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Persistent spatial clustering of Aleutian disease in Danish mink farms

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Background

Aleutian disease (Plasmacytosis) is caused by the Aleutian mink disease virus (AMDV), an autonomous parvovirus. It affects many mustelid species, including the American mink (*Neovison vison*), a fur animal with a great economic importance in several countries. The disease causes reduced litter sizes, embryonic death, stillbirths and abortions. In 1984, it had an estimated cost to the fur industry of 10 million dollars in Denmark alone. A national eradication program was initiated in 1976 and the number of farms tested positive for the disease was reduced from 100% in 1976 to 15% in 1996 [1]. Nevertheless, the disease persists in the Vendsyssel district of Northern Jutland, Denmark, despite the eradication efforts. In this district, there are special measures in place to control the spread of the disease [2].

Methods

In this study, we used spatial epidemiological analysis to test for spatial autocorrelation of the distribution of farms positive for the disease. We investigated 4046 farms in Denmark (351 of which in the Vendsyssel district), during the period 2000-2008. For the purpose of our study, a farm was considered positive when, on any test conducted in a year, at least three animals were tested positive. To detect spatial clusters, we performed a retrospective analysis with SatScan v.8.0 [3] setting the maximum spatial cluster size to 10% of the study area, the spatial window with an elliptic shape and using the Bernoulli distribution as the probability model. We performed one analysis for each of the nine years (2000-2008). A separate analysis was conducted with only the farms in Vendsyssel included.

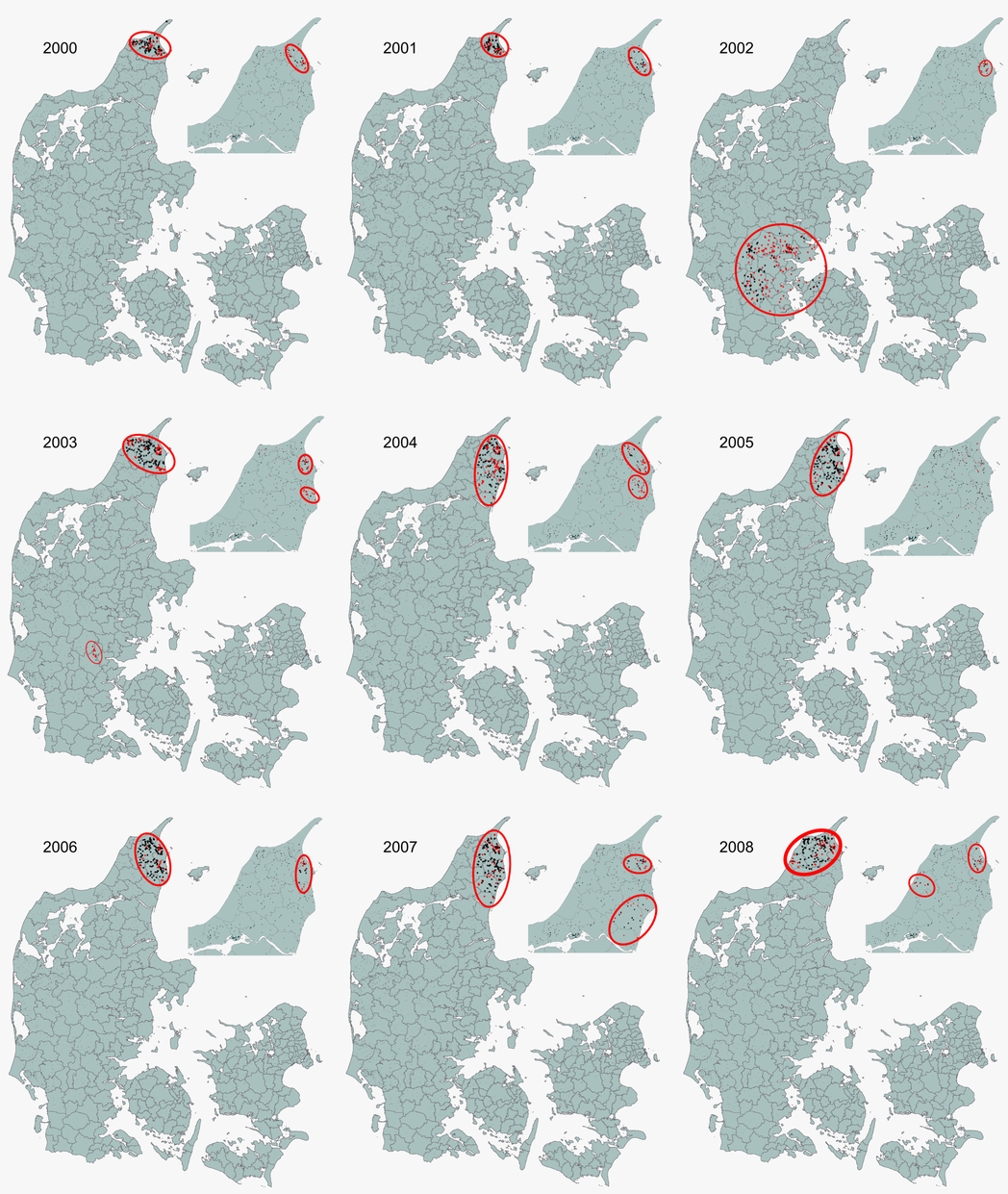

Figure 1– Distribution of the spatial clusters of Aleutian disease in Danish mink farms from 2000 to 2008. Detection of clusters was conducted using Kuldorff's scan statistic in SatScan. Red dots represent infect farms and black dots uninfected. Larger dots and red circles indicate that the farm is within the spatial cluster. Analyses were performed for Denmark and for the Vendsyssel district farms (insets) separately.

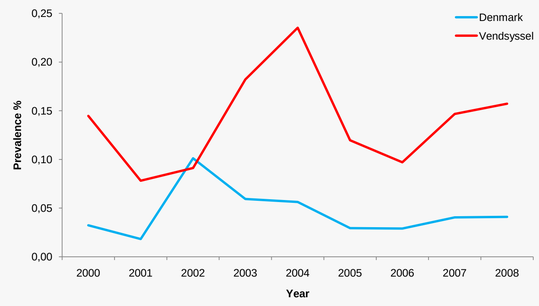

Figure 2 – Prevalence of Aleutian disease in Danish mink farms (blue) and in the Vendsyssel district (red).

Results and Discussion

The spatial cluster analysis revealed a significant cluster throughout the time period studied in northern Jutland (Fig. 1). The only exception was in the 2002 analysis where an outbreak was detected in the southern part of Jutland, and not in the north. The prevalence of the disease in Denmark was highest this year (Fig. 2), which indicates that the outbreak in the south could have masked the persistent signal from the north, which is still significant when analysing only the Vendsyssel populations (see map insets in Fig. 1). The only year in which a significant cluster was not detected in Vendsyssel was 2005, although it was detected when analysing Denmark. These results confirm that northern Jutland continues to have a significant higher number of cases than expected if the disease was randomly distributed. We are currently analyzing several risk factors related to the current distribution of the disease, which hopefully will help us understand why this cluster still persists.

References

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Acknowledgements

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