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The BRD handbook

Managing bovine respiratory disease in feedlot cattle

A joint initiative of ACV and Elanco

Bovine Respiratory Disease (BRD) is the most common cause of sickness and death in Australian feedlots.[1] Aside from direct costs associated with mortality, treatment and labour, this disease has a significant impact on feedlot profitability by reducing growth rates, feed conversion efficiency and carcass quality.

This handbook is a joint initiative of Australian Cattle Vets and Elanco. It aims to provide feedlot managers and staff with a greater understanding of the causes of BRD and effective management strategies to minimise its effect on animal health and feedlot profitability.

Your veterinarian can help you to devise the most appropriate BRD management strategy for your operation, but typically this will be based on an integrated approach of:

- management practices to reduce stress factors;
- vaccination to increase the animal's immunity to viral or bacterial infections; and,
- the early detection and aggressive treatment of sick animals.

Australian Cattle Vets is a special interest group of the Australian Veterinary Association (AVA). Formerly known as the Australian Association of Cattle Veterinarians or AACV, the organisation was established in 1973 to provide a professional forum for cattle veterinarians and to provide representation to the Australian Veterinary Association.

Elanco is a global leader in the discovery and development of products that improve the health and efficiency of livestock production. Its goal is to help livestock producers to supply the world with a source of abundant food that is safe, affordable and of high quality. To that end, its products protect animal health and welfare while contributing to food quality, food safety and industry profitability.

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Understanding BRD

BRD is caused by a complex interaction of stress factors, viral infection and bacterial infection. Symptoms are usually evident in the first four to six weeks after arrival at the feedlot.

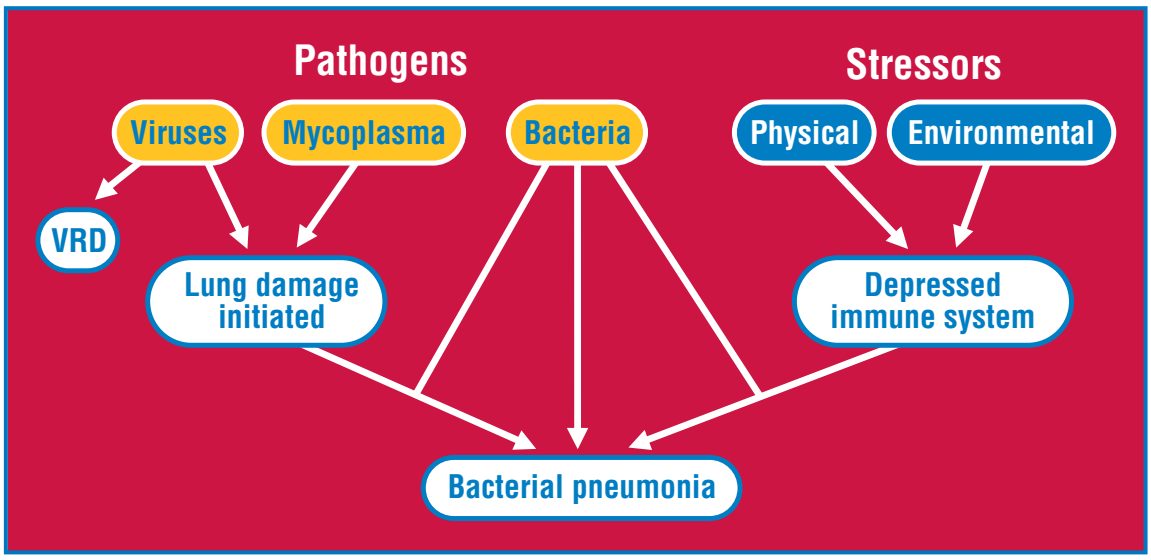
Causes of BRD

BRD is caused by a complex interaction of:

- Stress factors, which depress the immune system and make the animal more susceptible to viral and bacterial infections;
- Viral infections, which suppress the activity of the animal's natural defence mechanisms, thereby allowing bacteria to invade the lungs; and,
- Bacterial infections, leading to sickness, lung damage and reduced feedlot performance.

