© Cambridge University Press 2014
ISSN 1466-2523

Animal Health Research Reviews **15**(2); 186–188
doi:10.1017/S1466252314000309

BRD control: tying it all together to deliver value to the industry

Delbert G. Miles, DVM, MS* and Karen C. Rogers, DVM, MS
Veterinary Research and Consulting Services, LLC, Greeley, Colorado, USA

Received 16 May 2014; Accepted 18 August 2014; First published online 24 November 2014

Abstract

Pasteur described an organism causing fowl cholera in 1880. In 134 years we have progressed from crude vaccines for *Pasteurella*, to some refined vaccines, to a name change (*Mannheimia*), to autogenous vaccines (back to crude). In the last 25–30 years, we have attempted to mitigate the problem of bovine respiratory disease with antimicrobials and subsequently have a high incidence of multi-drug resistance. All of these attempts have resulted in little if any improvement in morbidity/mortality. Is it time to focus on the animal's response or lack of response to infectious pressure? Instead of focusing on the 10–50% morbid cattle should we focus on the 50–90% that are not compromised and determine why they stay healthy under the same environmental conditions?

Keywords: bovine respiratory disease, mortality, vaccines.

In 1880, Pasteur described an organism causing fowl cholera. In 1921, Jones studied an outbreak of hemorrhagic septicemia in a large herd of cattle and found one that hemolyzed horse and cow blood cells. The organism was named *Pasteurella haemolytica*. From these findings, crude vaccines were developed followed by more refined vaccines. The name was changed from *P. haemolytica* to *Mannheimia haemolytica*. During the last several decades numerous antibiotics have been used in an effort to mitigate the effect of this organism. Ironically, the use of so-called autogenous vaccines is becoming vogue, which essentially, is a return to the crude vaccines of several decades ago.

Our practice group has monitored mortality from bovine respiratory disease (BRD) since approximately 1990. Cattle recorded as dying from BRD are plotted by year in Fig. 1. There was a significant reduction in BRD mortality between 1991 and 1997 and since that time it has escalated above the 1991 level with some intermittent decreases.

Mortality from BRD varies with the time of year. Figure 2 depicts the percent of the population dying from BRD by month. The lowest mortality occurs during the months of April and May at 0.08% followed by a steady increase to a high in December of 0.18%. The average percent of the population dying from BRD was previously presented at the BRD Symposium in 2009. Figure 3 illustrates an increase in BRD death loss by month for the period June–December when we combine the information for the last 5 years (1990–2008 versus 1990–2013). As the numbers indicate, our practice group has not improved the numbers for our clients in the last 5 years.

It is not uncommon to operate under the mindset of 'vaccination can do no harm'. Table 1 refutes this paradigm. In a study that was replicated three times, we tested two different brands of commercially available vaccines containing the antigens of *M. haemolytica* and *Pasteurella multocida*. *P. multocida* increased the mortality by 2–3 when compared with negative controls. This study supports the fact that vaccines are not innocuous.

For various reasons, so-called 'autogenous vaccines' have become vogue. One dictionary's definition of an autogenous vaccine is 'a vaccine prepared from cultures obtained from a specific lesion of the patient and used to immunize him against further spread and progress of the same organism'. We seriously question how our profession can justify using so-called autogenous bacterial vaccines in a feedlot setting. It seems illogical to culture one lung isolate from a calf for example from Alabama, prepare a vaccine, and inject it into a group of calves that arrive several weeks later from Texas or some other state. Our group has not seen any results of controlled studies with autogenous vaccines in a feedlot setting.

There are two types of EBM. One is evidenced-based medicine, which we as a profession espouse. The second EBM is economic-based medicine, which is probably the one that fits the use of autogenous vaccines in a feedlot setting.

One reason provided by vaccine manufacturers for the negative effects observed in the trial in Table 1 was endotoxin

*Corresponding author. E-mail: vrcsmiles@aol.com

https://doi.org/10.1017/S1466252314000309 Published online by Cambridge University Press

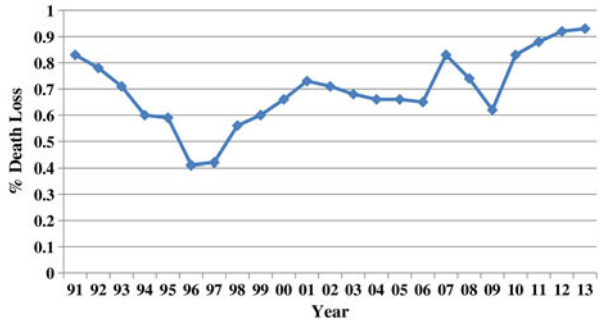

Fig. 1. The percent of cattle placed by Veterinary Research and Consulting Services, LLC (VRCS) clients dying from BRD between 1991 and 2013.

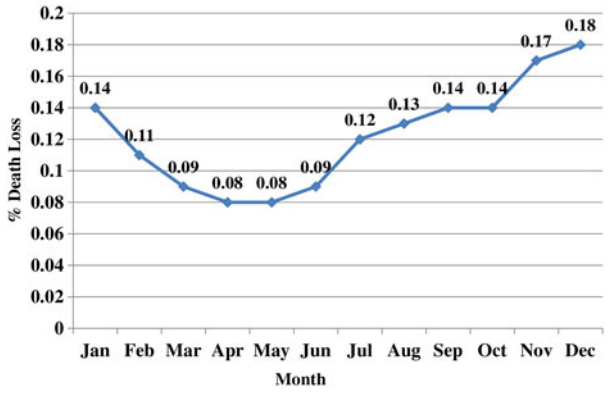

Fig. 2. The average percent of the population of VRCS client cattle dying from BRD by month between 1990 and 2013.

