Optimizing the control of foot-and-mouth disease in Denmark by simulation

Comparison of different control strategies on FMD in Denmark

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Inputs in the models

- All Danish herds in 2006/2007
  - Cattle (milking/not-milking)
  - Pigs (SPF/conventional, sow/finisher/farrow-finisher/hobby/nucleus)
  - Sheep or goat (hobby/commercial)

- Movement data
  - End. abattoir movements

- Disease data
  - Time to infectious, time to clinical signs, etc.

- Danish behavior
  - Probability of detecting and reporting disease, effect of movement restrictions, probability of tracking movements, etc.

- Time from 1. herds is infected to 1. detection - 21 days

Control scenarios

- Basic - Basic EU regulation
  - 3 days national movement standstill
  - depopulation of herds that received animals from infected herds

- Depopulation in zones (Depop)
  - varying radius

- Supressiv vaccination in zones (Vac-to-Cull)
  - varying radius

- Protective vaccination in zones (Vac-to-Live)
  - varying radius

Conclusions

- Extra control measures will most often reduce size, duration and costs of an FMD epidemic in Denmark

- Depopulation in zones is preferable

- Protective vaccination preferable from an epidemiological point of view

  - BUT in Denmark NOT from an economic point of view!

Control measures

- Surveillance
- Depopulation
- Movement restrictions
- Vaccination

Results

- Epidemiologic results
  - Infected herds
  - Detected herds
  - Duration of epidemic
    - from First to last depopulation
  - Depopulated herds
  - Vaccinated herds

- Economic results
  - 37 outputs (costs and losses)
  - Only total costs and losses are shown here!
### Epidemiologic results - CattleHigh

<table>
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<tr>
<th>Control strategy</th>
<th>Epidemic duration (days)</th>
<th>Infected herds</th>
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<tr>
<td>Basic</td>
<td>80 (5-205)</td>
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*Simulated effects of introducing emergency vaccination or depopulation during FMD outbreaks in Denmark.*

### Economics

- **Direct costs**
  - Surveillance
  - Depopulation
  - Cleaning & disinfection
  - Empty stables
  - Compensations
  - Welfare slaughter
  - National standstill
  - Vaccination

- **Export losses**
  - Lost export of live animals and animal products
  - For EU and non-EU

### Simulated effects of introducing vaccination or depopulation during FMD outbreaks in Denmark

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### Open Session of the EuFMD: 2012, Jerez de la Frontera, Spain
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Acknowledgements:
Anette Bøtner, DTU, Denmark
Graham Belsham, DTU, Denmark
Kirsten Tjørnehøj, DTU, Denmark
Sten Mortensen, Danish Veterinary and Food Administration, Denmark
Torben Grube, Danish Veterinary and Food Administration, Denmark
Kimberly N. Folle, USDA, Fort Collins, USA