BRD disease pathway

While a single viral or bacterial infection is capable of causing a disease outbreak, BRD usually results from a complex of several different pathogens and conditions. Viral infections inhibit the ability of the animal to fight and remove bacteria from the lower respiratory tract, by suppressing the activity of the alveolar macrophages, the animal's natural disease-fighting mechanism against respiratory disease. Viral infections further compromise the function of the mucociliary clearance system. Bacteria proliferate in the lungs, with the subsequent infection leading to pneumonia. Once lung damage has occurred, recovery takes longer and may not be complete, thereby compromising the long-term performance of the animal.



Stress factors

Stress factors

Feedlot cattle are exposed to a range of stress factors that can suppress their immune system, making them more susceptible to viral and bacterial infections. These factors are often interdependent and include:

Transport: During transport, cattle are exposed to dust and fumes that may have an adverse effect on the clearance mechanisms of the respiratory tract. Dehydration, injuries and poor feed intake after arrival at the feedlot may also occur as a result of transport.

Handling: Loading, unloading and induction are common forms of stress and/or injury.

Dehydration: Cattle that have been transported long distances may become dehydrated. Newly-arrived cattle may also become dehydrated if they are not used to drinking from troughs.

Hunger: Cattle purchased from the saleyards may have been subjected to feeding curfews for extended periods.

Co-mingling: Groups of cattle develop distinct behavioural patterns in relation to eating, drinking and general socialisation. Intermingling of cattle from different properties, either at the saleyards or upon entry to the feedlot, or the introduction of “add on” cattle to an individual pen, can disrupt these behavioural patterns, causing stress and competition. Intermingling also increases viral challenge in naive cattle.

Changes in feed: Newly-arrived cattle may not be used to feedlot rations or feeding from bunks, resulting in reduced feed intake. Rumen function becomes seriously impaired if cattle remain off their feed for more than 48 hours.

Weather: Extremes in weather conditions (e.g. hot days followed by cool nights) can adversely affect feed and/or water intake, which may exacerbate existing stress factors and the multiplication of pathogens in the upper respiratory tract.

Dust: Dust serves an obvious role in irritating the respiratory system and clearance mechanisms.

Viral and bacterial factors

Viral respiratory tract infections

Feedlot cattle are exposed to a range of viruses associated with BRD. These include:

- Bovine Pestivirus or Bovine Viral Diarrhoea Virus (BVDV)
- Infectious Bovine Rhinotracheitis (BHV1, commonly known as IBR)
- Bovine Parainfluenza-3 (PI-3)
- Bovine Respiratory Syncytial Virus (BRSV)

Viral infections can become established in cattle whose immune system has become weakened by stress. Although some of these viruses (e.g. BHV1) are capable of causing clinical disease in their own right, most typically they predispose animals to secondary bacterial infections by suppressing the immune system.

Bacterial infections

The onset of viral infections can result in the breakdown of the animal's natural defence mechanisms in the upper respiratory tract and lungs. Bacteria that normally live in the upper respiratory tract without causing any disease are able to invade lung tissue, causing pneumonia and lung damage. The key species of bacteria associated with BRD are:

- *Mannheimia haemolytica*
- *Pasteurella multocida*
- *Histophilus somni* (formerly *Haemophilus somnus*)

While certain species of bacteria (e.g. *M. haemolytica*) are capable of causing BRD in their own right, most act in concert with other bacteria and viral infections.

Reducing the incidence of BRD

Management practices can have a significant impact on reducing stress factors before or immediately after cattle enter the feedlot, as well as helping newly-arrived cattle to adapt quickly.

