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Optimal vaccination scenarios against vector-borne diseases - DTU Orbit (07/08/2016)

Optimal vaccination scenarios against vector-borne diseases

Using a process oriented semi-agent based model we simulated the spread of Bluetongue virus in Denmark. We evaluated the efficiency and minimum vaccination cover for eight different preventive vaccination strategies in Denmark.

The simulation model replicates both passive and active flight of Culicoides between hosts on pasture and stables in Denmark. Seasonal abundance of midges and temperature dependence on biological processes were included in the model. The eight vaccination scenarios comprised of: All holdings vaccinated to a given percentage, random holdings selected for vaccination, two scenarios based on the size of holdings, mosaic vaccination of nearest neighbor farms, vaccination of hosts on pasture, regional vaccination, and trench vaccination from the border to Germany. These eight scenarios were investigated under normal grazing conditions and under a forced housing scenario.

The most robust vaccination scenarios were all holdings vaccinated and the mandatory vaccination of hosts on pasture. Regional vaccination and trench vaccination display better results under some conditions, but are very sensitive to the incursion route.

With this study we intended to test scenarios that would increase distance between infectious and susceptible hosts. This can be done very efficiently on a regional scale if the incursion route is well specified. However as the long-range spread of midge borne disease is still poorly quantified, more robust national vaccination schemes seems preferable.

Results in this presentation were obtained building upon the model presented in: Simulating spread of Bluetongue Virus by flying vectors between hosts on pasture. Kaare Græsbøll et al. Scientific Reports. 2:863 (2012).

General information

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