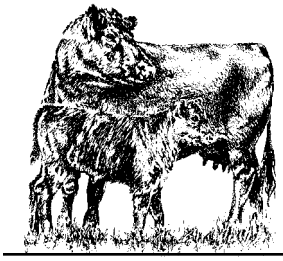

Western Beef Resource Committee *Fourth Edition*

Cattle Producer's Handbook

Nutrition Section 315

Trace Minerals and the Immune System in Cattle

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The Immune System in Beef Cattle

Beef cow/calf and feedlot operations often experience substantial economic losses due to morbidity and mortality of calves. One cause of loss is the inability of the animal to respond immunologically to an antigen.

Respiratory disease is prevalent in calves arriving at the feedyard, based on evidence that 14.4 percent of calves placed into U.S. feedyards develop respiratory disease (USDA-APHIS 2000). Similar data indicate that the majority (nearly 70%) of death losses in small U.S. feedlots can be attributed to respiratory disease (USDA-APHIS 1994). Respiratory disease also can lead to substantial economic losses due to treatment costs and depressed cattle performance, including lower average daily gains.

To avoid death loss or reduced performance due to disease, a calf's immune system needs to be viable when it encounters a stressful situation, such as occurs at weaning time. Cattle are able to overcome infectious pathogens through use of an elaborate immune system.

The immune system's primary goal is to recognize and defend itself against foreign materials (including bacteria, viruses, and other substances) that may be harmful to the body. The immune system includes several components that work together to initiate an immune response in order to maintain the health and well-being of an animal.

Materials and compounds foreign to the body are known as antigens. The body's immune system recognizes these antigens as foreign, and ultimately tries to destroy them by initiating an immune response.

Cattle producers in the U.S. commonly take advantage of a calf's ability to recognize and respond to antigens when they vaccinate cattle at branding and/or weaning in order to "trigger" an immune response. Administration of a small dose of antigenic material to a calf via a vaccine (which may include a killed or modified live virus) can improve the speed and efficiency of the calf's next immune response to that same antigen, which involves the "memory" component of its immune system.

A proper immunological response to an antigen is necessary to help a calf's immune system overcome future immune challenges. Therefore, to ensure a proper immunological response to an antigen, a calf's immune system must be working properly. This requires sufficient nutrition including adequate concentrations of several trace minerals shown to be vital for proper immune system function.

Components of an Immune Response

A healthy calf's immune system basically reacts to foreign material using two types of responses that work in harmony to overcome pathogens. These responses include a specific immune response and a non-specific immune response:

Specific Immune Response—A specific immune response to an antigen involves either a humoral or a cell-mediated immune response. A **humoral immune response** involves the systemic production and secretion of antibodies into the extracellular space. Antibodies are proteins produced in direct response to an antigen, and act on specific antigens by binding and inactivating them.