Selection of feeder cattle

The purchase of cattle directly from breeders can minimise stress that may result from handling, co-mingling, dehydration or injury associated with saleyards. Ideally, cattle should be sourced from producers who yard-wean their cattle. Weaning is a critical learning time for young cattle. Housing freshly-weaned calves in suitable yards with good quality hay or silage for 7–10 days conditions the calf to accept confinement and different food and water sources, resulting in faster adaptation to feedlot conditions. There is evidence to suggest that yard-weaned cattle have a lower incidence of BRD and higher growth rates in the feedlot compared to paddock-weaned cattle.[1]

Backgrounding

Backgrounding refers to the introduction of cattle to feedlot conditions prior to entry, thereby optimising performance once they enter the feedlot. Typically, cattle are placed onto grass pastures with hay, and possibly concentrated rations, for several weeks to allow them to socialise. It allows cattle that will share the same pen to co-mingle in a less competitive environment. Induction practices (e.g. de-horning) conducted on farm will further reduce the stress load on cattle once they arrive at the feedlot.

Vaccination

A number of vaccines are commercially available against respiratory viruses (e.g. BHV1 and BVD) or bacteria (e.g. *M. haemolytica*) that contribute to BRD. Vaccines expose the animal to low levels of antigens in order to stimulate the production of antibodies, thus increasing the animal's natural level of immunity. Ideally, vaccinations should be administered during backgrounding to allow sufficient time for the animal's immune system to respond to the vaccine before exposure to the potential stressors of the feedlot.

Feedlot arrival and induction

Freshly-arrived cattle should be provided with access to quality hay (e.g. lucerne), a palatable starter ration and fresh water to restore optimal rumen function. Getting cattle onto feed as quickly as possible will assist their ability to fight disease challenges. This is particularly important if cattle have been transported long distances. It is important to remember that cattle arriving in the middle of the night will need access to hay and water upon arrival.

Reducing stress factors

Social stress can be reduced by lowering pen density and minimising the level of co-mingling or “add-ons”. While there is no ideal pen size, pens that carry smaller numbers (e.g. 100) at the recommended stocking density promote social stability. Ensure the ration is consistent in both formulation and delivery time. Clean water troughs regularly. Watering lanes can be quite useful in reducing dust.

Key points

- Purchase cattle directly, ideally from producers who yard-wean
- Background cattle in pen groups prior to feedlot entry
- Vaccinate against respiratory viruses during backgrounding
- Provide access to quality hay, palatable starter ration and fresh water upon arrival
- Delay induction for a few days if possible
- Reduce pen size and minimise pen add-ons or movements
- Reduce feedlot dust

Front-line BRD therapy

The success of BRD therapy is dependent upon the early detection and treatment of disease to minimise costs and production losses.

Early treatment is essential

It is essential to use the best front-line BRD therapy available to ensure a speedy recovery and to minimise deaths, relapses and potential losses associated with poor performance and reduced carcass quality. Cattle that display visual symptoms, even those that are pulled in a timely manner, are already very sick. Early treatment with an effective antibiotic will minimise the risk of permanent lung damage which can adversely affect performance throughout the feeding period, even if the cattle appear to recover. Conversely, failure to detect and treat sick cattle early will result in increased treatment failure, relapses, death or "chronics/railers". It is widely accepted that BRD-infected animals, particularly those that require more than one treatment, never catch up to their pen mates.

Pen riding

Pen riders should be trained to recognise the early symptoms of BRD and cattle should be assessed at least once per day. Pen riders should evaluate the behaviour of the pen as a whole and then identify those animals that appear sick. Ideally, pen riding should be carried out early in the day when cattle are settled. This is particularly important during summer when there is less fluctuation between minimum and maximum daily temperatures, making it more difficult to distinguish between BRD and heat stress. Disturbance should be kept to a minimum to ensure any symptoms of BRD are not masked by exertion. The "depth of pull" (i.e. the extent to which animals are removed from the pen for treatment) should be based on the incidence of BRD across the feedlot, the disease history of the individual pen and the success rate of previous hospital treatment. All animals showing the same level of symptoms should be removed for treatment.

