

Christian-Albrechts-University, Kiel

Faculty of Agricultural and Nutritional Science

Institute of Animal Breeding and Husbandry

# Infectious disease spread in the pork supply chain A modelling approach using network theory

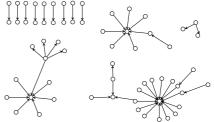
Have the network structure and the initially infected premise an impact on the course of disease spread?

#### Data

• 6,892 pig movements between 176 premises

Transported pig Supplier Purchaser Multiplier, Farrowing farm, Farrowing farm, Finishing Finishing Farm, Farrow-to-Farm, Farrow-to-Finishing Finishing Farm farm, Abattoir

• Recording from 06/2006-05/2009 on weekly basis



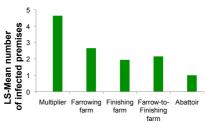
Network structure elements in an exemplarily chosen week

### Method

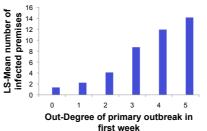
- · SIR-Model, dynamical percolation
- · Start at one primary outbreak premise

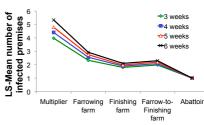
- Scenarios:
  - Influence of temporal changes in trading relations: Random change in the order of the weeks
  - Randomly chosen primary outbreak
  - Probability of infection (p<sub>inf</sub>): 0, 0.5, 0.6, 0.7, 0.8, 0.9, 1
  - Probablity of detection and culling (p<sub>diag</sub>): primary infected premise (3,4,5,6 weeks), secondary infected premise (1,2,3,4 weeks)

## Results



Type of primary outbreak





Type of primary outbreak

#### Conclusion

- > General structure of the network constant over time, only slight effect on epidemic.
- > Course of the epidemic depends both on type and out-degree of the primary outbreak premise.
- > Type of primary outbreak particularly important if long high risk period and high risk of transmission.

Institute of Animal Breeding and Husbandry nristian-Albrechts-University, Kiel itraulsen@tierzucht.uni-kiel.de www.tierzucht.uni-kiel.de



