Investigation of the relationship between bacteria counts, bedding characteristics and bedding management practices with udder health and milk quality on 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. Fox**,[4] MS, PhD

[1]Department of Veterinary Population Medicine, University of Minnesota, Saint Paul, MN 55108
[2]VDL, Laboratory for Udder Health, University of Minnesota, Saint Paul, MN 55108
[3]Department of Animal Sciences, University of Minnesota, Saint Paul, MN 55108
[4]Department of Animal Sciences, Washington State University, Pullman, WA 99164

Introduction

High levels of bacteria in bedding (bedding bacteria counts; BBC) are associated with increased bacteria loads on teat ends and, in some reports, with an increased risk for environmental mastitis infections. However, relatively few studies have investigated the relationship between BBC and udder health, and science-based guidelines are lacking to interpret BBC culture results in different bedding materials. Therefore, the primary goal of our study is to conduct a multi-state, multi-herd cross-sectional observational study to describe the relationship between bedding bacteria counts and udder health and to identify cutpoints for interpreting BBC data. A secondary objective is to identify bedding characteristics and bedding management strategies that are associated with lower BBC and improved udder health. In this abstract we present preliminary results that describe BBC in new and used bedding samples collected from herds using new sand (NS), reclaimed sand (RS), manure solids (MS) or other organic bedding materials (OB).

Materials and Methods

One hundred-eighty eight herds were enrolled from 17 dairy states with the assistance of herd veterinarians or mastitis researchers. New and used bedding samples, collected from the bedding storage area or from the back of stalls, respectively, and bulk tank milk samples were collected twice from each herd during summer and winter of 2016. A management questionnaire was used to collect data regarding farm characteristics, facilities, bedding management practices, parlor routines and treatment protocols. Bedding samples were analyzed to describe total bacteria count, counts of coliform bacteria, non-coliform bacteria, Klebsiella spp., Bacillus spp., Streptococcus spp., and Staphylococcus spp. per cc of bedding material, as well as pH, moisture (%) and dry matter (%). Herd level DHIA test day data describing udder health measures (e.g. herd avg. SCC, percent of cows with Linear Score > 4.0) will be obtained from the DHIA record processing centers (in progress).

For the preliminary analysis, generalized linear regression models were developed using SAS 9.4 (SAS Institute Inc., Cary, NC), both for new and used bedding samples, to evaluate if the total bacteria counts, total coliform counts and Streptococci spp. counts (dependent variable) were associated with the type of bedding material (NS, RS, MS, OB; explanatory variable). After adjusting for multiple contrasts, means were considered to differ when $P \leq 0.008$.

Results

The average herd size was 941 (35 to 9650) cows, the average milk production per cow/year was 25,663 (17,712 to 34,500) lbs and 26.2%, 17.4%, 22.4% and 34% of the herds used NS, RS, MS or OB, respectively. For new bedding, the mean ($\log_{10}$ cfu/ml ± standard error) total bacteria count in MS (5.80 ± 0.16) and RS (5.57 ± 0.18) was greater than for NS (3.20 ± 0.15) or OB (3.25 ± 0.13). Manure solids had greater mean coliform (2.35 ± 0.15) and streptococcal (3.82 ± 0.17) counts than NS. In used bedding, while there was some variation among the 4 bedding materials, mean total bacteria counts (6.56 to 6.81) and mean streptococcal counts (5.71 to 6.12) were high in all bedding types. Used MS had significantly a higher mean coliform count than other 3 used bedding types (MS: 4.20 ± 0.15; NS: 3.64 ± 0.14; OB: 3.26 ± 0.12; RS: 3.08 ± 0.17).

Significance

As expected, preliminary analysis indicates that BBC were lower in new than in used bedding. Likewise, in new bedding, the total bacteria count, coliforms and streptococcal counts in NS and OB were less than in MS and RS. Use of bedding increased total bacterial and streptococcal counts but these counts were not affected by bedding type. However, total coliform counts in used bedding were highest in MS. These preliminary results indicate that bacteria counts in bedding increase after being used in the stalls irrespective of the type of bedding material. Relationships between BBC and udder health will be reported when analysis is complete.