Symptoms

Most cases of BRD occur within the first four to six weeks after entry to the feedlot. Symptoms include:

- Discharge from the eyes, nose and mouth
- Coughing
- Rapid, shallow breathing
- Extended head
- Red nose and dry muzzle
- Rough hair coat
- Depression / loss of interest in surroundings
- Lethargy / unwillingness to move
- Separation from the rest of the mob
- Reduced appetite ("hollow" cattle, dry faeces)
- Elevated temperature
- Increased or abnormal respiratory patterns
- Hiding from pen rider
- Dehydration (elevated ridge around the eyes or sunken eyes)
- Undifferentiated fever showing in ears (sunken), eyes (dull) and nose (pink with beading)

Treatment regimes

Your veterinarian will recommend the most appropriate therapy for your situation. Typically, this will be based on the use of an effective antibiotic, possibly in conjunction with other ancillary therapies, such as anti-inflammatory drugs. A written copy of your veterinarian's recommended treatment protocol should always be kept handy, preferably near the hospital. Always follow your veterinarian's directions regarding storage, dose rate, injection volume, injection site, administration technique, treatment frequency and withholding periods to minimise the risk of tissue damage and/or drug residues. The design and availability of hospital and recovery pens may influence what treatment regime is recommended.

Hospital management

Ideally, pulled cattle should be housed in a hospital pen and provided with ready access to a palatable feed (one that would reduce the possibility of acidosis) and clean, fresh water. Once treatment is completed, the animal should be moved into a recovery pen. In smaller feedlots, this is not always practical and treated cattle are often put into an adjoining paddock. The ration in the recovery pen should be similar to that of the animal's home pen. For example, if the majority of infected cattle are being pulled at an average of Day 21, the ration should the same as what is fed to the home pen at Day 21. Hospital and recovery pens should have no more than 50% of the stocking density of the feedlot pens to avoid crowding and competition. Hospital and recovery pens should be monitored daily. Records should be kept for each animal detailing the admission date, weight, treatment dates, treatment regime, dosage rates, withholding period, date moved into the recovery pens and the outcome of treatment. Treated cattle should also be clearly identified, preferably using distinct ear tags. Good records will allow your veterinarian to analyse the success of various treatment regimes, assess the health status of cattle from various suppliers, predict seasonal influences and develop the most appropriate BRD management strategy for your feedlot. Good records are also needed for keeping track of withholding periods and Export Slaughter Intervals.

Post-mortem examination

Despite the best intervention, deaths from BRD will still occur from time to time. Post-mortem examinations should be performed on all dead cattle to confirm the cause of death. For example, post-mortem findings from "BRD" can range from laryngitis, tracheitis and ventral bronchopneumonia to extensive pneumonia, pleurisy or pericarditis, depending on which viral and bacterial agents were present. Post-mortem analysis can be an extremely valuable diagnostic tool to help develop more effective management strategies. Viral isolation and bacteriology may also be useful to determine key pathogens involved in the disease process. Note that any samples to be sent to a laboratory for bacterial sensitivity testing should be taken before treatment with an antibiotic, or from "pen deads" (i.e. cattle that died before they were treated with an antibiotic). Samples taken from treated animals will compromise the sensitivity testing. It is recommended that feedlot staff should be trained in post-mortem technique, diagnosis and sample collection by their veterinarian.

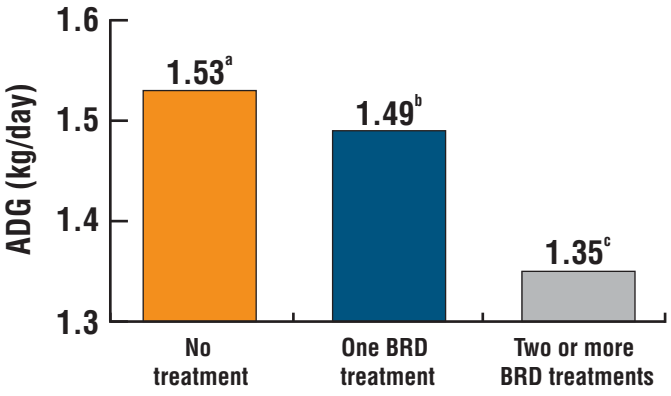
Do it right, first time

It is important to treat BRD effectively – the first time – to minimise potential losses associated with poor performance and reduced carcass quality.

