ISSN 1466-2523

Animal Health Research Reviews **10**(2); 165–167
doi:10.1017/S1466252309990247

BRD research needs in the next 10–20 years

D. Scott McVey

Veterinary Diagnostic Center, University of Nebraska – Lincoln, East Campus Loop and Fair Street, Lincoln, NE 68583, USA

Received 12 August 2009; Accepted 16 October 2009

Abstract

Despite numerous advances in bovine infectious disease research, bovine respiratory disease (BRD) remains a significant disease threat and a cause of tremendous loss. Renewed efforts and innovative strategies are required to build on the successes of the past to achieve the successes of tomorrow. Continued and improved support of BRD research will prove to be a worthwhile investment. To achieve better coordination and more efficient use of resources, the following supportive actions should be considered. There should be coordination of integrative teams through an over-arching agency (United States Department of Agriculture (USDA)) to provide peer review and priority review for available public research funds. This would include use of development grants (as seed and matching funding) available to public/private partnerships. Testing and validation of new procedures in production settings (providing more than cost analyses) should be strengthened. Publication of studies should be promoted and old links between clinicians, diagnosticians and basic researchers should be re-established. Sets of 'best practices' should be published. Programs to support both basic and applied research through graduate fellowships, residencies, workshops and start-up funding for young research scientists should be strengthened. Sustained funding to train the next generation of research investigators should be addressed as a critical need.

Keywords: pathogenesis, coordination, clinical management, innate resistance

Introduction

The bovine respiratory disease (BRD) complex is the most important cause of economic losses for the cattle backgrounding and feedlot industries as reviewed by Gagea *et al.* (2006) and Snowder *et al.* (2006). The costs of mortality, therapy and poor growth performance have contributed to these losses, which approach US$1 billion per year (Griffin, 1997). Treatment costs alone average over US$15.00 per head and labor and feed efficiency factors probably increase the costs significantly. Losses of this magnitude to cattle producers warrant continued research.

Vaccination as well as metaphylactic and therapeutic antibiotic treatment are commonly used to with limited success prevent and/or treat the bacterial components of the BRD complex. Although the aggregate scientific understanding of the host animal responses and interactions with microbial agents has increased substantially, immunization and antimicrobial therapy have not reduced the prevalence or severity of BRD (Gagea *et al.*, 2006).

There are several possible research strategies to reduce the incidence and impact of BRD. It is possible to categorize the strategies into three major areas. One of these is continuation of investigations to understand the pathogenesis of BRD and to create more effective strategies to enhance host resistance. This strategy would maintain the momentum of ongoing research. A second is the development of new methods and technologies to enhance the efficacy of clinical diagnostic and treatment procedures. The third approach is the application of genetic, management and nutrition technology to decrease the risk of BRD in cattle. Based on these three strategies, the following lists contain examples of possible research objectives for the future and also reflect the breadth of possible confounding factors that contribute to the current BRD problem.

E-mail: dmcvey2@unl.edu

Continued investigations to understand the pathogenesis of BRD

There is a need for improved vaccines whose end results go beyond marginal efficacy and incremental gain.

(a) The genetic basis of disease resistance requires further characterization.
(b) The role of inflammation in pathogenesis and its relationship to severity of disease are worth more exploration.
(c) Studies on vaccine formulation and administration strategies could lead to marked improvements in performance.
(d) It is important to build on historical research by identifying the leads that are worth pursuing.

Enhanced clinical management of BRD

Epidemiological concepts may be used to assist in managing BRD. In particular, the relationships between pathogenesis, therapeutics and disease management should be exploited.

(a) Stress has long been identified as a major factor in BRD but implementation of stress management is not a well-developed area. Handling, feeding, environmental pressure and transport all contribute to stress for the animals.
(b) Antimicrobial therapy has an important role but it needs to be administered to maximize the opportunities for clinical cures and minimize the selection of resistant organisms.
(c) Metaphylactic use of antibiotics has the potential to be a valuable pre-emptive too and vaccines could be used therapeutically as well as in prevention.
(d) Vaccine performance may be markedly enhanced by changes in vaccination strategies and timing of immunizations.
(e) There is a need for rapid and sensitive diagnostic tools and strategies that allow effective early intervention.
(f) Pre-arrival management, including stress reduction, can be refined to improve the outcome.
(g) More effective transfer of new information from the research laboratory to the production system is another way in which improvements may be possible.

