INTRODUCTION
Morbidity and mortality from bovine respiratory disease (BRD) in newly weaned or received cattle and associated losses in performance, as well as carcass grading continue to plague the beef cattle industry world wide. Mortality from bovine respiratory disease and the expense of medicine and labour to treat bovine respiratory disease, contribute to its negative economic and animal welfare costs. Hot carcass weights are reported to be lower in cattle treated more than once for bovine respiratory disease. Calves treated once returned USD 40.64, calves receiving two medical treatments returned USD 58.35 less and those receiving three or more treatments returned USD 291.93 less than calves that were not treated (Fulton et al. 2002).

Several viral and/or bacterial agents are responsible for bovine respiratory disease and interactions occur amongst the agents. Viral agents, including infectious bovine rhinotracheitis (IBR), bovine virus diarrhea virus (BVDV), parainfluenza-3 (PI3), bovine respiratory syncytial virus (BRSV) and bovine corona virus, have been associated with respiratory tract disease in feedlot calves. Viral agents often predispose animals to bacterial infections. Mannheimia haemolytica, biotype A serotype 1, Pasteurella multocida and Histophilus somni are the most frequently isolated organisms in cattle with bovine respiratory disease. In addition Mycoplasma bovis is responsible for at least 25 to 33% of all pneumonia cases in calves suffering from bovine respiratory disease (Gevaert 2006).

PATHOPHYSIOLOGY
Mannheimia haemolytica, Pasteurella multocida and Histophilus somni are present in small numbers as part of the normal bacterial flora of the upper respiratory tract. They are not considered as normal flora of the lungs, as lungs are sterile organs. The animal’s normal bodily defenses keep these bacteria in check.
Healthy cattle under feedlot conditions tend to have higher levels of these pathogens in the upper respiratory tract, from where they may be inhaled (Hodgins D.C et al. 2004). Lung clearance of *Mannheimia haemolytica* is highly efficient in healthy animals, as they are destroyed by antibodies and removed by macrophages.

Pneumonia associated with these three bacteria occurs when the animal’s normal defenses are compromised. Examples of compromised defense mechanisms include damage to the cell linings of the upper respiratory tract by the viruses such as IBR, PI3 and BRSV. Damage to the tracheal lining could also occur due to inhaled irritants such as exhaust fumes or dust. The respiratory defense mechanism can also be depressed due to immuno-suppression associated with BVD virus.

**CLINICAL SIGNS**

The first clinical signs observed in calves affected by the bacteria are vague and are often limited to a slight depression and lack of interest in eating. As the disease progresses the calf refuses to eat, becomes depressed, exhibits lowered or drooped head and ears and suffers increasing nasal discharge which changes in consistency from thin and clear to thick yellow and viscous. Body temperature may rise as high as 41.5°C with breathing often rapid and laboured. A cough may be noted early in the disease, however as lung damage increases coughing and breathing becomes very painful for the animal.

![Fig. 1 Typical BRD presentation](https://example.com/figure1.png)

*Photo courtesy of Prof DU Thomson (Beef Cattle Institute, Kansas State University)*
The laboured breathing and associated pain causes the calf to stand with its elbows positioned away from the chest wall. An affected animal will become reluctant to move and may stand with its head and neck extended (fig. 1).

**TREATMENT**

To ensure a successful treatment outcome, it is imperative that the animals are identified and treated early in the disease process.

The foundation of antimicrobial therapy for bacterial bronchopneumonia is to treat early, treat long enough, and treat with the appropriate antimicrobial agent. Treating early is considered more important, than which drug is chosen to treat the clinically ill animal. The role of antimicrobial therapy in treating bacterial bronchopneumonia is to control or stop bacterial replication. Recovery of an animal suffering from bovine respiratory disease is assisted by the use of an appropriate antibiotic, but requires an active immune system. It should be remembered that a major reason for treatment failure is the presence of lesions that are too far advanced for successful therapy.

**INSIDENCE REPORT**

The results contained in this report were all obtained from animals that were identified and pulled for the first time in the feedlots. The majority of the animals had received a metaphylactic antibiotic on arrival at the feedlot and some of them may have had antibiotics in their feed at the time they were identified and pulled for examination and treatment. All the samples contained in this report were obtained by transtracheal aspiration, using a saline solution. Based on the results obtained from the laboratory an antimicrobial was selected to be used as a frontline therapeutic agent.

It is generally accepted that a variable percentage of animals will succumb to bovine respiratory disease. Most animals are removed for examination and treatment for bovine respiratory disease on or before day 27 of the receiving period. Given the subjective nature of sick animal identification, the identification of animals with bovine respiratory disease is not always accurate. Pulmonary lesions were present at slaughter in both untreated (68%) and treated (78%) steers for bovine respiratory disease (Wittum et al. 1996a).

In South African feedlots it was reported that 42.8% of all animals had lung lesions at slaughter, but 69.5% of them had never been treated for bovine respiratory disease (Thompson et al. 2006).
During the winter of 2011, cultures made from samples by Idexx laboratories, yielded 44 isolates of *Mannheimia haemolytica*, 64 of *Pasteurella multocida*, 20 of *Histophilus somni*, 64 of *Mycoplasma*, 9 isolates of other *Mannheimia* spp. and 6 isolates of *Arcanobacterium (Actinomyces) pyogenes*.

