Evaluating the ability of quarter and cow-level somatic cell count to diagnose intramammary infections with non-aureus staphylococci (NAS) and *Corynebacterium* species

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Introduction

The ability to readily and dependably identify high cell-count quarters in dairy cattle that may have intramammary infections is key before any steps can be made to improve bulk-tank milk (BTSCC) quality. Prior work evaluating quarter-level somatic cell count (SCC) showed it can be a poor predictor of intramammary infection (IMI), but this work focused on a high SCC herd and broad categories of pathogens. The objective of this project is to establish how well quarter- and cow-level SCC corresponds to culture data for diagnosis of IMI in 10 herds with a low BTSCC, specifically evaluating 2 minor mastitis pathogens of increasing importance, non-aureus staphylococci (NAS) and Corynebacterium species. We will also explore if either composite or quarter SCC before and after sampling dates may predict a change in IMI status.

Materials and Methods

A longitudinal cross-sectional study of 10 organic dairy farms was carried out in Vermont, which was interrupted before completion in late March 2019. Most farms were sampled 3 times between December 2019 and March 2020. Thirty-five lactating cows of varying parity in early- to mid-lactation were chosen at random to be sampled for 3 consecutive farm visits. Bulk-tank milk and duplicate quarter milk samples were aseptically collected at every visit, with 4 to 6 weeks elapsing between each. Cows at all farms were milked twice a day with either a parlor or a pipeline system in a tiestall barn. All farms utilized pre- and post-milking teat disinfectant, and either individual cloth towels or single-use paper towels to wipe teats before milking. Five farms housed cows in a tiestall bedded with wood shavings, and 5 farms utilized a bedded pack system. Farms milked an average of 58 cows with a variety of breeds.

Bacteriological culture of quarter milk samples and bacterial identification was performed. A quarter was considered culture-positive when ≥1 CFU was identified with the same morphology for both duplicate samples when 0.01 mL was plated on blood agar. An IMI will be defined as persistent if an isolate of the same presumptive species with the same morphological description was isolated for 2 of the 3 sampling events. A transient infection will be defined when a quarter was culture-negative at the first sampling, positive for an IMI at the second sampling, then returned to culture-negative status at the third sampling. SCC was determined for both bulk tank and quarter milk samples.

Prevalence will be calculated as the number of quarters identified as positive for an IMI with a NAS species and number of quarters positive for an IMI with *Corynebacterium* species for each of the 27 farm visits. A cut-off of ≥200,000 cells/mL for quarter SCC will be considered an indicator of subclinical mastitis. The sensitivity and specificity of using quarter-milk SCC will then be calculated, using culture status for each quarter as the gold standard.

Results

The prevalence of NAS and *Corynebacterium* species IMI, the number of transient and persistent infections identified for both organisms, and the sensitivity and specificity of quarter-milk SCC to identify IMI for these organisms will be calculated and reported. Any pattern identified in both cow-level (when available) and quarter-level SCC preempting or following a transient infection with either of these organisms will be described.

Significance

This project will establish how well quarter- and cow-level SCC corresponds to culture data for diagnosis of IMI in herds with a low BTSCC, which is a more accurate reflection of the current state of the dairy industry. We will be evaluating the ability of SCC to diagnose IMI with 2 groups of organisms of emerging importance to milk quality, the non-aureus staphylococci (NAS) and Corynebacterium species. Lastly, if any characteristic changes in either quarter- or cow-level SCC could be identified as a possible signal for an impending IMI, this would allow for producers to flag cows for closer monitoring of infection status.