

BOOSTER VACCINES

Most of us have read vaccines labels and seen directions that say, "Give second dose in 2 weeks" or "Booster vaccination needed in 2-4 weeks". Why do some vaccines carry this label? Why aren't the necessary booster doses standardized? What if I give the vaccine in 6 months when I have the cattle in next time? Why do some vaccines require an annual booster? These are all good questions and we will address this topic in this month's column.

How do vaccines work in the first place?

Vaccines work by stimulating the animal's immune system to develop protection against the bacteria, virus, toxin, or other pathogen in question. This is usually done by injecting the animal with a protein (or group of proteins) that has been proven to stimulate a protective immune response. The animal's immune system recognizes these proteins (also called antigens) as being different than their own proteins ("non-self" or foreign proteins) and begins the process of making antibodies (also proteins) to neutralize the foreign material and to stimulate the development of cells that will also help to protect the animal from outside invaders (viruses, bacteria, etc). So the immune response has two major components that are stimulated by vaccines—one is the antibodies that are proteins "floating" around the body waiting to neutralize any invaders and the other are the cells that have been "turned on" to actively "kill" any invaders.

What is the timing of the immune response of the animal?

The first measurable response is an antibody response that occurs at about day 4 after vaccination. This antibody (referred to as IgM) appears relatively quickly (at day 4) and soon begins to decrease in amount. The second antibody response can be measured at 10-14 days after vaccination and this antibody (IgG) stays around for a longer period of time, but also decreases over time. The response of the cellular branch of the immune system is also measurable at about 10-14 days. Therefore, it is apparent that there is a significant lag time from administration of the vaccine to the time the animal has any measurable response (10-14 days for a primary response). Is this first response at day 14 protective? For some vaccines the answer is probably yes. For others it is obviously no! These latter vaccines are the ones that need booster doses for more complete protection.

Who determines if booster doses are necessary and what the label reads in terms of boosters?

The USDA (United States Department of Agriculture) has rules and regulations in place for the licensing of biologic products used for livestock and this includes vaccines. The USDA requires that vaccines be ***safe and effective*** for cattle (safety and efficacy

requirements). Additionally, USDA regulates the use of any additives or ingredients that are in the vaccines and what an appropriate withdrawal time (time after vaccination before an animal could be slaughtered for human consumption) would be. Therefore, there may be a withdrawal time on some vaccine labels that must be followed.

The company manufacturing a vaccine must submit data and supporting documents to the USDA that prove that a vaccine is safe and effective for cattle before it can be licensed for sale. The USDA then will determine if the data meets their approval requirements. This will include the need for booster doses if appropriate. Of course the company wants their vaccine to be safe and effective also, so it is in their best interest to recommend booster doses when appropriate. The need for booster doses will therefore, be on the label and should be followed.

Why are vaccines different with regard to boosters?

The short answer is that each vaccine is made from different protein antigens and the animal will respond to each in a unique manner. For some pathogens it is more difficult to isolate antigens that are as effective as other vaccine products. Also, live vaccines (where the organism is alive and will replicate in the animal without causing disease) tend to stimulate the immune system much more than killed vaccines. Thus, it is particularly important to give booster doses when using killed vaccines if required.

What if I don't give the booster vaccine at the recommended time?

First of all, the vaccine will probably not stimulate an effective immune response in the animal. Put simply, it will not protect the animal from disease or death if they contract the disease in question. You have “wasted” one dose of vaccine by not giving the second recommended dose at the appropriate time and not protected the animal. Additionally, you have given up any legal recourse if the vaccine fails to protect. The label is a legal document and if you do follow the instructions you are basically on your own with any untoward consequences.

What are other factors that might influence the effectiveness of vaccines?

There are a number of factors that can have a negative impact on the effectiveness of vaccines—whether they are boosters or primary vaccines.

Stress—heat, cold, handling, or transportation stress can all decrease the animal's ability to respond to vaccines.

Age—young and extremely old animals do not respond to vaccines in an optimal manner.

Nutrition—protein deficiency, selenium deficiency, or copper deficiency all decrease the immune response to vaccination.

Products used—some vaccines simply work better than others.

Previous vaccine history—vaccines used in the past may promote a better or worse immune response.

Handling of vaccines—avoid direct exposure of vaccines to sunlight, excess cold (freezing) or heat (greater than 75°F) all decrease (or eliminate) the effectiveness of vaccines. Also, do not use alcohol, soap, or disinfectants on syringes or needles used on modified live virus vaccines.

Parasites—worms, flukes, etc decrease the animal's immune response; therefore, vaccinating parasitized animals is not particularly cost effective.

Pregnancy—pregnant cows and heifers have a decreased response to vaccines also.

Where can I get more information?

The best source of vaccine information is from your cattle veterinarian. They will know which vaccines are the best values for your operation. Additionally, they will know the important diseases on your operation that you need to address and how to match the available vaccines to those needs.

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