



Vet Call

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Understand vaccine risks

Vaccines are valuable tools used by veterinarians and producers to reduce the risk of common diseases in beef cattle herds. However, as with any tool, there can be negative outcomes when using vaccines. Two concerns that beef producers should be informed about are the risk of inadvertently administering high doses of endotoxin when giving vaccines and the risk of an anaphylactic reaction when using animal health products.

Endotoxin

Endotoxins are imbedded in the cell walls of some types of bacteria (gram-negative bacteria). When these bacteria die and the cell walls break down, the endotoxins are released, and the animal's body responds in a negative way. When the dose of endotoxins is low, the liver can detoxify the challenge with no adverse effects. Endotoxin that enters the body through the mouth (drinking or eating) is almost always destroyed in the liver, regardless of dose — whereas inhaled or injected endotoxin may cause considerable problems.

Many herds vaccinate against common diseases caused by gram-negative bacteria, including campylobacter (vibrio), moraxella (pinkeye), *E. coli*, salmonella, *Haemophilus somnus*, leptospirosis (lepto), *Mannheimia haemolytica* and *Pasteurella multocida* [bovine respiratory disease (BRD) bacteria]. Vaccines directed against these bacteria can potentially have high doses of endotoxins. Of these gram-negative bacteria, the most common negative effects are associated with vibrio, pinkeye, *E. coli* and salmonella vaccines. Remember that vaccines against these bacteria are used frequently in beef herds, and negative outcomes are fairly rare.

Vaccine-induced endotoxic shock usually appears within two to three hours after vaccination, with cattle becoming noticeably dull or depressed approximately 24 hours after vaccination. Cows in the first trimester of pregnancy can abort within a few hours to three days following vaccination, and cows in the last trimester can give birth to premature calves. Cycling cows exposed to

endotoxins can result in corpus luteum (CL) lysis and a short cycle.

The risk of endotoxin problems varies based on a number of factors. Heat stress intensifies endotoxic reactions; therefore, problems are more common and severe in the summer. Some vaccine adjuvants (added to killed vaccines to improve immune response) can increase the risk of endotoxin problems. And, animal factors such as age and previous exposure can affect risk.

Even though endotoxins only originate in gram-negative bacteria, it is possible for gram-

positive vaccines, and even vaccines against viruses, to become contaminated with endotoxin from gram-negative sources during the manufacturing process. To minimize the risk of endotoxin problems associated with vaccination, veterinarians recommend that no more than three gram-negative vaccines be given at one time. Vaccines should be handled carefully. Heat, freezing and vigorous shaking can disrupt bacterial cells in gram-negative vaccines and release additional endotoxins. In addition, you should always record vaccine serial numbers and contact vaccine manufacturers if your cattle experience any problems following vaccination.

Anaphylaxis

Another problem many cattle producers should recognize is the risk of anaphylaxis following an injection of vaccines, antibiotics or other products. Anything injected into an animal is considered "foreign" by the animal's

immune system. When cattle are vaccinated, animals build antibodies or cell-mediated immunity to combat the "foreign" bacterial or viral invaders contained in the vaccine. In the future, if cattle are naturally exposed to the same bacteria or viruses, the vaccine is intended to provide some protection from disease.

On very rare occasions, cattle can develop a very rapid allergic reaction, called anaphylactic shock, to an injected foreign substance. These reactions can range from hives and itching to death caused by fluid filling the lungs. Although anaphylaxis is rare (about one per 10,000 cattle injected), cattle are at higher risk than other animals.

Anaphylaxis usually occurs within 10-20 minutes of the injection, but can take up to 2 hours. This is a much quicker response than reactions caused by endotoxins. Many cattle will survive anaphylaxis, but some animals will die quickly. The first indication of a problem is faster breathing and muscle tremors. As the condition worsens, the animal's lungs fill with fluid and it begins to breath with its mouth open and tongue extended. This can be followed by collapse and death.

Cattle identified as having an anaphylactic reaction should be treated as soon as possible with epinephrine and possibly anti-inflammatory drugs. It is a good idea to have these drugs available when you are processing cattle. To make sure the risk of anaphylaxis has passed, cattle should be confined and observed for a few hours after processing.

Minimize risk

Even though endotoxemia and anaphylactic shock are potential negative results of using vaccines, the benefits of a sound vaccination program outweigh the risks from these complications. However, you should work with your veterinarian to maximize the effectiveness of your vaccination plan and minimize the risks of vaccines and other animal health products.

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