BRD in preweaned calves: What's new in risk factors?

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Abstract

Surveys of cow-calf producers indicate that undifferentiated bovine respiratory disease (BRD) in preweaned beef calves is recognized on approximately 20% of operations. In the US, BRD is reported to be the leading cause of death in preweaning calves 3 weeks of age and older. As compared to feedlot BRD or dairy calf BRD, relatively little information has been published regarding the epidemiology of preweaning beef calf BRD, or risk factors for the problem. However, the available information indicates that the annual incidence of preweaning calf BRD varies significantly between herds, and between years in herds that experience the problem. Calves identified with preweaning BRD have been found to weigh less at weaning than calves not identified with preweaning BRD. While more research is needed, evidence available to date indicates that at the calf level, male calves, calves born with a twin, calves born to a heifer, and calves that experience dystocia requiring major assistance are at increased risk for preweaning BRD. At the herd level, factors that have been associated with preweaning calf BRD include those that may 1) increase the opportunity for introduction of pathogens new to the herd; 2) increase susceptibility of calves to infection; and/or 3) increase opportunity for close contact among cows and calves within the herd. Because risk factors to date have been identified in cross-sectional surveys and thus are not necessarily causative, more research is needed to confirm the factors that cause preweaning calf BRD, and to identify practices that can mitigate the disease in herds where it is a problem.

Key words: beef calves, BRD, risk factors

Résumé

Des questionnaires aux producteurs de bovins allaitants ont montré que le complexe respiratoire bovin (CRB) chez les veaux de boucherie présevrés était présent dans 20% des productions. Aux États-Unis, le complexe représenterait la cause majeure de décès chez les veaux présevrés âgés de plus de trois semaines. Au contraire du CRB en parc d'engraissement ou chez les veaux laitiers, il existe peu d'information publiée au sujet de l'épidémiologie du complexe chez les veaux de boucherie présevrés ou sur ses facteurs de risque. Toutefois, les recherches en cours indiquent que l'incidence annuelle du CRB chez les veaux présevrés varie significativement d'un troupeau à l'autre et d'une année à l'autre chez les troupeaux ayant ce problème. Les veaux présevrés ayant cette condition pèsent moins au sevrage que les veaux chez qui le CRB n'a pas été identifié. Bien que plus de travaux soient nécessaires, les données disponibles à ce jour indiquent que certaines catégories de veaux, dont les veaux mâles, les veaux nés avec un jumeau, les veaux de taures et les veaux issus d'un vêlage dystocique ayant nécessité une assistance importante, sont plus à risque de développer le CRB avant le sevrage. Au niveau du troupeau, les facteurs qui sont associés au CRB avant sevrage incluent ceux qui 1) augmentent la possibilité que de nouveaux pathogènes s'introduisent dans le troupeau, 2) augmentent la susceptibilité des veaux à l'infection et/ou 3) augmentent la possibilité d'un plus grand contact entre les vaches et les veaux dans le troupeau. Parce que les facteurs de risque connus ont été identifiés à partir d'études transversales, et ne sont donc pas nécessairement causaux, d'autres travaux sont nécessaires pour confirmer les facteurs qui causent le complexe respiratoire bovin chez les veaux présevrés et pour identifier les pratiques qui peuvent réduire l'impact de la maladie dans les troupeaux ayant ce problème.

Introduction

Bovine respiratory disease (BRD) is the leading cause of death for all classes of cattle and calves in the United States, with animal deaths alone costing producers over $643 million annually (2010 estimate).[15] This estimate does not include the cost of treatment or lost production, which likely put the annual total cost of BRD to US producers well over $1 billion. Recent National Animal Health Monitoring System (NAHMS) surveys confirm that BRD is the leading cause of mortality in US feedlot cattle,[12] weaned dairy heifers,[13] and nursing beef calves 3 weeks of age or older.[14] Thus, BRD has a significant impact on the profitability of cattle operations and on the health and welfare of cattle.

Bovine respiratory disease is the result of multiple factors acting in concert. Management practices play a role in the development of BRD. Modification of management procedures, along with adoption of practices to improve immunity and limit pathogen exposure, have been effective in curtailing respiratory disease in feedlot cattle in some situations.[3,6] Thus, knowledge of risk factors for BRD may provide opportunities to improve health and productivity in cattle. Much is

known about the management practices that increase BRD risk in feedlot cattle and dairy calves; in contrast, less is known about the management-related risk factors for nursing-calf BRD on cow-calf operations. This review will summarize currently available information regarding the impact of preweaning calf BRD and risk factors for the problem; it will also suggest future research necessary to improve the ability of veterinarians to make evidence-based suggestions for prevention of preweaning calf BRD.

