research snapshot
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Airway protein may help identify cattle at risk of developing pneumonia

What is this research about?

Stress-related or "shipping fever" pneumonia is the most common and economically important disease causing production loss in beef feedlots. Stress-related pneumonia is typically prevented with antibiotics, but there are negative impacts related to overuse of such treatments. A useful alternative may be early identification of calves at risk of developing stress-related pneumonia through "biomarkers" or laboratory tests. One such biomarker may be odorant-binding protein (OBP), a protein found in the airway (e.g., nose, throat) and lungs of cattle. OBPs are thought to have a role in cattle's ability to identify some odours, and also protect airway cells from damage. OBP may also play a role in inflammation in the respiratory system. This research was carried out to examine the role of OBP in cattle's response to inflammation and defense against bacterial infection, as a first step in using OBP as a biomarker for stress-related pneumonia.

What did the researchers do?

To learn where odorant-binding proteins (OBPs) are found and in what amounts, tissue samples were taken from the airway and lungs of dead cattle. OBP proteins were labelled with a specific antibody to identify the tissues where the proteins are built.

To find out if inflammation affects what kinds of OBP are present, the researchers took fluid samples from the lungs of eight healthy calves. Another sample from the live calves was taken 24h after they were injected with a bacterial toxin to mimic infection. To find out if OBP helps cattle fight off bacteria, two species of bacteria known to infect cattle were added to samples of the protein in the lab. After these mixtures were incubated, the researcher counted the number of bacteria present. Some of these samples were combined with a type of white blood cell called neutrophils, which help fight infections by "eating" the bad bacteria.

Keywords:

cattle, stress, pneumonia, respiratory system, infection, immune response, odorant-binding protein

What did the researchers find?

OBPs were found in large amounts in the nasal passages and upper airway (trachea) of cattle, but not farther down into the lungs. Healthy lung tissue had much higher levels of OBP than inflamed tissue. The OBP alone did not limit bacterial growth, nor did OBP help the white blood cells attack the bacteria. However, OBP reduced inflammation by discouraging white blood cells (neutrophils) from moving to the site of infection. Low OBP levels in cattle may be a biomarker of risk for stress-related pneumonia.

What you need to know:

Identifying cattle at risk of developing stress-related pneumonia is important in reducing economic loss and maintaining animal health. Odorant-binding proteins (OBPs) help reduce inflammation in the upper respiratory tract of cattle. OBP levels are reduced in response to bacterial infection and inflammation. Cattle with low OBP levels may be at greater risk of developing stress-related pneumonia.

Cite this work:

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How can you use this research?

Veterinary researchers can use this research to further understand how cattle immune systems respond to respiratory infections.
In the future, **veterinarians** and **cattle producers** may be able to use this research to check cattle for risk of developing stress-related pneumonia.