Vaccination -- Yes or No

Ronald L. Cravens, *MS, DVM*
601 West Cornhusker Hwy.
Lincoln, NE 68521

In light of current U.S. beef cattle economics, there is heightened awareness and scrutiny of all expenses. As a line item, animal health expenditures represent a relatively small percentage of overall cost and are often viewed as non-essential or optional expenses. This is understandable when you recognize that money spent on prevention results in reduced losses as opposed to increased output. It is difficult to determine lost potential or the cost savings of disease avoidance. However, from a business perspective, it does not matter whether improved operating performance comes from reducing losses or increasing output. What is important is how much was spent versus what was gained. In other words, what was the return on investment.

To determine return on investment, costs and all returns must be considered. In the case of vaccines it is important to know what to expect from a particular vaccine or vaccination program so that you can assess the expected return from use versus the potential loss from non-use.

Most vaccination expenses or input costs are straight forward. For example, direct capital outlay is required to purchase products, material, and equipment. Likewise, labor cost and facility depreciation can be calculated. Less quantifiable costs, such as unfulfilled performance potential, and reduced marketing options also occur. In addition, damage to your cattle's reputation can occur if non-use of vaccines results in increased health problems.

Once the expenses are tabulated, the gains must be determined. Returns from a good vaccination program come from reduced treatment costs, labor costs, improved performance, and other factors. Numerous studies have been conducted evaluating vaccination programs. Most of these studies have demonstrated a positive economic value associated with vaccine use.

Calculating the return on a given vaccine requires a clear understanding of epidemiology, biology, and immunology. As is the case for most things in biology, the occurrence of disease is not black and white. Just because a disease agent infects an animal does not mean the animal will succumb to disease. In fact the adaptive immune system requires exposure to an agent (virus, bacteria, fungus, toxin, etc.) in order to develop. Exposure to an agent causes the adaptive immune system to develop such that subsequent exposure stimulates a stronger and more specific secondary response. Vaccination is used initially to prime the adaptive immune system with subsequent doses acting as boosters to an already primed system. Vaccination prior to exposure to the virulent agent allows the immune system to respond and increase the animal's resistance.

Thus far we have talked about the animal's ability to resist or fight off infection. What is often forgotten is that an animal cannot be infected by a disease agent it is not exposed to. Therefore, disease occurrence requires exposure or challenge by the disease agent. If the animal has more resistance to the disease agent than it is challenged with, it will not develop the disease. That is not to say that the animal will not become infected. It also follows that any amount of disease resistance could be overcome given sufficient challenge.

Since cattle are living organisms, we must recognize that each and every one of them is unique and will therefore respond to vaccination based on his or her uniqueness. What this means to the person (veterinarian/owner) charged with health management of a herd (population) is that within the herd it is expected that a range of responses will occur following vaccination. In most instances herd responses will be normally distributed (e.g. a bell shaped curve). At any given time, most herds would be expected to have some level of resistance against common antigens. On average then, the herd would be expected to resist some level of challenge. The ever changing relationship between disease challenge and the herd's resistance to that disease determines the occurrence of disease outbreaks. How disease spreads in a group of animals is complex and will not be extensively covered. However, the basics of disease transmission are related to contact rate, level of disease organisms shed per infected animal, and herd resistance. Therefore, situations that result in high contact rates, increased concentration of agent, and/or reduced herd resistance, show up as explosive disease outbreaks.

To determine the value of a particular vaccine or vaccine program, we must know what a vaccine realistically can do. The foregoing discussion briefly covered what vaccines do and some of the interactions that occur when animals are managed as groups. We should always remember that vaccines cannot:

- protect against agents not in the vaccine;
- prevent disease that is already present;
- stop the immuno-suppressive effects of stress;
- correct "a-grocery-osis";
- stop rain, snow, mud or dust;
- protect against diesel smoke or hot shots.

Vaccines stimulate the normal immune system so that future exposure to the vaccine agent or its disease causing counterpart, results in a rapid, specific response. Using vaccines is analogous to taking defensive driving classes. The defensive driving class is supposed to teach an individual how to rapidly respond to dangerous situations. Taking the course does not guarantee you won't have an accident; but rather it should give you a better chance of avoiding or surviving an accident. Vaccination is driver's training for the immune system. The immune system is provided the opportunity to respond to a non-pathogenic (MLV, killed, subunit, vector, etc.) form of disease agent at some time prior to exposure to the wild or virulent disease agent. If the timing of vaccination is accurate, the animal or herd resistance level will be high when exposure to the virulent disease agent occurs. In the event timing is off, the response rate of a primed (vaccinated) immune system will be more rapid than that of a non-primed system. Having been vaccinated does not guarantee the animal will not get sick, or that no animals will die. Rather, those animals that responded to the product should be able to resist more challenge than animals that were not vaccinated.

All of this discussion is important to remember when assessing the value of a vaccination program. The expense side is fairly obvious. The return side is dependent on a number of biological variables. It is not sufficient to assess the value of a vaccination program solely on the outcome of the last truck load of calves. In the end, vaccination programs must be evaluated on the ability to reduce disease in situations where we know disease is likely to occur.

Abstract

Bovine ketosis and somatotrophin

Lean, I.J., Bruss, M. L., Troutt, H. F., Galland, J. C., Farver, T. B., Rostami, J., Holmberg, C. A. & Weaver, L. D.

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Aspects of the metabolism and health of 63 cows which had been treated with different amounts of bovine somatotrophin (BST) daily in the preceding lactation were compared with those of 25 control cows. Twelve of the control cows and none of the cows previously treated with BST were classified as ketonaemic, and nine of the control cows but only two of the cows previously treated with BST had clinical ketosis. Some, but not all, of the decrease in the risk of clinical ketosis was attributable to the lower body condition score of the cows previously treated with BST. The clinically ketotic cows had a greater risk of other illness in the first 10 days after calving than their herdmates, but the ketonaemic cows had a significantly lower risk of other disease during this period.