

How Vaccines Work
Vaccination Protocol for Sheep and Goat Owners
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Respiratory diseases, reproductive diseases and neonatal diarrheas continue to "plague" animal owners! To combat these "plagues," there are three management options: 1) **increase the resistance to the disease of the animal/herd (immunization and nutrition)**, 2) prevent the access of the disease to the herd (biosecurity), and 3) treatment. This discussion will emphasize immunization as applied via vaccination.

The basis of immunologic resistance is the recognition and disposal of an invading **infectious organism** by the **immune system** to prevent the establishment of infection and the development of disease. Vaccines have been developed to maximize the immune response of animals to resist and combat infectious disease.

Immunization involves complex molecular and cellular mechanisms which 1) recognize an invading infectious agent (ANTIGEN) and produce specific immune responses (ANTIBODIES and IMMUNE CELLS) to dispose of the invader. In addition, the immune system develops of specific memory (ANAMNESTIC RESPONSE).

The anamnestic response (the memory response), permits the immune system to "remember previous encounters" and respond more rapidly and specifically when re-exposed to the invading agent--**the premise for vaccination**. The anamnestic response also recognizes magnitudes lesser amounts of an antigen than was required to stimulate the primary response. Additionally, the memory response routinely results in more and quicker antibody production. **Vaccination does not mean immunization!**

VACCINATION PROGRAMS

Vaccination programs should be designed around the production system of each operation relative to animal production programs, animal use and disease history or problem. Two basic types of vaccines are available for use; killed or inactivated vaccines and modified live or attenuated vaccines.

Killed or inactivated vaccines contain the appropriate antigenic mass in the inoculating dose to stimulate the "memory" of the immune system, however, these vaccines usually require two vaccinations within 2-4weeks to fully stimulate the immune system AND establish the memory response. The immunogenicity of modern vaccines may be enhanced by the presence of chemical additives called adjuvants. Adjuvants are non-specific enhancers of recognition and processing of antigens and are commonly used in killed vaccines. Unfortunately, adjuvants may also increase the incidence of adverse vaccine reactions especially with repeated vaccinations. Some killed vaccines can now immunize with one injection.

Live (modified/attenuated/chemically altered) vaccines produce the antigenic mass by multiplying within the recipient. Living organisms stimulate both humoral and CMI immune responses and generally stimulate a higher level of immunity because they produce more antigen(s) through the replication/multiplication process. Immunization with living organism vaccines can be blocked by the presence of preformed antibodies such as colostral antibodies.

Antigens that are presented to the immune system via intramuscular or subcutaneous inoculation stimulate the immune response at similar rates and levels. Oral, or intranasal immunization stimulates local immunity in the respiratory and GI.

The immune system (both natural resistance and acquired immunity) requires the animal to be in an adequate nutritional state so all cellular and molecular functions are capable of recognizing and responding to limit the invading antigen (agent). Stress has a major depressant factor on the immune response by the release of glucocorticoids which inhibit the molecular and cellular functions. Nutritional, physical and mental stresses have an adverse effect on the animal's ability to respond immunologically. Management of stress from environmental conditions and rough or improper handling and inadequate nutrition is significant in maximizing the immune response of cattle.

Small Ruminant Vaccines

- Respiratory diseases
 - Pasteurellas,
- Reproductive diseases
 - Vibrio,
 - Chlamydia
 - Bluetongue
- GI diseases
 - Clostridia (*perfringens*) C & D
 - Contagious ecthyma—sore mouth
- Sudden death
 - Clostridials; *chauvoei*, *sordellii*, *novyi*, *septicum*, *hemolyticum*,
 - Tetanus
- Caseous lymphadenitis

Core Vaccine requirements. The vaccines that should be given every year to all animals.

- Clostridial C,D &T

Optional Vaccines. These vaccines can be incorporated in specific programs depending on need.

- Pasteurellas—Feedlot bound
- Vibrio—Infertility problem, vaccinate pre-breeding
- Caseous Lymphadenitis—*Corynebacterium pseudotuberculosis*
- Virals
 - Bluetongue
 - Sore mouth

The most common vaccine failure is failure of administration and results in the sporadic incidence of disease in vaccinated animals—that cow that was missed in the chute!. A second common failure is the inability of the animal to respond to the vaccine administered and all of the above factors play a part although the individual animal's system is the key to the response or lack of response for reasons we cannot define.

Vaccine handling is a significant contributor to vaccine failures. All vaccines should be kept in a cool dark environment (35-45°F). Live product vaccines should also be utilized within 1-3 hours following preparation and delivery systems must be chemically and biologically clean. MLV vaccines are stored at 35-45°F; killed products are to be stored at 35-45°F and NEVER ALLOWED TO FREEZE. Dispose of any unused/opened vaccines at the end of the day to avoid using contaminated or inactive product. Lastly, products must not be mixed either in the bottle or in the animal.

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