

Why do Some Calves Thrive and Others Die? Risk Factors Impacting Male and Female Dairy Calf Health

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■ Take Home Messages

- ▶ The health status of male and female dairy calves requires attention to improve its current state.
- ▶ Feeding an adequate quantity of high quality colostrum quickly after birth is essential for both male and female calves.
- ▶ Consistent and timely delivery of colostrum will ensure young calves can fight disease.
- ▶ Umbilical infections commonly occur in male and female dairy calves.
- ▶ Having a clean maternity pen area and excellent colostrum management, and housing calves on clean and dry bedding are good preventative practices to minimize navel infections.
- ▶ Early life nutrition is critical in protecting against disease and improving growth.
- ▶ Veterinarians are viewed as an important source of information by most Canadian dairy producers and can have a significant impact on calf health.
- ▶ Euthanasia is a practice that needs to be conducted in a manner that minimizes pain and suffering.

■ Introduction

Calf health, whether of male or female dairy calves, requires attention to improve its current state. A recent Canadian survey found that 6% and 2% of female dairy calves die during the preweaning and post weaning periods, respectively (Winder et al., 2018). These levels are similar to male calves, with 8% of calves dying over a 20-week production period at an Ontario milk-

fed veal facility (Winder et al., 2016). Most of this disease challenge occurs within the first weeks after birth, with 66% of female and 42% of male calves dying in the first three weeks of their respective production periods (Wells et al., 1996; Renaud et al., 2018a), suggesting that the management of the newborn dairy calf is essential to its survival and productivity.

Treatment for disease also occurs commonly in both male and female dairy calves. Approximately 23% and 22% of female calves are treated for diarrhea and pneumonia in the first 90 days of life, respectively (Windeyer et al., 2014). In male calves, 5% and 15% were treated for diarrhea and pneumonia, respectively, in a veal study conducted in Europe (Pardon et al., 2013). This high disease burden leads to the use of antimicrobials, which can contribute to the development of antimicrobial resistance. As mortality and morbidity are commonly used as markers of calf welfare, there needs to be a greater emphasis on their prevention to improve health and curb antibiotic use and resistance.

Objectives

The first objective of this manuscript is to evaluate some of the key factors influencing morbidity and mortality in male and female dairy calves. The second objective is to review some of the preventative practices that could be put in place to mitigate the risk of disease.

■ Colostrum Management

Colostrum management is a vital component of calf management. The success of the colostrum program can be evaluated using the rates of failure of passive transfer of immunity (FPT). Currently, in Canada the level of FPT remains elevated, with 12% and 22% of female and male calves having FPT, respectively (Renaud et al., 2018c; Windeyer et al., 2014). Many studies have highlighted the importance of passive transfer in male and female calves with lower levels of morbidity and mortality and higher average daily gains being seen in calves that did not have FPT. Thus, it is imperative to feed an adequate quantity of good quality colostrum with minimal bacterial contamination quickly following birth.

The Canadian Code of Practice for the Care and Handling of Dairy Cattle (Dairy Code of Practice) recommends feeding four litres of good quality colostrum in the first 12 hours following birth (NFACC, 2009). A recent survey identified that only 67% of over 1,000 Canadian dairy producers meet the dairy Code of Practice recommendation for colostrum management. Some producers also used the dam as a mechanism to deliver the colostrum to calves (Figure 1; Winder et al., 2018). With respect to male calves, 91% of dairy producers surveyed always fed colostrum to male calves, however, the

quantity and timing was not evaluated (Renaud et al., 2017). This suggests that trying to foster ways to improve colostrum management on some Canadian dairy farms may be necessary.

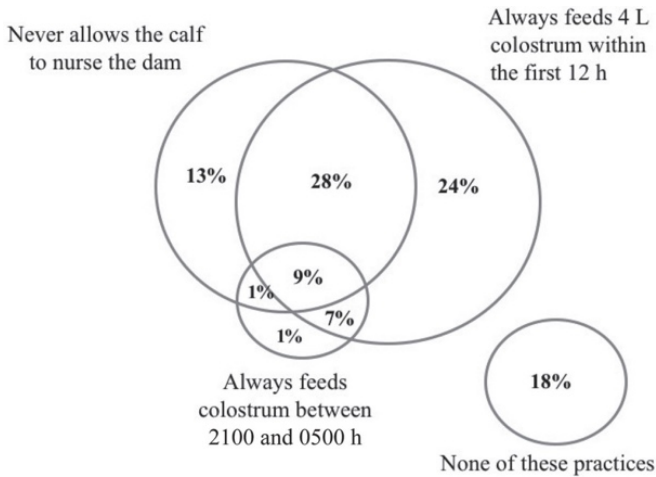


Figure 1: Overlap of the 1,036 Canadian dairy producer respondents who answered the following 3 questions: Regarding newborn heifer calves on your dairy farm, how often do you ... Allow the calf to nurse the dam? Feed at least 4 L of good-quality colostrum within the first 12 h? Feed colostrum between 2100 and 0500 h? Options were “always,” “most of the time,” “occasionally,” and “never.” Overlap is presented between those who answered “never” to allowing calves to nurse their dam, and “always” to the second two questions (Winder et al., 2018).

