ISSN 1466-2523

Animal Health Research Reviews **15**(2); 120–122
doi:10.1017/S1466252314000115

BRD in 2014: where have we been, where are we now, and where do we want to go?

W. Mark Hilton*

Beef Production Medicine, Purdue University College of Veterinary Medicine, 625 Harrison Street, West Lafayette, Indiana, USA

Received 15 June 2014; Accepted 19 August 2014; First published online 31 October 2014

Abstract

Bovine respiratory disease (BRD) is a worldwide health concern and is the number one disease of stocker, backgrounder, and feedlot cattle in North America. In feedlots in the USA, BRD accounts for 70–80% of all feedlot morbidity and 40–50% of all mortality. In 2011, the US Department of Agriculture's National Animal Health Monitoring System conducted a feedlot study that showed 16.2% of all feedlot cattle were treated for BRD. It is universally accepted that this number is distressingly high and that our industry has the tools available to reduce the incidence of BRD.

Keywords: bovine respiratory disease, risk factors, pathogens, morbidity, mortality.

Bovine respiratory disease

Bovine respiratory disease (BRD) is a disease of the lower respiratory tract of cattle that is multifactorial in origin and results in bronchopneumonia. Typical viral pathogens are: infectious bovine rhinotracheitis virus, bovine viral diarrhea virus (BVDV), parainfluenza type 3 virus, and bovine respiratory syncytial virus; while bacteria include: *Mannheimia haemolytica, Pasteurella multocida, Histophilus somni*, and *Mycoplasma bovis*. There may be other pathogens involved, but these are the most cited (Cusack *et al.*, 2003).

Risk factors for BRD include: weaning, surgical procedures at or near weaning, lack of immunity via vaccine or natural exposure, changes in diet – especially abrupt changes to a high starch diet, pooling of cattle from many sources, continuous additions of cattle to the pen, purchasing from salebarns, transportation, dusty conditions, parasitism, concurrent diseases, and weather extremes (Taylor *et al.*, 2010a, b). Exposure to pathogens from other cattle is frequently mentioned as a risk factor and the viral pathogens listed above are highly contagious, but this is not true for all of the bacteria. Recent work by Timsit *et al.* (2013) and Taylor (personal communication, 2014) indicate that during BRD episodes, disease due to *M. haemolytica* and *P. multocida* is not primarily due to the spread of a single virulent clone among cattle and highlights the importance of predisposing factors, such as viral infections, shipping, and comingling that enable the resident flora to overcome the cattle's immune system. In these studies, the bacteria recovered were for the most part resident flora of the calves' retropharyngeal lymph nodes and tonsil.

When a calf succumbs to BRD it is most likely due to an accumulation of errors earlier in life. One or numerous 'stressors' listed above results in a compromised immune system that may or may not have been adequately protected from viral and/or bacterial challenge by vaccination and/or natural challenge. The immune system is overwhelmed, the resident bacterial normal flora invades the lung and sickness occurs.

Programs such as the preconditioning of calves – weaning calves at the farm of origin and feeding for a minimum of 30 days (45 days or more is highly recommended), vaccinating against BRD pathogens, training calves to eat from a bunk and drink from a tank, deworming and performing all surgeries well ahead of weaning – have shown to dramatically decrease morbidity and mortality if calves are shipped to a feedlot that purchases most/all preconditioned calves (Cravey, 1996; Taylor *et al.*, 2010a, b). If a pen of preconditioned calves is placed in a feedlot filled with unweaned, unvaccinated, high-risk calves with other risk factors mentioned above, the chances are great that the preconditioned calves will have morbidity and mortality rates similar to the high-risk calves that are also in the environment. Contagious viral pathogens can overwhelm the preconditioned calf's immune system and the cascade of events that initiated BRD in the high-risk calves can also cause disease in the preconditioned calves.

The vaccines available to prevent BRD continue to improve. We now have viral vaccines with Type 2 BVDV and Type 1b

*Corresponding author. E-mail: hiltonw@purdue.edu

BVDV, the latter of which is the most prevalent strain found in morbid North American feedlot cattle. Current bacterins including the most common BRD pathogens have evolved and improved over the years similar to viral products. We have also added ancillary treatments such as flunixin meglumine to our protocols (National Animal Health Monitoring System, NAHMS; USDA, 2000), but the fact remains that we have a higher incidence of BRD in the feedlot than we had 20 years ago. NAHMS data from 1994, 1999, and 2011 shows BRD deaths increasing from 10.3 to 14.2 to 16.0 per 1000 head placed (Loneragan *et al.*, 2001). In 2011 we fed 25,747,000 cattle in the US and 1.6% or 411,952 cattle died of BRD. Zero mortality is impossible, but what is a reasonable number? Surely we can do better than 1.6% mortality.