If the four most important pathogens are considered, there was a decrease in the relative numbers of *M. haemolytica* and *H. somni* since 2010 (fig 1), and an increase in *P. multocida* and *Mycoplasma*. During the 1980’s *M. haemolytica* was found in 70% of such cases and *P. multocida* in 30%. *Histophilus somni* was almost unknown during the 1980’s. The decrease in *M. haemolytica* cases since the 1980’s has been ascribed to the advent of leucotoxin based vaccines, which are far more efficient for the control of *Mannheimia haemolytica*.

![Graph showing change in percentage of isolates from 2002 to 2011](image)

**Fig. 2** Change in the relative percentage of isolates from 2002

The rising levels of cases due to *P. multocida* are of concern. The relative increase/ decrease in the number of *H somni* isolates is associated with excessively wet conditions, with the organism being able to survive for up to 70 days in nasal discharges under ambient conditions (P.J Quinn *et al.* 2011).

**Antimicrobial sensitivity**
All the isolates, except *Mycoplasma*, were tested for antibiotic sensitivity using a standard gel diffusion test. *M. haemolytica, P. multocida* and *H. somni* were all sensitive to penicillin, amoxicillin, ceftiofur, fluoroquinolones and florfenicol. This is similar to what was found in previous years. There is as yet no standard method for *Mycoplasma*, but it is intrinsically resistant to penicillins and cephalosporins.

All *M. haemolytica* and *H. somni* isolates were sensitive to tetracyclines, but *P. multocida* showed a 59% resistance rate, up by 10% from 2010. The indiscriminate use of the in feed oxytetracycline and chlortetracycline products over protracted periods of time and often at sub therapeutic doses has given rise to this increase in bacterial resistance (*personal communication*).

The more sensitive MIC (minimum inhibitory concentration) test was only done for 14 of the isolates. There were 9 *M. haemolytica* and 5 *P. multocida* isolates. All 14 were sensitive to tulathromycin and the other MIC results were the same as those obtained using the gel diffusion test.

**References**

6. P.J. Quinn, B.K. Markey and F.C. Leonard. Veterinary Microbiology and Microbial Disease pg 317
1. Which one of the following viruses are not frequently associated with BRD in South African feedlot cattle?
   a. bovine viral diarrhea virus
   b. parainfluenza-3
   c. bovine respiratory syncytial virus
   d. bovine rotavirus
   e. infectious bovine rhinotracheitis

2. Which one of the following bacterial organisms are not frequently isolated from cattle with bovine respiratory disease?
   a. Pasteurella multocida
   b. Salmonella bovismorbificans
   c. Mannheimia haemolytica, biotype A serotype 1,
   d. Histophilus somni
   e. Mycoplasma bovis

3. Which one of the following statements regarding the compromising of an animal’s immune system is incorrect for the development of pneumonia in feedlot cattle?
   a. The cell linings of the upper respiratory tract are damaged by viral infections.
   b. Inhaled irritants such as exhaust fumes or dust damage the tracheal lining.
   c. Cortisones are often administered to feedlot cattle.
   d. The respiratory defense mechanisms can be depressed due to immuno-suppression associated with BVD virus.
   e. The respiratory defense mechanisms can be depressed due to immuno-suppression associated with coronavirus.

4. Which one of the following treatment principals is considered the most important foundation of antimicrobial therapy for bacterial bronchopneumonia?
   a. Treat early
   b. Give loading doses
c. Treat for a minimum of 10 days
d. Always treat based on antiobiotic gram results
e. Never use only one anti-bacterial agent.

5. Which of the following statements are correct?
   a. There was a slight increase in the relative numbers of *M. haemolytica* since 2010.
   b. There was a decrease in *Mycoplasma* isolates since 2010.
   c. During the 1980’s *M. haemolytica* was the most abundant respiratory pathogen.
   d. During the 1980’s *Histophilus somni* was frequently isolated.
   e. During the early 2000’s *M. haemolytica* was the most abundant respiratory pathogen.

6. The decrease in *M. haemolytica* cases since the 1980’s has been ascribed to…
   a. … the advent of leucotoxin based vaccines.
   b. …improved management in feedlot operations.
   c. …climate changes over the passed few decades.
   d. …the culling of carrier animals.
   e. …better disease surveillance.

7. *H. somni* are able to survive in nasal discharges under ambient conditions for…
   a. …2 weeks
   b. …1 month
   c. …70 days
   d. …90 days
   e. …130 days

8. To which one of the following antimicrobial agents is *Mycoplasma* intrinsically resistant to?
   a. Fluoroquinolones
   b. Cephalosporins
   c. Sulphonamides
   d. Aminoglycosides
   e. Tetracyclines

9. To which one of the following antimicrobials did *P. multocida* show a 59% resistance to?
   a. Penicillin
b. Florfenicol
c. Tetracycline
d. Cephalosporin
e. Sulphonamides

10. It is most likely that the resistance of *P. multocida* was influenced by…
a. ...the indiscriminate use of in feed antibiotics at sub therapeutic doses.
b. …the treating of clinical pneumonia cases with sub therapeutic doses.
c. …the treating of clinical pneumonia cases with inappropriate antibiotics.
d. …the absence of a sufficient vaccine for many years.
e. …combination antibiotic protocols