Bioeconomic modeling of Bovine mastitis

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In the first phase, a review was conducted on published peer reviewed papers since 1990 related to the economics of bovine mastitis and mastitis management in dairy herd. The review revealed an average loss of € 280 per case of clinical mastitis (CM) and an average loss due to SCM of € 102 per case. It also showed a wide variation between the estimations of the different studies, which could be explained due to different country regulations, market prices, analytical methodologies, and cost factors included in the analysis.
In the second phase, the milk, fat, and protein losses due to new SCM were estimated based on a random regression test-day model (RRTM). A cow was considered to have a new case of subclinical mastitis if the somatic cell count (SCC) of the previous test-day was < 50,000 cells/ml and SCC of the current test-day was > 100,000 cells/ml. A primiparous cow with SCC 200,000 cells/ml lost 0.41 kg milk, 4.5 g fat and 10 g protein per day. A multiparous cow with the same SCC lost 0.6 kg milk, 10 g fat and 13 g protein per day during the new SCM episode.
Currently, a bioeconomic model of mastitis is being developed including the dynamics of mastitis pathogens in a Dutch dairy herd in a year with 2 weeks time intervals. The model simulated the 4 predominant mastitis pathogens (*S. aureus, S. uberis, S. dysgalactiae, and E. coli*) separately and independently. The dynamics of infection of the first 3 pathogens were explained by the transmission rates (β) of these contagious infections between cows. Due to the environmental route of *E. coli* mastitis, a Greenwood model was developed to explain the dynamics of infection based on the incidence rate. A cow was assumed to be either susceptible or infectious of either of CM and SCM. A susceptible cow can become infectious based on the probability of infection calculated from β, and the number of infectious and susceptible cows. A CM cow may recover based on the probability of recovery of 3 days treatment and therefore become susceptible, may persist as a SCM case then flare up as CM in the next period, or may persist as SCM (remission case). A SCM cow may spontaneously recover and become susceptible, may flare up as CM, or persist as SCM case. The model simulated a herd with 100 cows in a quota situation. Milk yield, calving interval, parity and calving season were assigned based on random distributions. Lactation stage was assigned based on the calving season and the calving interval. Milk production was modeled based on the Wood's lactation curve. A SCC between 100,000 and 600,000 cells/ml was assigned to the SCM infections. A SCC of 750,000 cells/ml was assigned to CM infections. Accordingly the bulk tank SCC (BTSCC) and the geometric mean of the BTSCC were calculated based on the 2 weeks intervals. A new case of CM was considered when clinically infected at each time period. A new case of SCM was considered when infected after a healthy time period. Production loss of CM and SCM mastitis were included based on literature estimates. Each pathogen model was iterated 1000 times for a one year period. Validation of the model was conducted based on methods obtained from literature. These methods are rationalism, trace back, face validity and syntax debagging by an expert. The model is currently in the phase of validation and therefore the results are not available.