



# Cattle Producer's Handbook

Animal Health Section

600

## Immunology: Maximizing the Immune Response of the Cow to Increase Profits and Production

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Infectious disease remains a major cause of loss of production and profits affecting the cattle industry. The bovine respiratory disease complex, calf scours, and other infections, such as blackleg and infectious abortions, continue to be the primary infectious diseases of most concern and problem to the cattle producer.

The producer has three management options to alter the effect on the “bottom line” from infectious diseases:

1. Increase the resistance to the disease of the herd (vaccination and nutrition),
2. Prevent the access of the disease to the herd (see 250, Biosecurity and Agrosecurity: Protecting Your Cow-Calf Operation from Disease and Agro-terrorism), and
3. Treat affected animals (antibiotic and/or supportive therapy).

The only direct means a producer has to affect infectious disease resistance is through vaccination. Successful vaccination results from the stimulation of the adaptive (or learned) immune response. The adaptive immune response involves:

1. The recognition of an invading antigen (virus, bacteria, or parasite),
2. The production of specific antibodies and immune cells to dispose of the antigen, and
3. The development of a memory (also called the anamnestic response) for each antigen.

### The Adaptive Immune Response

Key components of the adaptive immune response are:

- **Antigen Recognition**—The interaction of the invading foreign antigen with specific cells of the white blood series and the subsequent stimulation of the appropriate component of the immune system to produce an immune response.

- **Antigenic Mass**—The quantity of antigen that must be present to be recognized as “foreign” before the immune system responds. The “antigenic mass” is dependent upon the type of antigen present.
- **Humoral Immunity**—The production of specific antibodies that appear in the blood and other fluids (such as colostrum).
- **Local Immunity**—The development of specific antibodies at the surface of the respiratory, urogenital, and GI tracts.
- **Cell Mediated Immunity**—The production of specific immune cells that (1) remove or kill cells infected with viruses, brucella, TB, or other organisms, or (2) directly remove invading bacteria. While the CMI is important in the total immune response, tests are not readily available to determine the level of the CMI, so it should be considered as an added, but undefined, factor of a live vaccine.
- **Memory**—Permits the humoral and cell-mediated immune systems to “remember previous encounters” and respond more rapidly and more specifically when re-exposed to the invading agent—the goal of vaccination.

### Factors Affecting the Immune Response

The nature, quantity, and route of administration of an antigen have direct effect on the response(s) of the system to the antigen. Protein is the major stimulant or recognition factor for the immune response. The larger and the simpler the protein, the better the recognition and immune response.

Viruses usually are better antigens because their proteins are simple, abundant, and unobscured. Bacteria routinely have multiple and complex proteins (antigens).