Hannah Dairy Research Foundation

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Research Paper Summary

Risk factors for poor colostrum quality and failure of passive transfer in Scottish dairy calves

Short title: **Colostrum quality and failure of passive transfer**

Key words: **colostrum management; dairy; FPT; calves; risks.**

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Practical point

Failure of passive transfer has negative implications for calf health and welfare and farm economics. A study of 38 Scottish dairy farms showed that colostrum quality failed to meet Brix thresholds on 44% of farms and 30% of samples exceeded total bacterial count thresholds. Increased time between calving and colostrum harvest was associated with a lower Brix result and increased time in a bucket prior to feeding was significantly associated with increased total bacterial count.

Background

Calves are born with no antibodies and rely on feeding of maternal colostrum of sufficient quality and quantity to provide them with immunity in the first few weeks of their life, through a process called passive transfer. Immunoglobulins (mainly IgG) in colostrum provide passive protection to the neonate from infection in the early stages of life. Studies have shown that the biggest risks for failure to transfer passive immunity (FTPI) are associated with colostrum management. Calves that have FTPI (serum IgG ≤10g/L) have higher incidence of morbidity and mortality than their healthy counterparts with long-term negative effects on growth rates and first lactation milk yields.

Work undertaken

Female dairy calves (n=392) ranging from 1-7 days old were sampled from 38 farms in Stirlingshire, Lanarkshire and Dumfries and Galloway (Feb - June 2019). Blood samples were collected from all calves to determine serum immunoglobulin G (IgG), and 252 colostrum samples were collected at point of feeding to determine colostrum IgG. All samples were frozen at -20°C until testing. Where possible, serum and colostrum samples were matched – i.e., the calf blood sample was matched with the colostrum sample that the calf ingested.

The IgG concentration in serum was measured directly using radial immunodiffusion plates. Colostrum samples were thawed and mixed and a Brix refractometer used to indirectly estimate the IgG concentration by the Brix percentage. The colostrum total bacterial count (TBC) and colostrum total coliform count (TCC) were measured using agar plate culture and Petrifilms™ respectively; both incubated and then bacterial colonies counted.

Of 252 colostrum samples, 44.05% failed to meet Brix thresholds for colostrum quality, with approximately 30% and 20% of samples exceeding TBC and TCC thresholds respectively. There was no correlation between the colostrum Brix measurement and bacterial measurements. Calves fed colostrum with a TBC below the threshold (100,000 CFU/ml) had serum IgG concentrations higher than those calves which had been fed colostrum exceeding TBC thresholds.

The prevalence of FTPI (serum IgG ≤10g/L) in the current study (14.05%) was equivalent to recent American research in indoor systems (FTPI prevalence of 15.6%) but lower than other international literature in New Zealand pasture-based systems (FTPI prevalence of 33%). However, authors note that the study period did not cover a whole year, and there may be variation in FTPI prevalence with changes in management, season and feeding across the year.

There was relatively high coliform contamination of colostrum in the current study (19.84% exceeding international industry thresholds of 10,000 CFU/ml). Authors note that as this study sampled from collection buckets, more attention to detail may be needed on farm with regards to cleaning colostrum equipment. Leaving colostrum sitting in a bucket (particularly ≥6 hours) was associated with an increased risk of exceeding TBC and TCC thresholds.

Feeding calves 4.5-5L of first milking colostrum at their first feed was protective against FTPI. It may be possible to overcome low IgG colostrum by feeding a volume higher than the 10-12% bodyweight recommendation, but many of the farmers surveyed in this work were still feeding low quality colostrum in inadequate volumes (approximately 40% of respondents feeding 2.5-3 litres of colostrum or less).

This work suggests it is possible to reduce the risk of FTPI on Scottish dairy farms with small, feasible management changes to colostrum management and storage. A freezer and freezer thermometer, though a small capital investment, could greatly reduce risk of FTPI if used appropriately to store and monitor the temperature of colostrum preserved using low temperature preservation at -20°C. Minimising time between calving and harvesting of colostrum (to maximise IgG concentrations) and minimising time spent sitting in buckets prior to feeding (to minimise bacterial contamination) will both improve colostrum quality and reduce FPT. Finally, feeding at least 10-15% of calf bodyweight (providing a mass of at least 200g IgG) in colostrum at first feed could also mitigate the risk of FTPI.

Reference

Haggerty, A., Mason, C., Ellis, K., Denholm, K., (2021). Risk factors for poor colostrum quality and failure of passive transfer in Scottish dairy calves. Journal of Dairy Research, 88: 337-342