COM = 9.78 [2.88], DIG = 13.10 [2.02], GRN = 12.84 [1.47], Type 3 P = 0.15). Finally, Avg305ME (kg/cow) was higher or tended to be higher for herds using DRY as compared to GRN or DIG solids, respectively, but with no difference between DRY versus COM, or between DIG versus GRN (DRY = 13,781 [402], COM = 12,752 [804], DIG = 12,517 [510], GRN = 11,689 [430], Type 3 P = 0.02).

Significance

In conclusion, preliminary results show that Midwest herds using mechanical drying or mechanical composting systems to process RMS generally had improved udder health and, for DRY, improved milk production, compared to herds using digested or green solids. Future analysis will explore if udder health or production differences may be explained by differences in bedding hygiene for the 4 processing systems investigated, and will evaluate the economics of adopting different RMS processing systems.

Investigation of the relationship between method of processing and bacteria counts in ready-to-use recycled manure solids bedding on Midwest dairy farms

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Introduction

There has been a rapid increase in adoption of recycled manure solids (RMS) as bedding in Midwest dairy herds over the past 10 to 15 years due to perceived advantages such as cost and availability. However, several studies have reported increased bedding bacteria counts (BBC) and increased mastitis risk in herds using RMS as compared to inorganic or organic non-manure materials. Although many RMS dairies use either green/raw (GRN) solids or solids first processed through an anaerobic methane digester (DIG), some herds have adopted mechanical composters (COM) or dryers (DRY) in an effort to lower BBC and control mastitis. Research is needed to evaluate potential benefits and costs of adopting these technologies. This research team initiated a study to evaluate udder health, air quality, antimicrobial resistance in solids, and economics, for herds using different RMS processing methods. In a companion abstract, we determined that use of COM or DRY was associated with improved udder health and milk production as compared to GRN. In this abstract, we explore if these benefits are likely to be explained by differences in bedding characteristics, such as BBC, for the 4 processing systems investigated. The objective of this portion of the study is to investigate if method of processing RMS is associated with BBC in ready-to-use (RTU) RMS on Midwest dairy farms.

Materials and Methods

This observational study was conducted with a convenience sample of 29 free-stall premises in MN and WI. Farms were recruited to achieve a representative sample of different processing systems including GRN (n=7), COM (n=4), DIG (n=6), and DRY (n=12). Premises were visited twice, once in Aug-Sept, 2019, and again in January 2020, to collect bedding samples, electronic herd records, and a management questionnaire describing facilities, manure and bedding management, and other practices. At each visit, post-processed

(ready-to-use, RTU) bedding samples were collected and immediately placed on ice, then frozen at -4°F (-20°C) within 8 h of collection. After transport to the Laboratory for Udder Health (University of Minnesota), bedding samples underwent routine culture to describe counts of coliform bacteria, *Klebsiella* spp, streptococci or streptococci-like organisms (SSLO), and *Staphylococcus* spp (Staph) (cfu/cc, wet basis). All bacteria count data were log (base 10) transformed prior to analysis. Mixed linear regression was used to describe the relationship between bedding processing system and each of the following BBC count variables in RTU bedding: coliform bacteria, *Klebsiella* spp, SSLO, and *Staphylococcus* spp. Season was offered as a covariate into models. Herd was controlled for as a random effect. Overall significance was set at $P < 0.05$, with a trend at $0.05 \leq P < 0.10$. However, the critical P value was adjusted for multiple contrasts.

Results

A total of 56 RTU bedding samples were cultured (DRY=23, COM=8, DIG=12, GRN=13). Although results varied by bacteria group, RMS processing system was associated with counts of coliform bacteria, *Klebsiella* spp, and SLLO in RTU samples. Specifically, the adjusted mean coliform count (± SE) was lower in herds using DRY solids, and tended to be lower in COM or DIG, as compared to herds using GRN solids, but with no difference between DRY, COM, and DIG (DRY = 1.97 [0.36], COM = 2.32 [0.61], DIG = 2.77 [0.50], GRN = 4.20 [0.48], Type 3 P = 0.009). *Klebsiella* spp counts were lower in herds using DRY, COM, or DIG as compared to GRN solids, but with no difference between DRY, COM, and DIG (DRY = 0 [0.17], COM = 0 [0.19], DIG = 0.12 [0.24], GRN = 1.89 [0.23], Type 3 P < 0.0001). Counts of SSLO were lower in herds using COM as compared to GRN or DIG, and were lower or tended to be lower in herds using DRY as compared to GRN or DIG solids, respectively, but with no difference between DRY and COM, or between DIG and GRN (DRY = 3.42 [0.38], COM = 2.37 [0.64], DIG = 5.06 [0.53], GRN = 5.78 [0.50], Type 3 P = 0.0005). There was no association between processing method and staph bacteria counts in RTU bedding, although counts were numerically lower in DRY as compared to GRN solids (DRY = 0.76 [0.45], COM = 1.55 [0.77], DIG = 1.58 [0.63], GRN = 2.47 [0.59], Type 3 P = 0.17).

Significance

In conclusion, preliminary results show that processing method was associated with BBC in RTU RMS bedding samples, with highest counts consistently observed on farms using GRN solids, and lowest counts most consistently observed on farms using DRY or COM solids. These findings may help explain our earlier findings (see preceding companion abstract) that udder health was generally improved in herds using DRY or COM as compared to GRN solids. Future analysis will explore differences in bedding characteristics that may explain these differences in BBC among the 4 processing systems investigated.