Emergency vaccination for Classical swine fever will not be cost-effective for countries with large amounts of export

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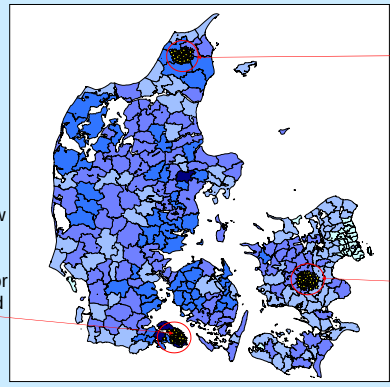
Introduction

In 2008, total Danish pork exports were evaluated at €3.6 billion, corresponding to approximately 5% of the total Danish exports, and an outbreak of a notifiable disease would have dramatic consequences for the agricultural sector in Denmark. The objective of this study was to simulate the epidemiological and economic consequences of such control strategies under Danish conditions with respect to herd demographics and geography and to investigate the effect of extra biosecurity on farms

Materials and Methods

We used InterSpread Plus to model the effect of nine different control strategies (Table 1). Each epidemic was simulated to start in 4 different index herds (Fig. 1). For each control strategy and index case, we calculated the size and duration of the epidemic, the number of depopulated and/or vaccinated herds and animals, the control costs borne by the public and the pig industry, respectively, as well as the lost exports associated with the epidemic

Fig. 1 Simulated epidemics were started in four different index herds

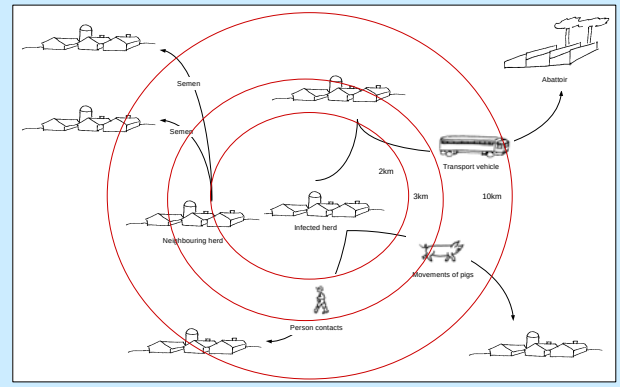


Southern Jutland: An area with low pig density. Index: Production or nucleus herd

Northern Jutland: An area with medium pig density. Index: Production herd

Zealand: An area with low swine density. Index: Production herd

Fig. 2 An illustration of different transmission routes simulated in the model



Results

The simulation showed that the EUplus strategy (=depopulation of infected herds, surveillance and movement restriction in the 3 km and 10 km zones and surveillance in herds that have been in contact with infected herds plus depopulation of contact herds and neighbouring herds within 500 m) is the most effective of the evaluated strategies with respect to limiting the size, duration and cost of the epidemic, regardless of the index case. However, regarding the number of slaughtered animals, the vaccination-to-live strategy appeared to be more effective. Epidemics become larger and longer if the index case is a nucleus herd. This implies that biosecurity in nucleus herds is extremely important to avoid transmission of CSF to these herds

Table 1 Comparison of epidemics starting in 4 different index herds

Index case (EUplus strategy)	Area	No. of inf. herds - 75 percentile (max.)	Duration (days) - 75 percentile (max.)
Production herd	Zealand	8 (70)	8 (236)
Production herd	Northern Jutland	8 (41)	8 (137)
Production herd	Southern Jutland	9 (29)	9 (230)
Nucleus herd	Southern Jutland	15 (248)	15 (248)

Table 2 Comparison of epidemics with use of different control strategies

Control strategy (Index case prod. herd, Zealand)	No. of inf. herds - 75 percentile (max.)	Duration (days) - 75 percentile (max.)
EUplus	8 (70)	8 (236)
Extra surveillance	8 (27)	9 (215)
Extra biosecurity, SPF	7 (42)	8 (191)
Extra biosecurity, all	6 (33)	7 (187)
Depopulation	8 (65)	8 (252)
Vaccination-to-kill, 1 km	10 (41)	12 (281)
Vaccination-to-kill, 2 km	10 (36)	12 (285)
Vaccination-to-live, 1 km	10 (36)	12 (286)
Vaccination-to-live, 2 km	10 (36)	12 (286)

Conclusion and discussion

Simulations showed that most Danish CSF epidemics are expected to include fewer that 10 cases and last less than 2 weeks on average. However, for some iterations, long-lasting and large epidemics were observed. This is consistent with the actual sizes of epidemics observed throughout EU in the last decades. These promising results for a short epidemic of CSFV in Denmark are based on an expected fast diagnosis of the disease and that the eradication procedure is facilitated by lack of virus reservoirs as there are no wild or feral pigs. Irrespective of the size and duration, an epidemic is expected to be very costly and the major cost component is due to export losses