



# Cattle Producer's Handbook

Animal Health Section

605

## Vaccination and Immunization: Vaccination Programs for Cattle Operations

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Respiratory diseases, reproductive diseases, and neonatal diarrheas continue to “plague” animal owners! Producers may use three management options to combat these threats: (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. The same response is used to fight off a natural infection. The advantage of vaccination is the host animal does not experience the natural course of the disease.

**Immunization** involves complex molecular and cellular mechanisms that recognize an invading infectious agent (antigen) and produce specific immune responses (antibodies and immune cells and humoral and cell mediated immunity, respectively) to dispose of the invader. In addition, the immune system develops a specific memory (anamnestic response).

The anamnestic response permits the immune system to “remember previous encounters” and respond more rapidly and specifically when re-exposed to the invading agent, which is the premise for vaccination. The anamnestic response also recognizes lesser

amounts of an antigen than was required to stimulate the primary response. The response is much more rapid (1 to 5 days) than the initial response (7 to 14 days). Additionally, the memory response routinely results in more antibody production. ***Vaccination does not mean immunization!***

### Vaccination Programs

Vaccination programs should be designed around the production system of each operation based on animal production programs, animal use, and disease history or problem. Two basic types of vaccines are available for use: (1) killed or inactivated vaccines and (2) modified live or attenuated vaccines. Vaccination programs are an integral part of a comprehensive herd health program!

Killed or inactivated vaccines contain the appropriate amount of antigen or foreign protein (called antigenic mass) in the inoculating dose to stimulate the immune system. However, these vaccines usually require two vaccinations over 2 to 4 weeks to fully stimulate the immune system and 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 vaccines produce the antigenic mass by multiplying within the recipient. Living organisms stimulate both humoral (antibody) and CMI (cell mediated

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