On-farm study of mastitis-associated bacteria recovered from five bedding materials

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Introduction

Mastitis remains the most costly infectious disease affecting dairy cattle. Bacterial populations in materials used as bedding in stalls for lactating cows has been correlated with teat-end exposure to mastitis pathogens and rates of clinical mastitis. Various bedding materials have different inherent ability to promote mastitis pathogen growth. In Atlantic Canada, access to quality bedding materials is a challenge. Milk 2020, a research agency of the New Brunswick dairy industry, sponsored this project to measure the growth patterns of mastitis-associated bacteria in different bedding materials under field conditions.

Materials and Methods

Five bedding materials (sand, peat, wood shavings, straw, and recycled manure solids) were chosen on the basis of previous research and industry priorities. Using a cross-over design, 25 cows and stalls were evaluated, with five cows exposed to each bedding material during each of five 28-day time periods. Bedding type and cow were randomly allocated after each period until all cows had been exposed to each bedding material. To duplicate industry practice, for the four organic bedding materials, the back one-third of the stall was cleaned out daily. Sand bedded stalls were groomed daily, without removal of all material, and new sand added to maintain the depth of 2 inches (5.1 cm). Bedding samples were collected using a systematic grid. A mixed sample of nine bites from the back one-third of each stall was collected and examined on day 0 (start of cycle) and days 2, 4, and 14 in each cycle according to a strict protocol. A spiral plater and three media (modified Edwards media (*Streptococci*), MacConkey (Gram negatives) and a modified MacConkey (*Klebsiella*)) were used to quantify bedding count numbers. Statistical analyses were performed included Kruskal Wallis and Mann-Whitney *U* tests with SPSS statistical software (version 17). Measures of cow comfort and teat-end bacterial count were also assessed, but not reported in this article.

Results

Analysis of the bedding count data proved to be challenging because data structure assumptions required for using standard parametric statistical methods were violated. As a result, nonparametric tests were applied. For all bacteria types, peat supported the lowest amounts of bacterial growth. Bacteria numbers for peat were significantly lower ($P < 0.05$) than all other bedding types for all time period/media combinations, except for wood shavings, which occasionally supported bacteria growth that was numerically, but not significantly higher. For example, on day 2, bacterial counts on all three media for 72% to 88% of peat samples remained < 10,000 cfus/g and only 0 to 4% of peat samples had bacterial counts > 1,000,000 cfus/gram. Conversely, on that same day, 40% to 84% of straw samples and 72% to 92% of manure solids samples had bacterial counts > 1,000,000 cfus/g. Generally, wood shavings and sand supported intermediate amounts of bacterial growth.

Significance

Peat performed extremely well in all evaluations; however, further evaluation is necessary to determine whether the handling characteristics of peat make it a viable option for dairy farmers. Sand was expected to be the gold standard material, but it was inferior to peat and wood shavings. Most of the research on sand has been in deep-bedded free stalls. Sand management in this study was different than previous reports and may explain the unexpectedly poor results.