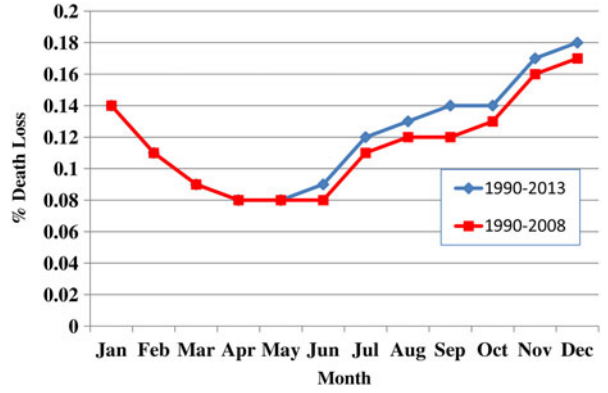

Fig. 3. Average percent of population of VRCS client cattle dying from BRD by month, 1990–2013 versus 1990–2008.

levels. The endotoxin levels detected in two different commercially available *M. haemolytica* vaccines were 40,000 and 20,000 EU/ml^{-1}. One could logically conclude these levels would be much higher if the vaccine contained the *P. multocida* antigen such as used in the study summarized in Table 1, but the levels were not determined. One could probably conclude endotoxin levels in autogenous vaccines would be highly

Table 1. Comparison of the impact of vaccination of feedlot cattle with one of two *M. haemolytica/P. multocida* commercial vaccines on subsequent treatment for respiratory disease ('% pulls') and on death attributable to respiratory disease ('% dead'), as compared with cattle not vaccinated (negative control).

Rep	Negative control			Brand A			Brand B		
	No. head	Percent pulls	Percent dead	No. head	Percent pulls	Percent dead	No. head	Percent pulls	Percent dead
1	196	53	1.5	197	50	4.1	197	60	6.1
2	222	36	1.8	223	31	2.7	223	43	5.4
3	206	54	1.5	204	50	3.4	204	55	3.9

https://doi.org/10.1017/S1466252314000309 Published online by Cambridge University Press

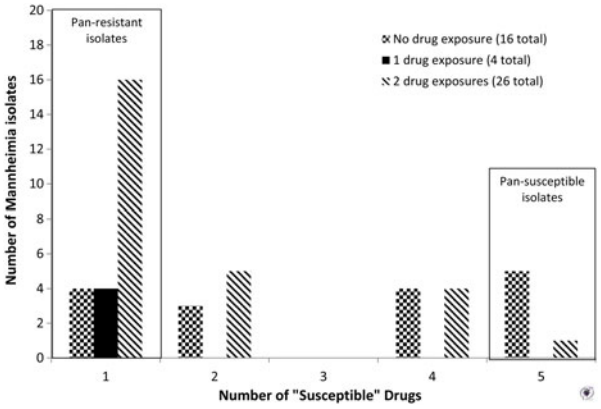

Fig. 4. Antimicrobial susceptibility profiles for *Mannheimia haemolytica* isolated from lung tissue of cattle dying of BRD, as related to number of antimicrobial drugs the cattle received antemortem.

variable and much higher, but to our knowledge none have been tested.

For the past approximately 3 decades our profession has attempted to reduce morbidity/mortality by metaphylactically treating incoming cattle. There are copious data available indicating an approximately 50% reduction in morbidity and a 30–50% reduction in mortality using this practice. A recent publication (Lubbers and Hanzlicek, 2013) would indicate our success rate with this practice is declining.

In order to determine if our practice population was affected in a similar pattern we worked with Dr. Brian Lubbers on a culture and sensitivity study. We cultured lung tissue from cattle with no known previous antimicrobial treatment, those that received a metaphylactic treatment on arrival, as well as those receiving a metaphylactic treatment followed by one hospital therapy. The results are shown in Fig. 4. Pan-resistance was reported in 24 of the 46 isolates, except that no organisms were reported resistant to ceftiofur. Unfortunately, we can find very little correlation between *in vitro* and *in vivo* results with this compound.

Considering all of the above, one could surmise that it is time to try something different. Questions are:

1. Is it time to look for ways to improve death loss other than continuing to focus on the pathogen?
2. Is it time to focus on the animal's response to the pathogens instead of the pathogens? Work by Aich *et al.* (2009) demonstrated that stress doubled the mortality even though the pathogen load remained constant.
3. Instead of focusing on the 10–50% morbid cattle, should we focus on the 50–90% that are not morbid and determine why they stay healthy in the same environmental conditions?

As a group, we have been searching for management interventions on high-risk cattle that lower stress. We have no controlled studies at this time but some of these practices appear to decrease morbidity/mortality as effectively as metaphylactic treatment. Obviously, no commercial company is willing to fund management studies because they are unable to market them. It is my hope by the time of the 2019 BRD Symposium we and others will present results of just such studies.

References

Aich P, Potter AA and Griebel PJ (2009). Modern approaches to understanding stress and disease susceptibility: a review with special emphasis on respiratory disease. *International Journal of General Medicine* **2**: 19–32.

Lubbers BV and Hanzlicek GA (2013). Antimicrobial multidrug resistance and coresistance patterns of *Mannheimia haemolytica* isolated from bovine respiratory disease cases – a three-year (2009–2011) retrospective analysis. *Journal of Veterinary Diagnostic Investigation* **25**: 413–417.

https://doi.org/10.1017/S1466252314000309 Published online by Cambridge University Press