Impact of Preweaning Calf BRD

Surveys of cow-calf producers in the US and Canada have indicated that BRD in preweaning beef calves is recognized annually on 18% to 36% of operations,[2,11,18] with 13% to 18% of total calf mortality attributable to BRD.[2,11] In the US, BRD is reported to be the leading cause of death of preweaning calves 3 weeks of age and older.[14] A survey of necropsy results from calves submitted over a 15-year period found BRD to be the third most common cause of all calf death, after dystocia and hypothermia.[1] The within-herd rate of preweaning calf BRD appears to be highly skewed, with many herds reporting no BRD and a few herds reporting a high rate of disease;[5] this has also been reported for dairy calf BRD.[8] Details of the epidemiology of preweaning calf BRD in a single large US research herd have been reported.[7,9] Over 20 years, the annual incidence of preweaning calf BRD in this herd varied from 3% to 24%, with an average annual incidence of 11%. Annual mortality among calves with BRD varied from 7% to 17%, with an annual average of 13%. Calves identified with preweaning BRD weighed 17.0 lb (7.7 kg) less at weaning than calves not identified with preweaning BRD. In some years, the incidence of preweaning BRD was higher than the incidence of BRD after calves were weaned and transferred to the feedlot. While these data represent only one large herd, they confirm that the impact of BRD in nursing beef calves can be important. In another study, calves with BRD in the first 45 days of life were found to weigh 36.3 lb (16.5 kg) less on average at weaning than calves that were not identified to have signs of BRD.[18]

Calf-Level Risk Factors

Calf-level factors associated with preweaning respiratory disease over several years in a large US herd included the year of the calf's birth, the location of the calf's group on the operation, whether or not the calf experienced dystocia requiring major assistance, the calf's sex (with male calves being at greater risk), and the age of the calf's dam (with calves born to heifers being at greater risk).[7] Other investigators reported that calves born with a twin, and male calves, were significantly more likely to be identified with respiratory disease in the first 45 days of life.[17] Antibody titers to viral respiratory pathogens in calves have been correlated with titers in their dams when their dams are vaccinated.[4] Higher titers to bovine herpesvirus-1 (BHV-1), bovine viral diarrhea virus (BVDV), and bovine coronavirus (BCV) in cows vaccinated for these pathogens were associated with decreased risk of respiratory disease in their calves.[4]

Herd-Level Risk Factors

A survey of Canadian cow-calf producers in the province of Québec[2] found that farms with fewer than 40 cows were less likely to report a problem with preweaning calf BRD than farms with 40 or more cows; 16% of producers with fewer than 40 cows reported the occurrence of preweaning calf BRD, while 36% of producers with 40 or more cows reported calf BRD. In this study there were regional differences in the rate of recognition of preweaning calf BRD, with producers in the northern regions of the province reporting treatment of a larger proportion of their calves for preweaning BRD than producers in the southern and central regions. The rate of preweaning calf BRD was associated with calving season length, with a longer calving season being associated with more cases of calf pneumonia. Another study in Québec found that the incidence of preweaning calf BRD in the first month of life was decreased if the herd vaccinated cows for respiratory viruses, with a 13% incidence of BRD in calves in the first month of life in herds not vaccinating cows, versus a 6% incidence in herds vaccinating cows.[4]

More recent research has evaluated herd-level risk factors for preweaning calf respiratory disease in US cow-calf herds. An analysis of USDA NAHMS data collected by survey of 443 producers in 24 states found that the rate of preweaning calf BRD was increased in herds that imported steers from outside sources, herds composed of 2-breed or 3-breed crossbred or composite cattle (versus single-breed cattle), herds that administered antibiotics in feed to prevent calf BRD, and herds that were considered the primary source of income for the producer (versus herds that were considered a supplemental source of income).[5] The monthly number of visits to the herd by outsiders was associated with calf BRD, but the relationship between number of visits and the calf BRD rate was not linear.

