



Vitamin E (alpha-tocopherol) and Meat Color

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Producing quality beef with high consumer appeal is essential in maintaining a successful beef industry. Beef quality encompasses several factors, but consumers primarily judge meat quality, and especially freshness and wholesomeness, by lean color.

The color of meat is dictated by the concentration and the oxidative state of myoglobin, which is the protein responsible for muscle color. Oxymyoglobin is responsible for the normal color of meat (bright, cherry-red color in beef), which is formed when meat is exposed to oxygen and myoglobin is reduced or oxygenated. Deoxymyoglobin is myoglobin that is bound to water and causes meat to appear a purplish color often found in vacuum-packaged products. Lastly, metmyoglobin is the oxidized state of myoglobin, which causes meat to appear brown. Metmyoglobin production is of particular concern to the beef industry in regards to color stability and length of time meat can be placed on the retail shelf before becoming discolored. Metmyoglobin is formed because of temperature changes, bacterial growth and/or exposure to ultraviolet light in the retail case.

With this in mind, there has been extensive research to develop methods to ensure more desirable meat color and to prolong the shelf life of products. As a result, one such advancement in production practices that has demonstrated tremendous results is the supplementation of high levels of vitamin E to cattle during the feeding phase (commonly 90-100 days prior to harvest). When vitamin E is supplemented to fed cattle, there is an increased concentration of alpha-tocopheryl acetate present in the meat. Alpha-tocopherol acts as an antioxidant in meat by temporarily blocking the ability of oxygen to bind with myoglobin, thus inhibiting the production of metmyoglobin and delaying the discoloration of meat. In addition, the antioxidant properties of alpha-tocopherol (vitamin E) allow for a setback in lipid oxidative rancidity by isolating and slowing the formation of free-radicals in the meat, further extending the shelf life of the products.

The relationship of increased levels of alpha-tocopheryl acetate in beef with heightened color stability and increased shelf life provides a great opportunity to reduce economic losses associated with the discoloration of meat. In addition, with greater demands for extended aging, distribution, and case display periods, there is a greater need to ensure that color is adequately maintained. As a result of these benefits and the essential need for high quality products, vitamin E supplementation has been implemented in some premium/branded beef program's standards and is becoming a more common practice in the beef cattle industry.