Estimating Duration of Infection from Interval Censored Observations of Subclinical Mastitis in Dairy Cattle

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Streptococci are the dominant pathogens causing mastitis in many dairies herds. Duration of infection is a key parameter used to evaluate intramammary infection status, mastitis transmission dynamics, and the efficacy of control programs. Information on duration of infection for streptococci is limited, and methods to estimate duration of intramammary infection from field studies have not been evaluated. In this study, the duration of infection of bovine mastitis caused by *Streptococcus* spp. is examined. Data are available from a 12-month clinical field trial enrolling 750 cows from two commercial dairy herds. Infection status of individual mammary quarters is determined from serial quarter milk samples collected at 30-day intervals. The potential impact of censoring (right, left, and interval), on estimates of duration is evaluated. Estimation methods include descriptive statistics, and proportional hazard and parametric survival models. Unit of time approximations based on mid-point estimates of time to event are compared to alternative time-point estimates. The potential bias of standard descriptive methods are demonstrated and compared to survival estimates. The potential for biased estimates resulting from analysis of interval-censored data using Kaplan-Meier methods are explored. A parametric maximum likelihood estimate approach for doubly-interval censored data is proposed as an alternative method. Estimates obtained from this analysis are important to improve understanding of variability of the course of infections and transmission dynamics of mastitis in dairy herds.