Assessment of the relationship between differential somatic cell count and presence of subclinical mastitis

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Introduction

Somatic cell count (SCC) is commonly used for the identification of cows with subclinical mastitis. Differential somatic cell count (DSCC) represents a novel diagnostic method that allows for the identification and quantification of the different types of inflammatory cells in milk samples (neutrophils (NEU), lymphocytes (LYM) and macrophages (MAC)) and thus the proportions of different cell types could be utilized for subclinical mastitis screening. The objective of this study was to investigate if the counts and abundance of different leukocytes types could be used for the identification of cows with subclinical mastitis.

Materials and methods

This observational study enrolled 409 cows from 1 dairy farm in Minnesota between September 2019 and March of 2020. Quarter milk samples were collected at dry-off and pooled into a composite sample inside a laminar hood by transferring 2 mL of milk from each quarter-level vial into a single sterile plastic vial. DSCC (NEU, LYM, MAC counts and their relative abundance [%]) (QScout MLD. AAD, Durham, NC) were measured on-farm in composite milk samples within 2 hours of samples collection. A receiver operating characteristic curve was built to determine the optimal threshold for each cell type, using the Youden index, to predict subclinical mastitis (SCC > 200,000 cells/ml). Sensitivity (Se), specificity (Sp), positive predictive value (PPV), negative predictive value (NPV) and area under the curve (AUC) were reported for the selected cut-offs.

Results

The prevalence of subclinical mastitis in composite milk samples was 27.6%. For NEU, the optimal threshold on the absolute scale was 72,000 cells/mL (Se = 96.5%, Sp = 89.9%, PPV = 78.4%, NPV = 98.5%, AUC = 0.98). Additionally, for NEU%, the best cut-off point was established at 60.9% (Se = 38.1%, Sp = 84.8%, PPV = 48.9%, NPV = 78.2%, AUC = 0.59). For LYM, the optimal cut-off on the absolute scale was determined to be at 30,000 cells/mL (Se = 89.4%, Sp = 92.9%, PPV = 82.8%, NPV = 95.8%, AUC = 0.96) and for LYM% at 18.6% (Se = 49.6%, Sp = 79.7%, PPV = 84.3%, NPV = 34.2%, AUC = 0.62). For MAC, the best threshold on the absolute scale was settled at 55,000 cells/mL (Se = 87.6%, Sp = 88.5%, PPV = 74.4%, NPV = 94.9%, AUC = 0.95). In addition, for MAC%, the limit for detection of subclinical mastitis was determined at 20.6% (Se = 74.3%, Sp = 31.9%, PPV = 74.4%, NPV = 32.1%, AUC = 0.49).

Significance

The counts of NEU, LYM and MAC showed an excellent predictive capacity for the identification of cows with subclinical mastitis. Meanwhile, the ability to identify cows with subclinical mastitis based on the percent of distinct cell types was low.