Vet Call

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Vitamin E plays a role in the pasture, feedlot and meat case

Feeding vitamin E to beef cattle has received attention recently because of several real and perceived benefits. Green forages and high-quality hay are good sources of vitamin E; however, dormant or drought-stricken pastures, hay or other forages may be deficient.

Like all fat-soluble vitamins, vitamin E is absorbed in the small intestine along with dietary fat.

Vitamin E is important for proper function of the reproductive, muscular, circulatory, nervous and immune systems. It's a strong antioxidant. As such its primary job is to protect cell membranes from oxidative damage.

Substances that cause oxidative damage, such as free radicals, are produced naturally when cells are working. The body has a number of enzymes that detoxify these substances. Vitamin E and the trace mineral selenium work together in several of these enzyme systems to protect cells. Cells and tissues that have a lot of activity (heart and skeletal muscles) need a great deal of protection from oxidative damage.

White muscle disease

White muscle disease is the most common disease associated with vitamin E deficiency. Calves with this syndrome have degeneration of both skeletal and heart muscle. Young, rapidly growing, nursing calves are most commonly affected; however, older cattle also can have the disease.

Because very little vitamin E is passed to the calf during pregnancy, newborns are highly susceptible to vitamin E deficiency. They must rely heavily on ingestion of colostrum as a source of vitamin E.

A calf affected by white muscle disease will usually have weak legs, resulting in difficulty standing, walking with a stiff gait and crossover walking. These calves will have difficulty suckling. Heart abnormalities may be detected.

White muscle disease can be prevented by ensuring pregnant cows are consuming a diet that results in an adequate level of vitamin E in colostrum and milk. If the diet is deficient, animals can be supplemented with feed-grade vitamin E or with injections that increase body stores of the vitamin.

In the feedlot

Researchers have proposed supplementing vitamin E to newly arrived, stressed feeder calves to improve health performance. Stress or disease will increase an animal's production of stress-induced hormones (cortisol, epinephrine, etc.) and will elevate activity of white blood cells. Production of these compounds leads to release of free radicals, which challenge the animal's antioxidant system.

Research indicates early performance of newly arrived growing cattle can be improved by supplementing vitamin E. In a Texas study, average daily gain (ADG) also was improved in yearling cattle supplemented with vitamin E.

The growth response to vitamin E could be related to the fact young, rapidly growing animals are in a metabolically demanding state resulting from overall tissue growth, which has a high energy demand, and increased production of free radicals.

In the meat case

Another benefit to supplementing vitamin E during the feeding phase is improved color and increased longevity of an appealing color of beef in the meat case. Because vitamin E is a strong antioxidant that protects muscle cells from oxidative damage, increased levels in meat will delay the natural browning process of beef in a grocery store display case. This browning is due to oxidative changes in the muscle.

Beef color is due principally to three pigments. Deoxymyoglobin is the purple pigment observed in freshly cut meat. Following several minutes of exposure to air, deoxymyoglobin becomes oxygenated to form oxymyoglobin, which produces beef's characteristic bright, cherry-red color. After several hours to several days of exposure to air, oxymyoglobin converts to metmyoglobin, which results in brown discoloration.

To consumers, acceptable fresh beef color is bright, cherry-red. They discriminate against meat cuts that lack this fresh appearance. Meat that becomes discolored is often reworked, then marketed in a reduced-value form.

Researchers at a number of universities have shown vitamin E supplementation delays the onset of discoloration in fresh, ground and frozen beef.

Except for cattle grazing green forages, the levels of vitamin E needed to affect meat color and fat oxidation will not be supplied in the diet. Therefore, cattle require an external source to meet the levels of vitamin E needed to benefit the retail product. How long the color display life of beef is extended depends on dose level and duration of vitamin E supplementation, the length of the aging period and the muscle being considered. Other factors that affect the longevity of acceptable beef color are the intensity of the lights in the meat case, the type of light used, the temperature of the cooler and the wrap used on the beef cuts.

In addition to its effect on beef color, feeding Vitamin E to feedlot cattle decreased fat oxidation and rancidity in fresh, ground and frozen beef and less so in cooked beef. Fat oxidation is a degradative process resulting in rancidity in uncooked meat and warmed-over flavor in cooked meat. It is one of the primary causes for deterioration of color, texture and flavor.

Lipid oxidation is positively correlated with pigment oxidation, but the basis for this relationship is not understood.

Because of its many beneficial uses, research concerning supplemental vitamin E will continue to be a priority for many institutions. With additional research, beef producers, veterinarians and nutritionists will have a better understanding of how and when supplementing vitamin E can be of benefit for beef production.

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