The cost of relapse

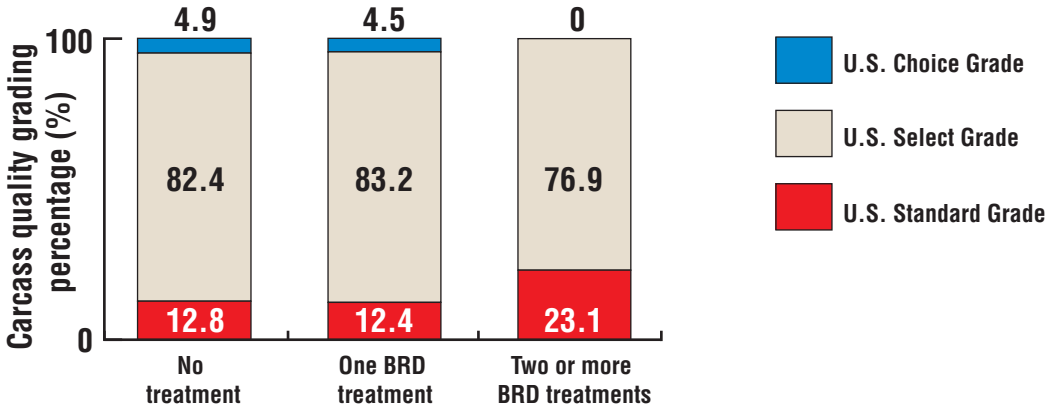
Occasionally an animal will require a second or third treatment if it fails to respond to the antibiotic treatment administered, or if it has not fully recovered by the end of the treatment regime. North American research has clearly demonstrated the negative impact of multiple treatments upon growth rates and carcass quality. In one 150-day study involving 204 recently-weaned calves that received none, one or multiple BRD treatments, as necessary, cattle that were treated once had a 2.6% lower average daily gain (ADG) compared to untreated steers (Table 1).[2] This study showed that treated steers had 6.43 kg less total weight gain over the trial for each day they were held in the hospital pen. Compared to steers treated once only, multiple-treated steers recorded a 9.4% lower ADG, a 1% lower dressing percentage and produced carcasses that were 15 kg lighter (Table 1).[2] Nearly twice as many carcasses from multiple-treated steers were graded Standard and none were graded Choice (Table 2).[2] This trial highlights the need to detect and treat sick cattle as soon as possible using the most effective front-line therapy.

Table 1: Effect of number of BRD treatments upon average daily gain[2]



Means with different superscripts are statistically different. $^{ab}P<0.02$ $^{bc}P=0.04$

Table 2: Effect of number of BRD treatments upon carcass quality[2]



No significant statistical difference.

Choosing an antibiotic

It is essential to use the best front-line BRD therapy available to minimise deaths, relapses and potential losses associated with poor performance and reduced carcass quality.

Your veterinarian will prescribe the most appropriate antibiotic for your situation. Some of the factors that should be considered include:

Efficacy: Efficacy is arguably the single most important consideration in choosing a BRD therapy. The objective of treatment is to return sick cattle to full health and performance as quickly as possible, with minimal relapse, death or carcass damage.

Precision therapy: It is critical to select a therapy that is effective against the bacteria associated with BRD. Using a precision therapy that is specifically registered for treating BRD means you can have greater confidence in a successful outcome.

Total treatment cost: Antibiotics that offer sustained therapeutic activity can reduce the total number of injections required to treat BRD, thereby minimising the amount of handling, labour, stress and potential carcass damage.

Administration route: Antibiotics that can be injected subcutaneously reduce the potential for injection-site damage which may result in carcass trim. Always administer the prescribed product in accordance with label directions and/or veterinary instructions.

Dose volume: The use of concentrated antibiotics minimises the quantity of fluid that needs to be injected at an individual site or the need for multiple injection sites, thereby reducing stress and potential carcass damage.

Withholding period: Depending on the number of days remaining on feed, the withholding period and Export Slaughter Interval of the chosen product may need to be taken into account. Always read and follow label directions.

Value: The value of a product should be determined by a combination of the above factors, not just cost per dose.

