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Publication date: 2017

Document Version
Publisher's PDF, also known as Version of record

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Citation (APA):
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.

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.