Pure

Scotland's Rural College

Bovine respiratory disease changes feeding behaviours in pre-weaned artificially reared calves

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[Link to publication](#)

Introduction

Dairy cattle are susceptible to temperature changes, especially the rapid rise of temperature or long periods of extreme heat. Therefore, strategies to alleviate the heat stress of dairy cattle during heatwave becomes a crucial issue in dairy cattle industry for the good welfare of the cattle. The objectives of the study are: 1) to understand the indoor heat stress in a dairy cattle house during a heatwave event in the UK; 2) to assess the impact of different building design interventions to reduce overheating risk in such dairy cattle house.

Materials and methods

Indoor heat stress measurement (THI) has been conducted during the heatwave period of 2018 in both barn and milking areas. Building thermal modelling has been carried out to assess the impacts of different architectural design interventions on the overheating risk in both regions in the cattle house, after the model is validated using the measurement data.

Results

Our measurement results found both barn and milking parlour were overheated during the heatwave event and milking parlour was overheated for more than 90% of the time (with THI higher than 68). We also compared three types of architectural design mitigation strategies, i.e., white roof, natural ventilation and exhaust fan. The white roof could reduce the indoor temperature maxima by 4K and overheating degree hours by 11%, but all the mitigation strategies combined could reduce overheating risk by 89%, therefore significantly improve the welfare of the dairy cattle.

Conclusions

Architectural design could reduce indoor overheating risk in dairy cattle house and therefore improve the welfare of the dairy cattle during heatwave period.

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Application

An understanding of how disease affects behaviour is essential for the development of behaviour-based disease detection tools. Earlier detection improves outcomes and reduces antimicrobial use.

Introduction

Respiratory disease is common in pre-weaned artificially reared calves and represents significant economic loss. Calf behaviour has been shown to change early in the disease process and thus has potential as an early disease detection tool. The objective of this study was to determine differences in behaviour between healthy calves and those with bovine respiratory disease.

Materials and methods

114 calves were observed from entrance into a straw-bedded group pen at approximately eight days of age until 39 days of age. Calves were fed a restricted daily milk allowance of seven litres of milk replacer (150 g/Litre) through an automatic milk feeder. Calves had ad-libitum access to calf starter and straw in racks. Calves were Wisconsin health scored daily and behaviours were continually monitored using a tri-axial accelerometer and the automatic milk feeder. For statistical analysis, diseased calves with a peak Wisconsin score ≥ 5 were paired with a healthy calf in the same group, of the same sex, within seven days of age and within ten kilograms of live weight. Healthy calves had no treatment events, a rectal temperature of <39.4 °C and a Wisconsin score of ≤ 3 for five days prior to and after the peak disease day. Eighteen pairs were analysed for the feeding behaviours and fourteen for activity parameters. The activity parameters tested were daily lying time, daily standing time, daily lying bouts, daily standing bouts, mean lying bout length, mean standing bout length, total daily activity and mean activity/standing bout. The feeding behaviours tested included daily milk intake, total time at milk, total milk visits, mean milk visit length, mean milk per feed and mean milk drinking speed.

Generalized linear mixed modelling was used to assess the effect of disease and day versus peak disease with group included as a random effect. Estimated marginal means with pairwise comparisons were used.

Results

Mean milk visit length was greater in diseased calves compared to healthy calves on day 0 and day 3 relative to the day of peak disease ($p < 0.05$). In addition, the total time at the milk feeder was greater in diseased calves compared to their healthy counterparts ($p < 0.05$) on day 3 relative to peak disease. No other parameters showed significant changes with disease on any of the days tested.

Conclusions

In limit fed calves, both the mean time per visit to the milk feeder and the total time at milk are increased. The changes in behaviour seen with disease is different in limit fed calves to those seen previously in ad-libitum fed calves. This has implications for development of automated tools for disease detection.

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The potential for milk markers as indicators of health disorders in transition dairy cows

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Application

Determine how extramammary conditions (EMC) influence inflammatory markers in milk during early lactation as potential disease indicators.

Introduction

Inflammatory markers in blood are disease indicators. Studies investigating inflammatory markers in milk focus on mastitis. Little is known about how EMC influence inflammatory markers in milk during early lactation. Measuring such markers in milk is promising as it is less invasive and labour intensive than blood sampling. We characterised the profiles of haptoglobin (Hp; inflammatory protein) and substance P (neuropeptide involved in immunomodulation) in milk during 3 weeks postcalving in clinically-healthy dairy cows and those experiencing an intramammary condition (IMC) or EMC postcalving.

Materials and methods

Multiparous Holstein-Friesian dairy cows ($n = 111$) from a commercial dairy herd were enrolled provided they were not visibly sick or lame 3 weeks precalving. Health and milk yield and somatic cell count data were retrieved from the on-farm database. Composite milk samples were collected on days 0–4, 7, 14, and 21 relative to calving and Hp and substance P concentrations determined using ELISA. Retrospectively, based on their health status within 5 weeks postcalving, cows were assigned to 3 groups: Control (no clinical ECM, or subclinical or clinical IMC; $n = 76$), Extra (≥ 1 ECM; $n = 18$), or Intra (≥ 1 subclinical or clinical IMC; $n = 15$ and 2, respectively). Differences in milk yield and markers between the 3 groups and across weeks and days, respectively, were investigated using a repeated-measures ANOVA (PROC MIXED, SAS).

Results

Extra cows yielded less milk (mean ± SEM; 33.9 ± 1.42 kg/d; $P < 0.01$) than Intra cows (38.1 ± 1.43 kg/d), which in turn, tended ($P = 0.10$) to yield less milk than Control cows (39.5 ± 0.36 kg/d). Mean Hp and substance P concentrations were associated with day (both $P < 0.001$) and were greater on day 1 postcalving (0.53 ± 0.02 μg/ml and 70.1 ± 4.16 pg/ml, respectively) compared with all other days (all $P < 0.05$). There were no interactive health status and day associations for both milk markers (both $P > 0.68$), and health status was not associated with milk Hp (range = 0.28–0.32 μg/ml; $P = 0.29$) and substance P (range = 42.8–45.9 pg/ml; $P = 0.67$).

Conclusions

Milk Hp and substance P were not influenced by EMC. Milk Hp concentrations were elevated 1 day postcalving and were commensurate with concentrations reported in healthy cows and lower than concentrations reported in clinically mastitic cows. Milk Hp may have potential as a mastitic marker immediately postcalving.

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