Ask your veterinarian about front-line or metaphylactic BRD management regimes using the fast-acting, long-lasting and cost-effective BRD therapy from Elanco.

Metaphylactic treatment

The strategic use of vaccines, coupled with metaphylactic treatment of high-risk cattle with an effective antibiotic, can be a realistic option to managing BRD.

What is metaphylaxis

Metaphylaxis aims to reduce the incidence of BRD based on the proactive treatment of entire groups of high-risk animals with an approved and effective antibiotic before clinical symptoms of disease become evident. This approach aims to control respiratory disease while it is still in the incubation phase. Early treatment not only improves the odds of success, but minimises the risk of permanent lung damage which can adversely affect livestock performance throughout the feeding period.

At induction

Treatment at induction has also been shown to extend the time to first pull, meaning cattle are more settled before the onset of disease. Elanco has been at the forefront of research in this field.

High-risk cattle

Ideally, cattle should be sourced directly from producers who pre-condition their cattle. However, factors such as pen utilisation, cattle availability and the higher cost of pre-conditioned cattle mean that saleyards remain an important source of feeder cattle for many feedlots. “High risk” cattle include:

- Young cattle
- Cattle subjected to lengthy curfews
- Cattle transported long distances
- Cattle purchased from saleyards or unknown vendors
- Cattle purchased from vendors or regions whose cattle have a history of BRD
- Pens of cattle sourced from multiple vendors
- Cattle in poor condition, and
- Naive cattle that have not been previously exposed to respiratory pathogens.

Your veterinarian can help you assess at-risk groups and establish early treatment protocols that fit your situation.

Sub-clinical BRD

Even with the best management, some cattle will still be infected with BRD even though they do not show any symptoms. These cattle will not perform as well as their pen mates. Metaphylactic treatment regimes are particularly effective at treating sub-clinical BRD. In one North American study, 37% of cattle that were not pulled or treated for BRD showed signs of respiratory tract lesions at slaughter, suggesting these animals may have been sub-clinically sick but remained undetected (Figure 1).[2] In another study it was as high as 68%.[2] Subsequent analysis found these steers had lower growth rates, carcass weights, dressing percentages and carcass quality than those cattle with healthy lungs.[2] The high prevalence of sub-clinical BRD in this study suggests that a metaphylactic treatment regime for high-risk animals, in tandem with veterinary consultation, is a viable approach in order to maximise livestock health, performance and profitability.

Figure 1: Incidence of sub-clinical BRD in feedlot cattle[2]

After induction

Although typically administered to an entire pen of high-risk cattle at induction, metaphylactic treatment should also be considered if there is an escalation in the incidence of BRD throughout the feedlot, or when available pen riders or hospital facilities are over-extended. Those pens with a high incidence of “pulls” should also be considered for metaphylactic treatment once a pre-determined threshold has been reached. For example, if more than 10% of cattle “pulled” on two consecutive days or more than 20% of cattle in the pen display symptoms. All cattle should be treated and for practicality, are usually returned to their home pen.

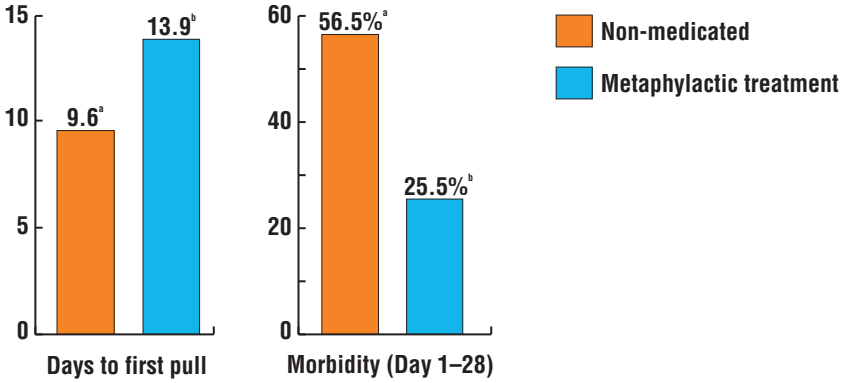
Economic benefits of metaphylactic treatment

Extensive research conducted in both North America and Australia has demonstrated that metaphylactic treatment can significantly reduce the incidence of sickness and death associated with BRD in high-risk cattle.

