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Simulating the influence of Danish cattle markets on the spread of Foot-and-Mouth disease

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Objective: To examine the influence of cattle markets on the spread and costs of FMD in Denmark by stochastic simulation modelling.

Stochastic disease-event model InterSpread Plus version 2.001.11

Important inputs:
Movements TO and FROM individual herds based on movement data, incl. movements to and from markets.

Data sources:

Danish Central Husbandry Register (type, number of animals and location) – for cattle, pigs and sheep/goats

The Danish Cattle Database (movements of cattle)

The Danish Database for pig movements

Markets – how do they influence an epidemic?

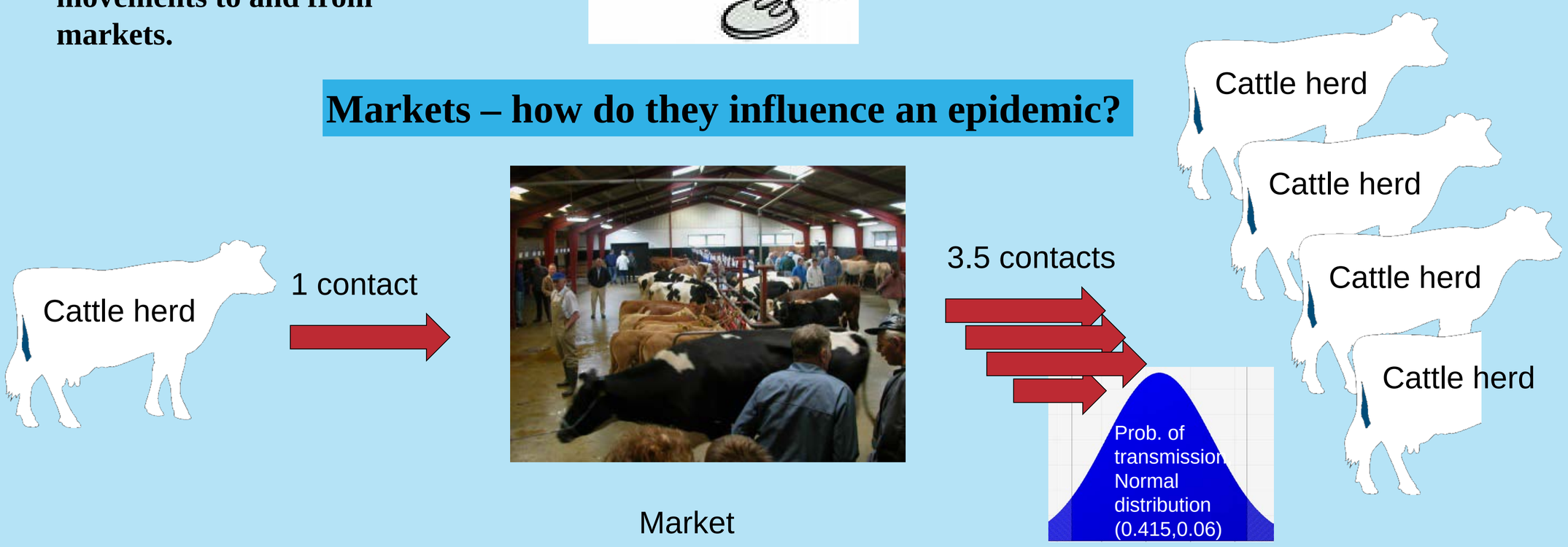
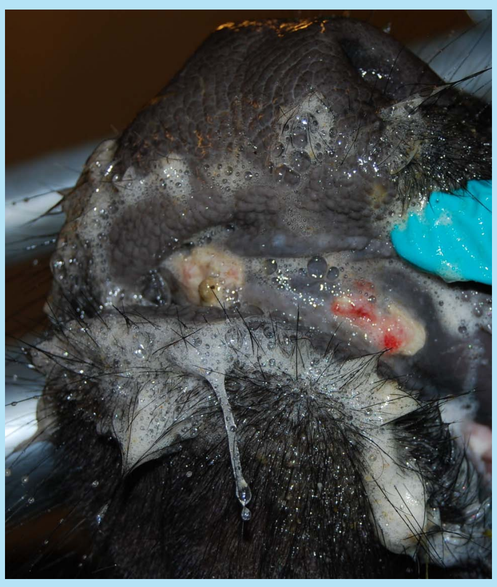


Table 1: Results of 38,600 simulation runs, starting in one of 386 cattle index herds and running 100 times for each index. For each index herd simulations were run with and without market spread. Markets were only open for trade the first 21 days of the epidemics (high risk period), until the first infected herd was detected by definition.

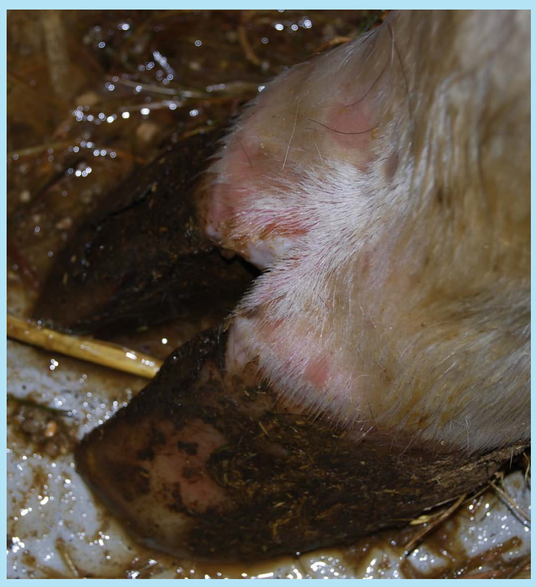
Control scenario	Epidemic duration[1]	Number of infected herds	Number of depopulated herds	Size of infected area (1000 km²)	Direct costs (million €)	Indirect costs (million €)
Markets	90 (9-262)	187 (5-732)	194 (5-754)	14.3 (6.8-126.7)	37.5 (6.8-937.3)	629.6 (375.7-1166.7)
No markets	87 (8-262)	167 (4-711)	173 (4-731)	12.6 (3-36.4)	33.9 (6.5-124.6)	613.8 (370.5-1161.8)

[1] Duration was calculated as days from detection of first herd to detection of last herd.



Conclusions:

- **Markets have small but significant influence on the size and duration as well as the size of the affected area of an FMD epidemic in Denmark.**
- **Despite the small influence on epidemiologic outcomes, the economic influence will be considerable.**
- **The caracteristics of the index herd had significant influence on the size and duration of epidemics.**



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