In another recent study, a mail survey of 459 US cow-calf producers in 3 eastern states (Georgia, Florida, and West Virginia) and 3 plains states (Iowa, Kansas, and Nebraska) found that the occurrence of preweaning calf BRD was significantly associated with larger herd size, the occurrence of respiratory disease in cows, and the occurrence of diarrhea in calves.[19] Calving season

length was associated with calf respiratory disease in plains but not eastern herds, with plains herds calving in less than 3 months recognizing less calf BRD than plains herds calving over 3 months or longer. The proportion of calves treated for BRD (i.e., the cumulative treatment incidence) was negatively associated with larger herd size and checking cows for pregnancy, and positively associated with winter calving, bringing calves into the herd from outside sources, giving calves supplemental feed not available to the cows (creep feed), and using a heat synchronization program for cows and/or heifers. Thus, in larger herds producers were more likely to identify calves with preweaning BRD, but they treated a smaller proportion of calves for BRD than producers with smaller herds.

It is important to note that the herd-level risk factors described above were all identified in cross-sectional surveys. Thus, it is not possible to determine from these studies whether the factors associated with preweaning calf BRD were causative. That is, since these results were identified from data collected at one point in time, it is not possible to say whether preweaning calf BRD came before or after the risk factors noted. More research will be needed to determine whether the factors listed above (or others) are actually causative, and whether manipulation of management practices related to these or other factors can mitigate preweaning calf BRD. However, it is noteworthy that some common themes are identifiable in the risk factors reported to date. Larger herd size has been repeatedly linked to the occurrence of preweaning calf BRD; this may simply be because herds with more calves have more animals that have the opportunity to develop BRD. Practices that may be a source of introduction of pathogens new to the herd have been related to calf BRD in multiple studies, such as introduction of weaned steers[5] or calves[18] from outside sources. Also, practices that increase opportunities for calves to come into close contact with other calves or cows, such as creep feeding calves,[19] or estrus synchronization of cows,[19] may increase risk for preweaning BRD by providing more opportunities for calves to contact other cattle shedding respiratory pathogens, and for respiratory pathogen shedding in the group to be amplified. Longer calving season, which has been associated with calf BRD in two studies,[2,19] may increase opportunity for transmission of respiratory pathogens to older calves with waning immunity from younger calves who may be shedding pathogens.

While the risk factors identified to date cannot be assumed to be causative, some may be. Future research to evaluate modification of some of these risk factors may lead to strategies to decrease calf BRD in herds where the disease is a problem. For example, calf diarrhea was strongly associated with occurrence of calf BRD in one study.[19] Calf diarrhea has also been associated with occurrence of respiratory disease in dairy calves.[16] This relationship may be due to negative metabolic or immunologic effects of diarrhea which then diminish the ability of calves to resist respiratory infection. Alternatively, the occurrence of calf diarrhea may be indicative of a herd problem such as suboptimal passive transfer or frequent opportunities for contact with infectious agents, which could also increase risk for BRD. It would appear that controlling calf diarrhea on operations where it is a problem might lead to decreased respiratory disease incidence in at least a subset of herds also dealing with BRD.

The relationship identified between heat synchronization of cows and/or heifers and calf BRD[19] is the subject of anecdote; this practice may lead to calf BRD because gathering cow-calf pairs together for the treatments required for synchronization of the cows increases opportunities for transmission of infectious respiratory pathogens from cows to calves, or among calves. If this is the case, perhaps modifications in calf handling during synchronization, or efforts to improve calf immunity before synchronization occurs, could help decrease respiratory disease in herds that synchronize. Likewise, creep feeding calves may increase opportunities for transmission of infectious respiratory pathogens among calves. Perhaps the practice should be discontinued if it is occurring in a herd with a persistent preweaning calf BRD problem. Alternatively, it may be that neither synchronization nor creep feeding increase calf BRD, but rather the practices give producers more opportunities to recognize calves with signs of BRD. Bringing in steers[5] or calves[19] from outside sources may increase calf BRD through introduction of respiratory or other pathogens new to the herd. This practice is an obvious biosecurity risk, and should perhaps be discouraged on operations with a high incidence of preweaning calf BRD.

Taken together, the research to date suggests that practices that may increase opportunity for introduction of pathogens new to the herd, situations that may increase calf susceptibility to infection, and practices that may increase opportunity for transmission of infectious agents among cows and calves, should be a particular focus in efforts to develop evidence-based practices to control preweaning calf BRD.

Conclusions

Preweaning calf BRD can have an important impact on cow-calf operations, although the incidence of disease seems to vary substantially among herds, and across years in an individual affected herd. Although more information is needed to support evidence-based recommendations to control preweaning beef calf BRD, currently available information indicates that control measures may effectively be aimed at practices that in-

crease the opportunity for introduction of pathogens new to the herd, factors that increase susceptibility of calves to infection, and practices that increase opportunity for close contact among cows and calves within the herd.

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