Simulating the epidemiological and economic effects of an African swine fever epidemic in industrialized swine populations

African swine fever (ASF) is a notifiable infectious disease with a considerable impact on animal health and is currently one of the most important emerging diseases of domestic pigs. ASF was introduced into Georgia in 2007 and subsequently spread to the Russian Federation and several Eastern European countries. Consequently, there is a non-negligible risk of ASF spread towards Western Europe. Therefore it is important to develop tools to improve our understanding of the spread and control of ASF for contingency planning. A stochastic and dynamic spatial spread model (DTU-DADS) was adjusted to simulate the spread of ASF virus between domestic swine herds exemplified by the Danish swine population. ASF was simulated to spread via animal movement, low- or medium-risk contacts and local spread. Each epidemic was initiated in a randomly selected herd – either in a nucleus herd, a sow herd, a randomly selected herd or in multiple herds simultaneously. A sensitivity analysis was conducted on input parameters. Given the inputs and assumptions of the model, epidemics of ASF in Denmark are predicted to be small, affecting about 14 herds in the worst-case scenario. The duration of an epidemic is predicted to vary from 1 to 76 days. Substantial economic damages are predicted, with median direct costs and export losses of €12 and €349 million, respectively, when epidemics were initiated in multiple herds. Each infectious herd resulted in 0 to 2 new infected herds varying from 0 to 5 new infected herds, depending on the index herd type.
Biosecurity in 116 Danish fattening swine herds: descriptive results and factor analysis

Biosecurity measures are important for the herd's protection against diseases and also to provide nationwide protection against the introduction of exotic diseases. In this paper, we describe the farmers’ choices and routines regarding biosecurity in Danish fattening herds. Overall, 116 Danish swine fattening herds in three areas of different pig density were interviewed. Of these herds, 78% purchased weaners from one sow herd only, whereas 10% purchased from >5 sow herds during 1 year. Large herds (>500 finishers) purchased weaners more often than smaller herds (≤500 finishers). Only
two swine producers purchased weaners from a market. Almost all herds (95%) received weaners from one sow herd at one time, and only one herd received from >5 sow herds in one batch. Twenty-one percent did not use an effective barrier between the loading area and the stables when delivering pigs for slaughter. Entry rooms (in which clothing and boots are changed) were common at the farm, and the numbers of visitors were generally low (3.10). A site scoring high on factor 1 was a large SPF herd, which received weaners from a single source, had biosecurity requirements for the transport vehicles, and had a high level of biosecurity for visitors. A site scoring high on factor 2 was a multi-site farm, which had personnel working on more than one of the sites, only received weaners from one sow herd, had delivering herds placed close to the participating site, and transported animals themselves. A site scoring high on factor 3 was a site which hired commercial transport for slaughter, was situated far from the abattoir and had a high level of biosecurity when loading pigs. A production site scoring high on factor 4 was a large site, which used all-in/all-out management, washed and disinfected between each group, and purchased many weaners.
Biosecurity in 121 Danish sow herds

Herds are under constant risk of introducing new pathogens from different sources. In this article we describe biosecurity practices in Danish sow herds. Between December 1, 1999 and February 29, 2000, 121 sow units were interviewed regarding biosecurity on the site. The questionnaire contained 62 questions. The 121 units were situated in three areas with different swine densities. Sow units were described by their sizes (units with >110 sows were regarded as large herds) and health status (SPF herds or conventional herds). Of the 121 sow herds, 63 (52%) sold weaners. Most sow units (71%) used delivery facilities for the picking up of weaners, but half of these did not have a barrier between the loading area and the stable while loading. In 19% of the units, weaners were picked up directly from the stable, and in 10% the truck driver had access to the stables. Most units required the vehicle to be cleaned (16%) or cleaned and disinfected (48%) before the transport; large sites and SPF sites more often required stricter biosecurity measures, for example a quarantine period before the transport of weaners.

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