Edwards sums up the current state of affairs: 'Although there have been aggressive advances in the technology of vaccine, antimicrobial, and anti-inflammatory agents, these products are merely tools intended to assist in the prevention and control of BRD. Despite these advances, morbidity and mortality rates among feedlots have not declined. We cannot overlook the effect that sound animal care and husbandry practices have on the health and performance of cattle. It is highly unlikely that control of BRD in the feedlot can be accomplished through an on-arrival vaccination program. Therefore, the initial effort for developing a competent immune system must be initiated at the cow–calf level and carried through each sector of the production chain.' (Edwards, 2010)

Why do we have increased BRD in the feedlot?

Just as BRD is a multifactorial disease, the answer to the above question has many facets. Our differential list of why BRD is increasing includes: younger cattle with less immunity being placed into the feedlot environment; increased viral exposure due to larger numbers of cattle in the pens; more cattle moving through multiple marketing channels; and, due to extremely high prices, more unweaned, unvaccinated cattle being marketed.

Prevention of BRD

Metaphylaxis

Metaphylaxis, or mass medication during the incubation period of the disease, of feedlot cattle has been a well-documented way to decrease morbidity and mortality due to BRD in 'high risk' cattle. The 2011 NAHMS feedlot survey estimated that 21.3% of all cattle entering the feedlot undergo metaphylaxis while in 2000 it was only 10.4% (NAHMS; USDA, 2000). While quite effective, is this the complete answer? Will this satisfy the consumer when we see that the number one concern of the 2011 beef audit is food safety (NCBA, 2012)? I think we need to do even better yet.

What if McDonald's or Wal-Mart decides not to purchase cattle that were given antibiotics at feedlot entry instead of using best management practices before arrival? Who among us can defend the practice of taking unweaned, unvaccinated calves and hauling them sometimes hundreds of miles and placing them in a new environment with hundreds of other similarly naïve calves? Our cattle deserve better and we can surely provide better care.

In the US Department of Agriculture's NAHMS 2011 Feedlot Study, feedlot operators were asked about the importance of pre-arrival management practices such as weaning at least 4 weeks prior to shipment, use of respiratory vaccines before or at weaning, calves castrated and dehorned at least 4 weeks prior to weaning, introduction to feedbunk, and calves treated for external and internal parasites prior to shipping, on the effectiveness of reducing morbidity and mortality. An average of 81.5% answered that these practices were extremely or very effective in reducing sickness and death loss in feedlot cattle.

When asked about the importance of having pre-arrival processing information, 69.3% of feedlot managers said this was 'very important'. However, when asked how often the feedlot receives this information, only 34.7% responded 'always' while 56.2% responded 'sometimes'. This is another area where we must do better (USDA, 2013).

Preconditioning

Why are we continuing to discuss a subject that has shown promise in preventing BRD for over 50 years? Some of the reasons are due to initial studies that showed it was not cost-effective for the cow–calf producer to precondition calves before sale. Many of these studies had daily gain well below what cattle should gain on a preconditioning ration and some showed a much higher morbidity and mortality rate at the farm of origin (cow–calf herd) than was seen in later trials. Others only focused on the preconditioning 'premium' and totally neglected the much larger profit made in the efficient weight gain of newly weaned calves (Cravey, 1996). Another reason not everyone agrees that preconditioning is beneficial is that buyers of 'cheap calves' can at times add tremendous value to these calves in the right circumstances. Of course, at other times these high risk calves are the source of large financial losses.

In 2008 it was estimated that only 33.6% of all calves marketed were sold after being weaned for 32 or more days (USDA, 2010). If we as professionals want to encourage the production of more preconditioned calves, staging a boycott of purchasing high risk calves would probably not work on an industry-wide basis. We have all heard stories of feedlot clients that have made a large profit on a group of high risk cattle despite a high morbidity rate. A long-time cattle feeder once told me that 'bought right is half sold' and I have never forgotten that. Cheap calves can become highly profitable. Our goal should be to continue to show the value of preconditioning to our clients so they produce fewer and fewer 'cheap calves'. In an 11-year study of a herd in Indiana, the owner returned $80.70/head to labor and management for preconditioning calves for 63 days with 63% of the added profit due to

https://doi.org/10.1017/S1466252314000115 Published online by Cambridge University Press

additional weight sold. In our study, the owner's wage for his time spent with preconditioning/backgrounding was \$54.74–130.22 h^{-1} (Hilton and Olynk, 2011). It is my opinion that instead of always discussing the buyer-dependent 'preconditioning bonus', we need to highlight the profit from additional pounds sold and profit per hour for the enterprise which is seller dependent.