North American trials

Commercial trials conducted in North America involving many thousands of cattle have shown that metaphylactic treatment significantly reduces the incidence of sickness and death associated with BRD in high-risk cattle, as well as significantly improving average daily gain (Table 3).[3] Other trials have demonstrated that metaphylactic treatment regimes are significantly more effective in reducing the incidence of sickness and death due to BRD than standard pull-and-treat programs (Table 4).[5] In a large feedlot, these benefits can more than offset the increased treatment costs. Metaphylactic treatment programs are also feasible for small feedlots where the implementation of intensive treatment programs might be impractical due to lack of hospital facilities or staff.

Table 3: Effect of metaphylactic treatment on days to first pull and respiratory morbidity in high-risk calves[3]

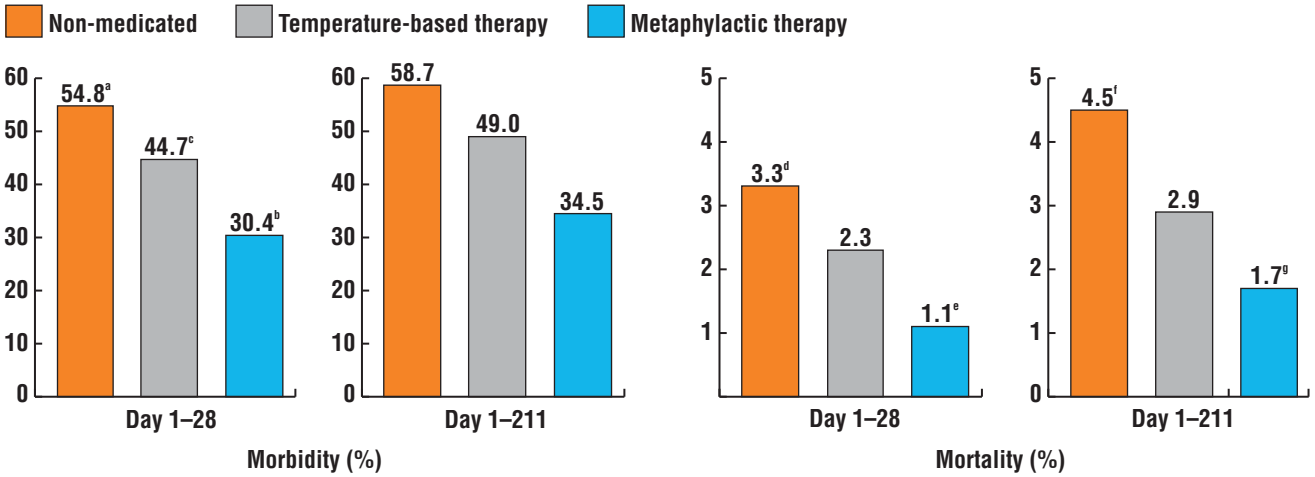


ab *Means in the same row with different superscripts are significantly different (P<0.01).*

This study showed that metaphylactic treatment administered on arrival to high-risk northern calves resulted in:

- **lower morbidity**
- **increased average days to first pull**
- **higher finishing and carcass weights**

Table 4: Incidence of respiratory morbidity and mortality in non-medicated, temperature-based therapy and metaphylactic treatment[5]

