Investigation of the relationship between bacteria counts and bedding characteristics with udder health and milk quality on U.S. dairy farms: preliminary results

K. Patel,[1] BVSc, MVSc; **S.M. Godden,**[1] DVM, DVSc; **E.E. Royster,**[1] DVM, MS; **J.A. Timmerman,**[2] BS;
B.A. Crooker,[3] MS, PhD; **L.K. Fox,**[4] MS, PhD

[1] Department of Veterinary Population Medicine, University of Minnesota, Saint Paul, MN 55108

[2] Laboratory for Udder Health, Veterinary Diagnostic Laboratory, University of Minnesota, Saint Paul, MN 55108

[3] Department of Animal Science, University of Minnesota, Saint Paul, MN 55108

[4] Department of Animal Science, Washington State University, Saint, Pullman, WA 99164

Introduction

The major objective of this multi-herd observational study was to describe the relationship between BBC and udder health and to identify cutpoints for interpreting bedding culture results. A secondary objective was to identify bedding characteristics and bedding management strategies that are associated with lower BBC and improved udder health. This abstract presents preliminary results describing some of the relationships between bedding bacteria count (BBC), bedding characteristics, and udder health for 4 bedding materials: new sand (NS), reclaimed sand (RS), manure solids (MS), or other organic bedding materials (OB).

Materials and Methods

We enrolled 188 herds from 17 states with the assistance of herd veterinarians or mastitis researchers. New and used bedding samples were collected twice from each herd during the summer and winter of 2016. Bedding samples were cultured to describe total bacteria count (TBC), counts of coliform bacteria, non-coliform bacteria, *Klebsiella* spp, *Bacillus* spp, *Streptococcus* spp, and *Staphylococcus* spp per cc of bedding material. Bedding was also tested for pH, organic matter (OM %), and dry matter (DM %) content. DHIA data were available for 168 herds, describing udder health measures for the test days preceding and following each bedding sampling event.

Linear regression models, using the MIXED procedure in SAS (version 9.4), were generated to describe the relationship between each of the udder health measures (dependent variables) and the various BBC for the new and used bedding samples, respectively, after stratifying by bedding type. Dependent variables included the clinical mastitis incidence (CMI %) for the month prior to sample collection, DHIA average linear score (LS), % of cows with LS ≥ 4.0, New IMI % (% of cows changing from LS < 4.0 to LS ≥ 4.0), Chronic IMI % (% of cows with LS ≥ 4.0 in the last 2 tests), and Cure % (% of cows changing from LS ≥ 4.0 to LS < 4.0). Additional factors offered into models included season, herd size, breed, milk production, and geographic region. Herd was controlled for as a random effect. The relationship between bedding characteristics (OM, DM, or pH) and udder health measures were analyzed separately for each bedding material. Statistical significance was set at $P < 0.05$.

Results

Mean herd size and milk production was 895 cows and 25,459 lb (11,548 kg), respectively. Mean CMI%, avg LS, % LS ≥ 4.0, New IMI %, Chronic IMI % and Cure % for all herds was 3.5%, 2.4%, 21.9%, 7.9%, 12.0%, and 6.1%, respectively. Though not true for all BBC or udder health measures, models generally showed that increased BBC in new bedding samples was associated with worse udder health. For example for every 1 log increase in TBC, it was estimated that the proportion of cows with LS≥4 increased by 2.8% and 0.96% in herds using MS or OB, respectively. In used bedding, for every 1 log increase in staphylococcal count, it was estimated that the New IMI (%) increased by 0.4% in herds using MS or NS.

With regards to bedding characteristics, increased DM% and reduced OM% were generally associated with better udder health, though this was not consistent for all bedding types or udder health measures. For example, for new bedding samples for every 1 unit increase in DM% the herd avg LS was estimated to decrease by 0.01 and by 0.007 in herds using MS or OB, respectively. Similarly, for used RS samples, for every 1 unit increase in DM% the proportion of cows with LS≥4 was estimated to decrease by 1.2%. Also for used bedding, for every 1 unit increase in bedding OM% the proportion of cows with LS≥4 was estimated to increase by 0.8% in herds using RS.

Significance

Our preliminary results indicate that high BBC are generally associated with worse udder health, though the nature of these relationships varied by bedding material. Similarly, bedding characteristics such as low DM% and high OM% were also associated with worse udder health, though the nature of these relationships also varied by bedding material. Once final analysis is completed this information may be useful to derive goals for BBC and bedding characteristics for herds using specific bedding materials.