Considerations for Vaccination Protocols in Cow Calf Herds

Max Irsik[1]

[1]Beef Cattle Extension Veterinarian, University of Florida College of Veterinary Medicine, Gainesville, FL

Beef producers optimize their herd's performance and health by implementing numerous management considerations. One of the most important considerations is an efficacious and economical vaccination program which is designed to prevent disease within the herd and to prepare the herd's calves for the next stages of production: stocker, backgrounding, feedlot, grass fed, natural, organic, or being retained within the herd as a replacement.

Development of vaccination protocols is one of the most challenging services provided by bovine practioners. A tremendous amount of time, effort, and expense is placed on vaccination programs for cow-calf herds. Vaccination programs should be designed around the concept of strategic vaccination in order to provide the most effective immunity to the animals prior to stress or exposure. There are many considerations that impact the structure and implementation of vaccination protocols; including safety, efficacy, necessity, and economics. There is no single correct vaccination protocol; rather the protocol must be tailored to the individual producer, based upon many factors such as geographic location, industry sector, facilities, and husbandry practices.

There are many opportunities to undermine the benefits of vaccination. The first and foremost rule of vaccine usage is to follow the manufactures label recommendations. In order to accomplish this, a producer must take the time and effort to read the label and understand the information which it provides. Table 1 provides a list of practices that decrease the efficacy of herd vaccination programs.

Table 1. Practices that decrease the efficacy of herd vaccination programs.

Not vaccinating all susceptible animals
Not following manufactures labeled recommendations
Not vaccinating incoming animals
Vaccinating animals under stress
Vaccinating in the face of disease outbreak
Vaccinating too late relative to anticipated exposure or stress
Failure to provide appropriate booster to primary vaccination
Providing primary booster too early or too late
Inappropriate vaccine choice
Improper vaccine handling
Vaccinating in the face of maternal immunity

There are essentiality three different types of viral vaccines, killed, modified live and mucosal vaccines. Killed vaccines rely on the uptake of a large antigenic mass by the immune system and generally stimulate a type ll (antibody production) immune response which is directed toward antibody production and protection against extracellular organisms. Killed vaccines rely on adjutants which aid or stimulate the immune response. Adjutants are chemicals that assist the immune response, improving the uptake and presentation of antigens to the immune system. Modified live vaccines (MLV) provide a more natural method of antigen presentation and immune system stimulation. MLV vaccines rely on administration of a relatively low antigenic load that multiplies and stimulates the immune system in a fashion similar to natural infection. MLV vaccines stimulate both a type lI (antibody production) and type l (cellular immune) response. A type l response, cell mediated immune response, is directed toward cancer cells and intracellular organisms.[5] It is generally considered that a MLV vaccine provides stronger and more prolonged immunity compared to killed viral vaccines. MLV vaccines possess the potential of converting to virulent strains, have virulent residuals, or contamination with unwanted pathogens. Mucosal vaccines are generally attenuated live vaccines that are administed intranasally or orally. They are administered in a manner similar to the natural route of infection. They have the ability to stimulate a mucosal immune response along with a humoral and cytotoxic response or up-regulate the immune system. Bacterins are utilized to protect against diseases caused by bacteria such as Leptospirosis or Pasteurella pneumonia. Generally these vaccines are produced by growing the specific organism in cell culture and then killing that organism with formaldehyde prior to administration.

Strategic vaccination programs are based upon utilizing the proper vaccine, during the most advantageous time in the production cycle to provide the greatest immunity to the animals at risk within the management framework of the cow calf herd. Prior to establishing a vaccination protocol a producer along with their veterinarian must determine what agents are considered significant production and economic threats to the individual herd. There are several pathogens which are considered endemic or always potentially present and able to produce disease. Vaccination against these pathogens with significant potential for adverse health and economic threats and which there are reasonably efficacious vaccines available should be recommended for every cow-calf herd. Other infectious agents which may have limited geographic ranges or are observed sporadically may not be considered as “required” in a routine cow herd vaccination program. In all cases vaccines, should be used judiciously with their use periodically reevaluated.

In food animals, the main goal of vaccination is to increase the immunity in the population (herd) rather than in the individual, and herd immunity must be considered as an indicator of the efficacy of the vaccination. The presence of immune animals within the herd will reduce the probability of encountering the infection for a susceptible animal and will increase the resistance of the immunized herd as a group. It must be remembered that vaccination does not imply immunization and immunizations does not imply protection. It is also critical to identify the population of animals that each vaccine is intended to protect. Different populations of animals are at higher or lower risk than others for the specific disease agents contained in a vaccine. For example, an infectious bovine rhinotracheitis (IBR) vaccine utilized in a cow is directed first at protecting the cow from an abortion caused by the virus and second for colostral antibody production against the virus which is passed through the colostrum to the calf at the time of birth. Vaccinating a calf against IBR virus is directed first at preventing bovine respiratory disease (BRD) associated with the virus, second as a means of limiting the effects of the virus within the herd, and third as a required vaccine for replacement heifers.

One of the major failures of vaccination programs is that the vaccines are administered

under conditions that do not allow ample opportunity for the development of an effective immune response. One example often cited is the use of vaccines in cattle on entry into a feedlot. In most cases significant exposure has occurred to these animals prior to vaccination. Stressors such as handling and transport, a change in environment, diet changes, and re-socialization are all having negative impact on the animals immune system. In beef cattle, once the immune system is compromised by stress, it takes three weeks before that animal's immune system will adjust and come back to its full potential.[2] There continues to be disagreement between veterinarians regarding the presence of maternal antibody and a calf's response to vaccination when maternal antibody is present. Some of the disagreement between veterinarians is focused on the following points.[1,2,3,4,5] Maternal antibodies are thought to interfere with the immune response in a beef animal. Maternal antibody interference is different for different types of vaccines and agents. MLV may produce an active immune response at an earlier age than killed vaccines. Intranasal MLV will elicit an immune response earlier than intramuscular vaccination. The majority of animals will not mount a detectable immune response until after two months of age. Vaccination of a beef calves is not recommend prior to ten days of age. After 10 days of age a beef calf has been show to be able to mount an effective immune response.[2]

Vaccine efficacy and safety is monitored by the United States Department of Agriculture (USDA). The USDA requires that all vaccines are safe and elicit a measurable immune response. This does not mean that all vaccines licensed by the USDA are similar. Some USDA licensed vaccines are more efficacious than others. Producers need to read the label on all vaccines they utilize and consult with their herd veterinarian prior to utilizing any vaccine within their herd. There are adverse reactions that can be encountered with vaccine use. Questions should be entertained regarding vaccine safety.

1. What types of adverse reactions can occur?
2. What types of vaccines are safe?
3. What animals are at risk of vaccine induced disease?
4. To what degree do modified live vaccines shed, and is this a concern for comingled cattle?
5. What vaccines contain significant endotoxin level?
6. What is the significance of anaphylactic reactions?

Veterinary vaccinology addresses a broad spectrum of objectives and provides a cost effective approach to control infectious diseases in animals, to improve animal welfare, and to decrease the cost of production in food animals. Vaccination strategies for beef herds are unique and should be reviewed annually. Producers should schedule an appointment with their veterinarian either on their ranch or at the veterinarian's office evaluating the past herd health performance and then setting goals for the coming year. There is probably no other investment in a cow-calf herd that has as high a return on investment as the dollars invested by a producer as consulting with their herd veterinarian.

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