What do we need to do to decrease BRD incidence in cattle?

I have broken down some ideas into three areas relating to the impact of significantly decreasing the incidence of BRD in North America.

Questionable impact

- Develop new BRD vaccines and/or bacterins to give at feedlot entry
- Develop new and longer-acting antibiotics

Potential impact

- Increased study on micronutrients that are important for immune function
- Improve preweaning nutrition of calves
- Discover new viral or bacterial pathogens that cause BRD
- Develop new BRD vaccines and/or bacterins to be given well before entering marketing channels
- Discover genetic components of BRD susceptibility

Likely impact

- Improve immunity of the calf before it arrives at feedlot
- Increase the age of cattle at feedlot entry
- Feed more calves to slaughter at farm of origin, eliminating co-mingling
- Decrease the number of high-risk calves entering marketing channels
- Perform all surgeries at the farm of origin
- Demand by retailers for beef from preconditioned calves based on enhanced animal welfare

Summary

Despite many advances in prevention and treatment of BRD, morbidity and mortality due to BRD have increased over the past 20 years. Our current antibiotics and vaccines are superior to those used many years ago, and the benefit of adding ancillary therapies to the use of injectable antimicrobials for treatment of BRD seems equivocal at best. The many known risk factors, not therapeutic failures, seem to be the most important reasons for explaining an increased incidence of BRD in the feedlot.

While we have seen some advances in prevention of BRD, we still have morbidity and mortality rates due to BRD that most experts would concur are too high. Prevention of BRD must begin at the cow–calf level and producers need to closely examine the benefits of programs like preconditioning. Selling calves at heavier weights where the additional pounds are added in a cost-effective manner can add significant income to the producer's business. Benefits of feeding preconditioned calves in the feedlot include: decreased morbidity and mortality, improved animal welfare, decreased use of antimicrobials, and increased profitability for the feedlot.

References

Cravey MD (1996). Preconditioning effect on feedlot performance. *Proceedings of the Southwest Nutrition and Management Conference* p. 33.

Cusack PMV, McMeniman N and Lean IJ (2003). The medicine and epidemiology of bovine respiratory disease in feedlots. *Australian Veterinary Journal* **81**: 480–487.

Edwards TA (2010). Control methods for bovine respiratory disease for feedlot cattle. *Veterinary Clinics of North American Food Animal Practice* **26**: 273–284.

Hilton WM and Olynk NJ (2011). Profitability of preconditioning: lessons learned from an eleven-year study of an Indiana beef herd. *Bovine Practitioner* **45**: 40–50.

Loneragan GH, Dargatz DA, Morley PL and Smith MA (2001). Trends in mortality ratios among cattle in US feedlots. *Journal of the American Veterinary Medical Association* **219**: 1122–1127.

National Cattleman's Beef Association (NCBA) (2012). The beef checkoff: executive summary: the 2011 National Beef Quality Audit. [Available online at: http://viewer.epaperflip.com/Viewer.aspx?docid=2ccd33e4-23dd-499e-aa72-a09400acb502#?page=0]. Last accessed August 24, 2014.

Taylor JD, Fulton RW, Lehenbauer TW, Step DL and Confer AW (2010a). The epidemiology of bovine respiratory disease: what is the evidence for predisposing factors? *Canadian Veterinary Journal* **51**: 1095–1102.

Taylor JD, Fulton RW, Lehenbauer TW, Step DL and Confer AW (2010b). The epidemiology of bovine respiratory disease: what is the evidence for preventive measures? *Canadian Veterinary Journal* **51**: 1351–1359.

Timsit E, Christensen H, Bareille N, Seegers H, Bisgaard M and Assie S (2013). Transmission dynamics of *Mannheimia haemolytica* in newly-received beef bulls at fattening operations. *Veterinary Microbiology* **161**: 295–304.

USDA (2000). Part III: Health Management and Biosecurity in U.S. Feedlots, 1999. USDA-APHIS-VS-CEAH-NAHMS, Fort Collins, CO. #N336.1200.

USDA (2010). Beef 2007–08, Part IV: Reference of Beef Cow–calf Management Practices in the United States, 2007–08. USDA: APHIS:VS, CEAH. Fort Collins, CO. #523.0210.

USDA (2013). Feedlot 2011 Part I: Management Practices on U.S. Feedlots with a Capacity of 1,000 or More Head. USDA-APHIS-VS-CEAH-NAHMS, Fort Collins, CO. #626.0313.

https://doi.org/10.1017/S1466252314000115 Published online by Cambridge University Press