Innate resistance to BRD

The identification of heritable and selectable traits that relate to enhanced resistance to BRD pathogens, or perhaps to enhanced clearance and healing, would provide another avenue for producers. More information is needed on the interplay of nutrition and disease management.

BRD continues to be an important source of loss to the cattle industry and current management systems contribute directly and indirectly to this disease problem. It seems therefore reasonable that integrated research strategies that investigate the interactions of pathogenesis, epidemiology, clinical and laboratory diagnostics and innate resistance would be advantageous. These types of research activities generally require teams of investigators with sufficient resource, experience and skill. Examples of general research and educational objectives that could be addressed through such integrated approaches are: (1) trait selection for enhanced resistance to BRD and perhaps other acute inflammatory diseases, (2) innovative immunization strategies that provide rapid and effective onset of immunity, (3) handling practices to minimize stress of cattle, (4) early and rapid diagnostic methodologies to anticipate clinical 'breaks' and enhance early and more effective use of therapeutics and management strategies, (5) antimicrobial therapy that aims for a reduction in microbial resistance in addition to a reduction in clinical disease, (6) management of therapy that includes reduction of microbes and inflammation and also enhances healing (reducing pain and stress and improving well-being) and (7) continued recognition that health and welfare are components of quality systems.

One of the major obstacles for research investigators interested in addressing these problems is a lack of funding. While it is unlikely that even adequate funds from governmental agencies will be available to support such research, there are significant sources of support available. Governmental agencies such as the United States Department of Agriculture (USDA), the pharmaceutical and biological industries, veterinary organizations, animal advocacy groups, food animal industry associations, universities and private firms all contribute in many ways to these research objectives. Unfortunately, these contributions are poorly coordinated and often in direct conflict. To achieve better coordination and perhaps more efficient use of all resources, the following supportive actions could be considered:

1. Coordination of integrative teams through an overarching agency (USDA) to provide peer review and priority review for available public research funds. This would include use of development grants (as seed and matching funding) available to public/private partnerships.
2. Strengthening of testing and validation of new procedures in production settings (providing more than cost analyses). Promote publication of studies.
3. Re-establishment of old links between clinicians, diagnosticians and basic research. This would include published sets of 'best practices'.

https://doi.org/10.1017/S1466252309990247 Published online by Cambridge University Press

4. Strengthening of programs to support both basic and applied research through graduate fellowships, residencies, workshops and start-up funding for young research scientists. There is a critical need to provide sustained funding to train the next generation of research investigators.

Improved scientific understanding of the bovine immune system and the infectious agents are reflected in many publications and patents from global BRD research programs. Many cattle producers have become far better animal health managers. However, BRD remains a significant disease threat and a cause of substantial loss to the cattle industry. It is clear that renewed efforts and innovative strategies are required to build on the successes of the past to achieve the successes of tomorrow. Continued and improved support of BRD research will prove to be a worthwhile investment.

References

Gagea MI, Bateman KG, van Dreumel T, McEwen BJ, Carman S, Archambault M, Shanahan RA and Caswell JL (2006). Diseases and pathogens associated with mortality in Ontario beef feedlots. *Journal of Veterinary Diagnostic Investigation* **18**: 18–28.

Griffin D (1997). Economic impact associated with respiratory disease in beef cattle. *The Veterinary Clinics of North America, Food Animal Practice* **13**: 367–377.

Snowder GD, Van Vleck LD, Cundiff LV and Bennett GL (2006). Bovine respiratory disease in feedlot cattle: environmental, genetic, and economic factors. *Journal of Animal Science* **84**: 1999–2008.

https://doi.org/10.1017/S1466252309990247 Published online by Cambridge University Press