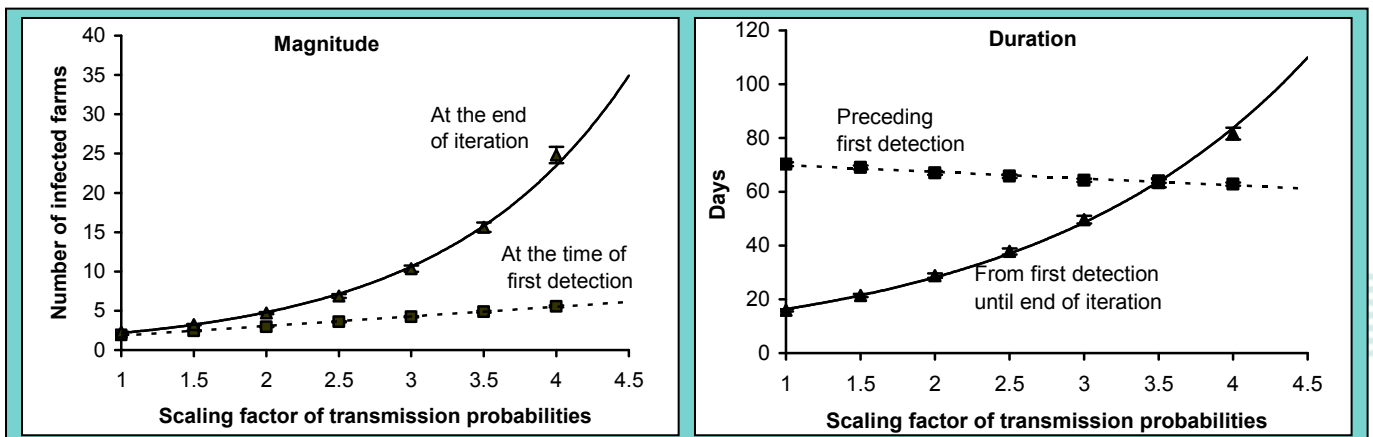
➢ The magnitude and length of an epidemic extended exponentially with increasing transmission probability
➢ Time preceding first detection shortened when transmission probability increased and the reduction
in time counteracted against the number of infected farms by that time

Conclusions

➢ Although the time preceding first detection of infection seems to shorten, the duration of an
epidemic can be expected to prolong with higher transmission probability of infection between farms

Stegeman J.A., Elbers, A.R:W., Bouma, A. & de Jong M.C.M 2002: Rate of inter-herd transmission of classical swine fever virus by different types of contact during the 1997-8 epidemic in The Netherlands. *Epidemiology & Infection* 128: 285-291.