A potential opportunity to facilitate change in colostrum management on farm is through the use of benchmarking. Atkinson et al. (2017) demonstrated that by providing benchmarked levels of FPT to dairy producers, the rate of FPT was reduced from 21% to 13% when combined with changes made to the colostrum management program. A similar response was also seen with respect to calf growth (Figure 2). Advisors, specifically veterinarians, should be encouraged to provide this service to dairy producers as a way to facilitate improved colostrum management.

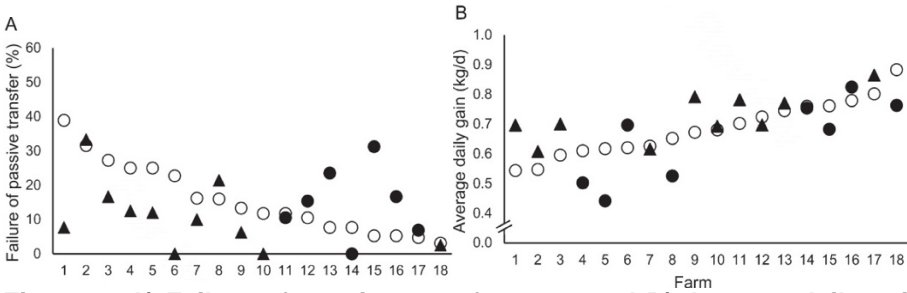


Figure 2: A) Failure of passive transfer rates and B) Average daily gain in preweaned calves before and after benchmarked reports. Open circles show the results of the farms prior to benchmarking intervention, triangles indicate farms that made management changes after the report, and closed circles represent farms that made no changes following the benchmarked report (Atkinson et al., 2017).

■ Umbilical Management

The umbilicus is responsible for the in-flow of nutrients and out-flow of waste products during gestation. There is a significant amount of blood that still flows to the umbilicus following birth and due to its proximity to several organs (Figure 3), bacterial contamination of this structure can lead to significant consequences, such as localized infection and inflammation, and dissemination to the joints, lungs, kidneys and other organs.

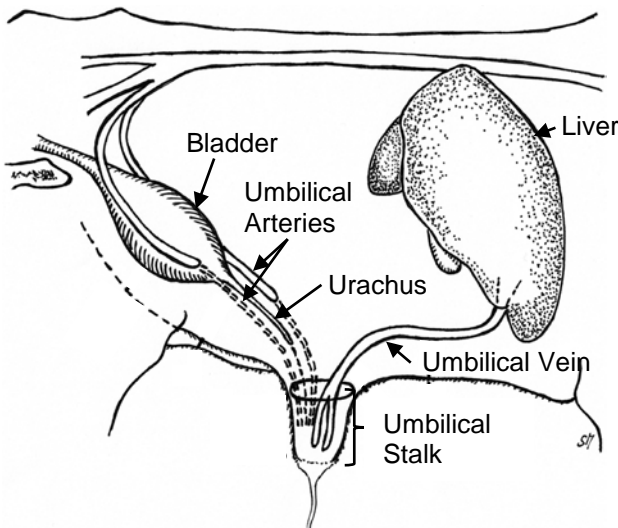


Figure 3: Anatomical representation of the umbilical structures in a young calf. Adapted from Wieland et al. (2017).

Recent studies have identified that both male and female dairy calves have high rates of umbilical infections. Wieland et al. (2017) found that 27% of female calves had an umbilical infection when examined over the first four weeks of life, whereas Renaud et al. (2018a) found that 26% of male calves arrived at an Ontario veal facility with an umbilicus that was at least enlarged with heat, pain and moisture. If navel infection is present, whether in male or female calves, the calves have a greater risk of dying and will have a lower growth rate. Hence, it is imperative to have preventative measures in place.

Several critical preventative measures can be followed to reduce the risk of umbilical infections. Having a clean maternity area, decreasing the amount of time newborn calves spend in the maternity pen, having excellent colostrum management and housing calves on clean and dry bedding have been shown to be good preventative practices to minimize umbilical infections. However, Winder et al. (2018) found that 83% of surveyed producers did not remove the calf from the cow within 30 minutes of birth, 24% of respondents never cleaned the calving area after calving and 11% always used the calving area to house sick or lame cows. This leads to a concern about the cleanliness of the calving area, which increases the risk of infection.

The application of umbilical disinfectant is also a common practice completed on calves in an effort to prevent umbilical infections. In fact, in a recent Canadian survey, 40% of producers always applied an umbilical disinfectant to male calves (Renaud et al., 2017). However, despite the high number of producers using this practice, little is known about its effectiveness in preventing umbilical infections. There has not been a single study comparing the use of navel dip compared to no navel dip. We also don't know how often the dip should be applied or the best application method to use. Thus, your efforts should be focused on cleanliness of housing and excellent colostrum management to prevent umbilical infections.

