Optimal vaccination strategies against vector-borne diseases - DTU Orbit (23/12/2018)

Using a process oriented semi-agent based model, we simulated the spread of Bluetongue virus by Culicoides, biting midges, between cattle in Denmark. We evaluated the minimum vaccination cover and minimum cost for eight different preventive vaccination strategies in Denmark.

The simulation model replicates both a passive and active flight of midges between cattle distributed on pastures and cattle farms in Denmark. A seasonal abundance of midges and temperature dependence of biological processes were included in the model. The eight vaccination strategies were investigated under four different grazing conditions. Furthermore, scenarios were tested with three different index locations stratified for cattle density. The cheapest way to vaccinate cattle with a medium risk profile (less than 1000 total affected cattle) was to vaccinate cattle on pasture. Regional vaccination displayed better results when index cases were in the vaccinated areas. However, given that the long-range spread of midge borne disease is still poorly quantified, more robust national vaccination schemes seem preferable.