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A Cow- and Herd-specific Bio-Economic Model of Intramammary Infections in Dairy Cows

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Background

Intra-mammary infections (IMI) are often caused by more than one pathogen circulating on a farm, each with different prevalence, transmission and required management approach. **Farm-specific simulation models** can be useful for choosing the optimal **management strategy,** e.g. **prevention measures, antimicrobial treatment** or **culling specific cows**.

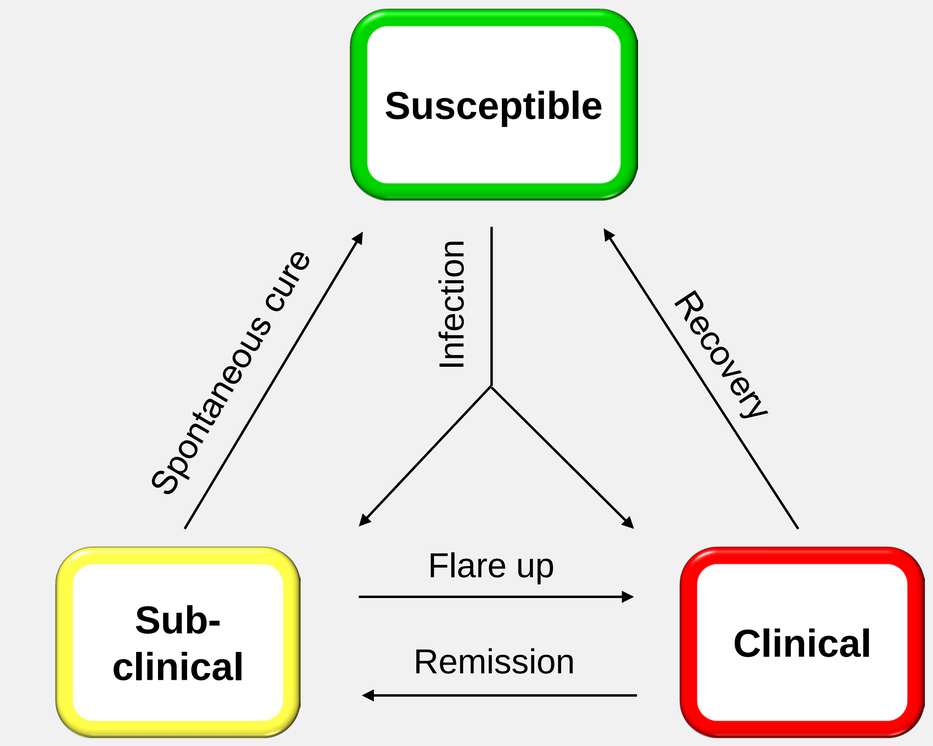
We created a bioeconomic model for IMI infection with multiple pathogens within dairy cattle herds. The model is versatile enough to simulate specific herds with management decisions on cow level.

Objectives

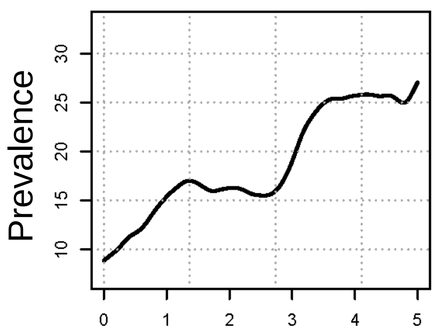
- Simulate infection with **multiple pathogens** within a herd
- Take economically sound **management decisions** such as prevention, treatment and culling for individual farms and cows.

Methods

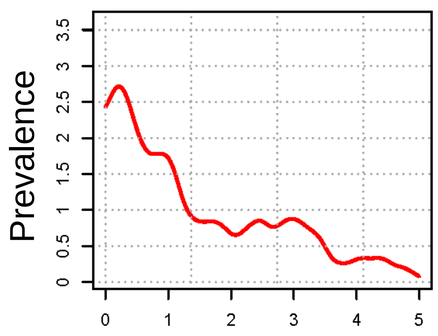
We developed a **mechanistic, stochastic simulation model** for a 200 cow herd with individual properties such as curves for milk and somatic cell count. **Infection is on quarter level** based on two transmission modes: **environmental and contagious pathogens**. Subclinically infected cows have increased somatic cell counts and a reduced milk yield.



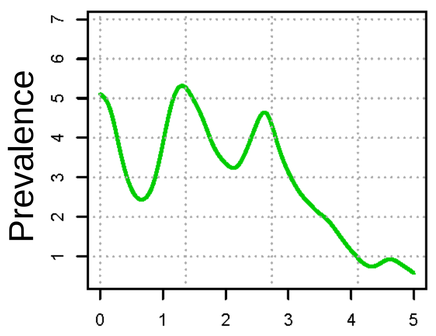
S. aureus



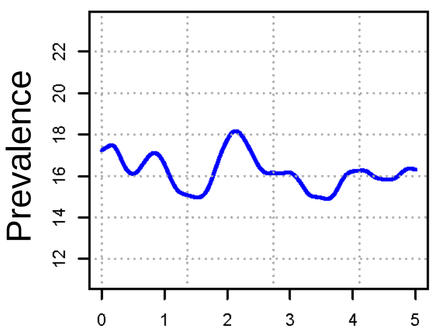
S. agalactiae



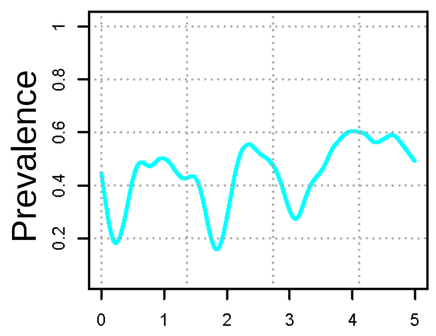
S. uberis (cont.)



S. uberis (env.)



E. coli



First results:

A model output example (above) shows co-existence of three **contagious** pathogens: *S. aureus*, *S. agalactiae* and *S. uberis* (contagious strain); and two **environmental** pathogens: *S. uberis* (environmental strain) and *E. coli*. Adjusting the transmission parameters enables simulation of specific herds with different sets of **pathogens** and **strains**. The model provides the **economic result of different management strategies**, and can thus be a tool to pinpoint the optimal strategy for the specific herd and cow.

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