■ Nutritional Management

The importance of early life nutrition in dairy calves has been well documented. Nutritional programs providing higher volumes of milk increase weight gain and may aid in improving disease resistance over the pre-weaning period in female dairy calves. When male dairy calves arrive at a veal facility with low body weight or a visually depressed flank, they have a high risk of mortality and if they survive, have a lower rate of gain (Renaud et al., 2018a). Thus, nutrition on the source dairy farm is an important factor in prevention of morbidity and mortality in male calves because of its influence on average daily gain and immune function.

The average maximum level of milk provided by surveyed Canadian dairy producers was eight litres; however, 33% of respondents stated that they fed a maximum of six litres or less (Figure 4; Winder et al., 2018). Differences

were also found in the nutrition provided to male calves when on the source dairy farm, with 13% of respondents feeding male calves differently than female calves. Because of the importance of early life nutrition in maintaining health, growth and vigor, it is important to feed 20% of the calf's body weight as recommended by the Dairy Code of Practice.

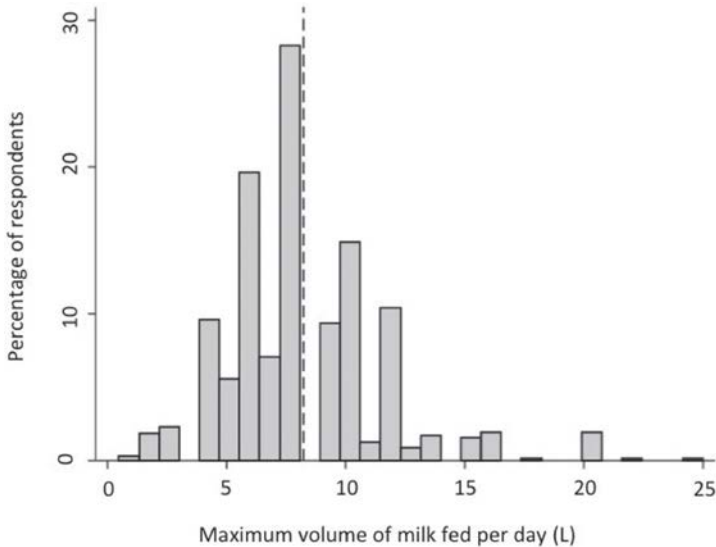


Figure 4: Distribution of the maximum amount of milk fed per day to female dairy calves by proportion of Canadian dairy producer respondents (Winder et al., 2018)

■ Veterinary Involvement

Most Canadian dairy producers view their veterinarians as an important source of information about dairy herd health and management (Winder et al., 2018). However, in a recent survey conducted in Ontario, only 33% of veterinarians asked about the health and performance of calves at routine herd health visits. If the veterinarian did not ask about the calves, the dairy farm was associated with having a higher level of mortality in the male calves being shipped to a veal facility (Renaud et al., 2018b). Having veterinarians routinely involved in calf care is important because they initiate discussions and play a key role in implementing changes in management practices to improve disease control (Jansen and Lam, 2012). Thus, producers and veterinarians are encouraged to engage in discussions regarding calf health management to identify problems early and put in place corrective management practices as well as aid in creating treatment protocols for calf-hood diseases.

One way to improve engagement could be through the use of benchmarked reports in calves as mentioned earlier in this review. Taking blood samples from calves between one and nine days of age could be used to monitor total protein levels as a marker of colostrum management. Heart girth weight tapes could also be used as a simple metric to monitor the growth performance of young calves. This type of data collection could be completed and presented at routine herd health visits to allow for informed decision making on some dairy farms.

■ Euthanasia Practices

Although not a risk factor impacting calf health, proper euthanasia practices are needed to minimize the amount of pain and/or suffering that a calf experiences when it is euthanized. In the recent National Dairy Study, some of the respondents indicated that they used blunt force trauma as a mechanism of euthanizing calves (Renaud et al., 2017). This is, however, not an acceptable method of euthanasia for neonatal calves because the anatomical features make it difficult to achieve immediate destruction of brain tissue, and it is challenging to apply this method consistently (Leary et al., 2013). This method of euthanasia is also not deemed acceptable in the Dairy Code of Practice; thus, it is important to ensure alternative and appropriate humane methods of euthanasia are used on all farms. Acceptable methods of euthanasia include a gun shot, captive bolt or the injection of veterinary solutions that lead to a quick and painless death.

■ Conclusion

Calves, whether male or female, experience many health challenges in early life. The first hours and days following birth are integral to set up the calf for success. It starts with colostrum and umbilical management and continues with having ample nutrition to ease disease burden. Veterinarians can play a key role in improving calf health management by collecting information on critical components of calf care and presenting the data in a useable format. Veterinarians can also ensure producers are educated on euthanasia methods that ensure a quick and painless death occurs for calves. Talk to your veterinarian about your current calf health practices, and to tailor a plan that ensures optimal health and welfare of your calves.

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