Please consider the manuscript entitled “Relationship Between Facility Type and Bulk Tank Milk Bacteriology, Udder Health, Udder Hygiene, and Milk Production on Vermont Organic Dairy Farms” for publication in Journal of Dairy Science.

… We believe this manuscript is appropriate for publication in Journal of Dairy Science because it can inform dairy producers who are interested in switching to a bedded pack system to house their cows. This observational study gives insight on what milk quality, bulk tank milk bacteriology, and cow hygiene looks like on bedded packs in a Northeastern U.S. state on small-midsize organic dairy farms.

Thank you for considering our manuscript for publication in Journal of Dairy Science. Please contact me if you would like additional information (802-656-1396 or john.barlow@uvm.edu).

*Interpretive summary*

Previous studies have reported bedded packs can improve cow welfare and comfort and have advantages for manure management, soil health, and water quality. Consensus is lacking on whether bulk tank milk quality, udder health, udder hygiene and milk production are compromised on bedded packs. In an observational study measuring these outcomes during the non-grazing season on 21 organic dairies in Vermont, bedded packs were similar to tiestalls and freestalls the most commonly-used housing types for organic dairies in Vermont. We conclude that bedded packs are a viable option for dairy cattle housing during the non-grazing season in the Northeastern US.

*Discussion summary/strengths*

This work presents the results of our observational study exploring the relationship between facility type and udder health and hygiene metrics, BTM quality (SCC and microbiology), and milk production on organic dairy farms in Vermont. The current study is to the authors’ knowledge the first direct comparison of milk quality, udder health and udder hygiene on bedded pack farms to both tiestall and freestall herds of similar size and management styles, for a population of entirely small to midsize organic dairy farms. The major objective was to identify if milk quality, udder health and hygiene outcomes were associated with facility type, thereby exploring if bedded pack systems are a viable option for housing in Vermont during the non-grazing season compared to the two most common indoor housing systems in the state (freestalls, tiestalls). This study is also the first to describe udder health and hygiene on bedded packs in the Northeastern US, which is significant as the performance of these systems can be greatly influenced by climatic factors. As BTM bacteriology, udder health and hygiene metrics, and milk yield did not differ for BP herds compared to TS and TS herds, there was insufficient evidence to reject our hypothesis that these metrics would vary by facility type. We conclude that bedded pack systems can be considered a viable loose-housing option for organic dairy cattle during the non-grazing season in the Northeastern US.

*Abstract*

The primary objective of this cross-sectional observational study on organic dairies was to determine whether bulk tank milk quality, udder health, udder hygiene and milk production outcomes were associated with facility type. A secondary objective was to identify other management-related risk factors associated with bulk tank milk quality, udder health, udder hygiene, and milk production on organic dairy herds in Vermont. We aimed to collect bulk tank milk samples, udder hygiene scores, and complete a questionnaire on mastitis risk and bedding management practices on 40 farms, in order to compare herds using the two most common housing systems (freestalls, tiestalls) for organic dairy cattle in the state during the non-grazing season with those using a bedded pack. The study was completed on 21 farms (5 bedded packs, 6 freestalls, 10 tiestalls) before interruption due to the COVID-19 pandemic. Data captured from Dairy Herd Improvement Association records from the test closest to the date of the farm visit included avg. somatic cell score (SCS), standardized 150-day milk (pounds), % cows with current high SCS (“elevSCS,” ≥4.0), % cows with newly elevated SCS (“newSCS,” previous SCS <4.0 to current ≥4.0), and % cows with chronically elevated SCS (“chronSCS,” ≥4.0 last two tests). Multivariable linear regression models were performed to describe outcomes by facility type, but suffered from limited statistical power due to small group sample sizes. Final results from unconditional comparisons showed that farms using each of the three facility types did not differ in metrics captured from Dairy Herd Improvement Association test data (cow-level udder health measures, milk production), bulk tank milk somatic cell count (BTSCC) and aerobic culture data, or udder hygiene scores. Subsequently, a secondary analysis was conducted using univariate linear regression to identify associations between herd management factors and outcomes for all 21 farms combined. Although not all differences found were statistically significant, numeric differences that may be biologically important are reported showing farms with deeper bedding had a lower BTSCC, lower newSCS, lower elevSCS, lower avg. SCS, and better udder hygiene metrics. Farms with lower mean udder hygiene scores had numerically lower chronSCS, lower elevSCS, and lower avg. SCS. Although statistical power was limited, the current study provides insight on factors affecting bulk tank milk quality, udder health and hygiene measures on organic dairy farms in Vermont. Because outcomes for bedded packs were comparable to more commonly used indoor housing systems, we conclude that bedded pack facilities are a viable option for confinement during the non-grazing season for pasture-based herds interested in a loose-housing system in the Northeastern US.