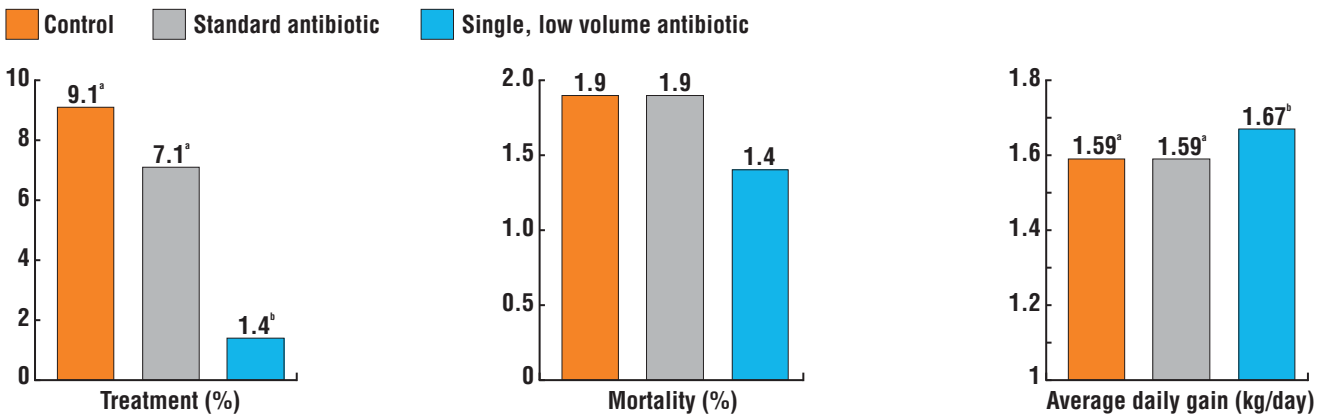


Non-medicated: No antibiotic administered at feedlot arrival. Temperature-based therapy: antibiotic administered at induction if rectal temperature >40°C. Metaphylactic treatment: All cattle received BRD-specific antibiotic at induction. Means with different superscripts are statistically different. $^{ab}P<0.01$ $^{bc}P<0.03$ $^{de}P<0.06$ $^{fg}P<0.05$

Australian research

Australian research has shown the benefits of metaphylactic treatment in reducing the incidence of BRD and increasing feedlot performance in high-risk cattle.[6] An independent trial conducted in 2001 involved 630 beef cattle being finished for the short-fed domestic market. At-risk cattle treated with a low volume, single injection site, BRD-specific antibiotic upon feedlot entry had fewer "pulls" and significantly higher growth rates than those treated with a high volume, multiple injection site, broad spectrum antibiotic upon feedlot entry or left untreated (Table 5).

Table 5: Effect of mass medication upon animal health and feedlot performance[6]



Means with different superscripts are statistically different (P<0.05)

Managing BRD in feedlot cattle

At a glance

- The leading cause of sickness and death in Australian feedlots
- Has a significant impact on feedlot profitability
- A complex of stress factors, viral infections and bacterial infections

Reducing the incidence of BRD

- Purchase cattle directly from property
- Background cattle prior to feedlot entry
- Vaccinate against respiratory viruses
- Provide access to quality hay, starter ration and fresh water upon arrival
- Reduce pen size and minimise pen additions or movements
- Minimise feedlot dust

Front-line therapy

- Early treatment is essential to restore sick cattle to full health and production as quickly as possible
- Monitor cattle regularly, preferably early in the morning
- Pull suspect cattle early
- Move to hospital pen
- Treat using the best front-line antibiotic
- Adhere to veterinary instructions
- Perform post-mortem examination on all deaths

Consider metaphylaxis in "high risk" cattle

- Assess and treat at induction; or
- Once a pre-determined disease threshold has been reached; or
- If an escalation in the incidence of BRD overwhelms feedlot resources

Ask your veterinarian about front-line or metaphylactic BRD management regimes using the fast-acting, long-lasting and cost-effective BRD therapy from Elanco.

References: [1]*Controlling bovine respiratory disease in feedlot cattle* (FL06), Meat & Livestock Australia, July, 2001. [2]Gardner, B.A *et al*, *Journal Animal Science*, 1999. 77:3168–3175. [3]Guthrie, C.A. *et al*. Tech Report, Elanco Animal Health, 2000. [5]Vogel, G.J. *et al*. Tech Report. Elanco Animal Health, 1997. [6]Cusack, P.M.V. *Australian Veterinary Journal*, 2004, 82(3): 154–156.
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