Lung Protection Therapy is enhanced lung protection

• BRD can cause irreversible lesions in the lungs which affect both the growth of calves and their carcass quality.

• Lung Protection Therapy (LPT) is a treatment strategy designed to preserve lung function in one step:
  • Treats infections due to common BRD pathogens
  • Rapidly reduces inflammation
  • Optimizes oxygen transfer across the lungs

• LPT provides a visibly faster recovery by rapidly reducing fever
• Preserving the lung function of calves may reduce the economic losses associated with BRD.

LPT combines both antibiotic and NSAID in the treatment of BRD

Use LPT in BRD

Save Cattle and Profits with Lung Protection Therapy

Do you have both sides of BRD covered?
The principle of Enhanced Lung Protection in action

Lung Protection Therapy

Antibiotic → NSAID

Healthy lungs

Bovine Respiratory Disease directly affects your profitability

- BRD is the most important cause of economic losses for the cattle industry - losses estimated as high as $3 billion annually
  - Morbidity and mortality
  - Reduced growth performance
  - More days on feed
  - Reduced beef quality
  - Medical and manpower costs
- Once the lungs of cattle are infected, inflammation and bacterial toxins cause lesions to develop in the lungs
  - Lesions develop quickly and may cause irreversible damage to the lungs

Healthy lungs
Effects of pneumonia
Irreversible damage

Preserve and protect
The lung lesions of BRD affect growth performance

- The presence of lesions in the lungs at slaughter have been directly linked to the growth performance of calves
  - Reduction in average daily gain (ADG)\(^4\,5\)
  - Reduction in weight at slaughter (p=0.001)\(^5\)
  - Reduction in dressing percentage (p=0.021)\(^5\)

The presence of lung lesions was associated with a significant reduction in ADG

<table>
<thead>
<tr>
<th>Study</th>
<th>No lesions present</th>
<th>Inactive lesions – Lesions present but no active infection</th>
<th>Active lesions – Lesions present and active respiratory infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study A</td>
<td>91%</td>
<td>18%</td>
<td>9%</td>
</tr>
<tr>
<td>Study B</td>
<td>67%</td>
<td>33%</td>
<td>67%</td>
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\(n=204\) steer calves. Lung lesions were present in 33% of all lungs at slaughter. Adapted from Gardner et al.\(^5\)
Why protection from lung damage is essential

• Physiologically, cattle are particularly prone to the development of BRD and lung lesions.

Physiological: cattle are particularly prone to the development of BRD and lung lesions.

Effects of BRD

• The damage from these lesions can be irreversible.
• Even when clinical symptoms are not present during the infection, irreversible lesions can still develop.

Irreversible damage

• Cattle’s lungs are so undersized, compared to their oxygen needs, that the animals cannot afford to sacrifice even a small portion of lung to lesions.

Why antibiotics alone are not enough

Lesions are the result of the immune response to bacterial infection.

Bacterial toxins damage immune cells which release proteases and free radicals.

• The immune response may be more damaging than the infection itself.
• In a study of 469 calves, treatment for BRD with antibiotics alone did not prevent significant production losses.
• Irreversible lung damage may be avoided by simultaneous control of bacterial infection and local inflammation.

Irreversible damage

• Cattle need 250% more oxygen than horses, with 30% less lung volume to consume it.

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Lung cell

Macrophage

Neutrophil

Bacteria

Bacteria such as Mannheimia haemolytica invade the lungs and release toxins.

Inflammation occurs as the immune response is stimulated.

Healthy immune cells continue to produce cytokines and mediators.

Cytokines and mediators recruit more immune cells, increasing inflammation.

The presence of proteases and free radicals, and the progression of the inflammation cascade, causes lesions and irreversible lung damage.

Bacterial toxins damage immune cells which release proteases and free radicals.
Effectively controlling the inflammatory response

- NSAIDs reduce lung consolidation and enhance response to antibiotic treatment

Randomised study of 66 calves with a temperature of at least 104°F at inclusion. Ceftiofur dose 1.1mg/kg i.m., flunixin dose 2.2mg/kg i.v. Total percentage lung consolidation calculates as 0.1 (lobe 1+2, cranial and caudal segments of left cranial lobe) + 0.27 (lobe 3, left caudal lobe) + 0.05 (lobe 4 accessory lobe) + 0.3 (lobe 5, right caudal lobe) + 0.08 (lobe 6, right middle lobe) + 0.2 (lobes 7 and 8, cranial and caudal segments of right cranial lobe). Adapted from Lockwood et al.

The presence of a non-steroidal anti-inflammatory drug reduced lung consolidation

- *significantly different from Ceftiofur (p=0.003)
- *15.3%
- *1.7%

Unlike corticosteroids, NSAIDs can exhibit an antipyretic response without suppressing the ability of the immune system to fight off viral and bacterial infections

NSAIDs begin protecting the lungs within seconds after IV administration and continue to be therapeutic for two days

- The optimal therapeutic strategy is, therefore, the combination of an antibiotic and an NSAID to provide enhanced lung protection and a visibly fast recovery
References:
2. NC1027: http://nimss.umd.edu/homepages/home.cfm?trackID=7796