



AMPT™ . . . Delivers a Positive Charge with Nova-E™ and Selenium-Yeast

Protect Cattle Health and Profitability with ADM Nova-E Natural-Source Vitamin E



Vitamin E (alpha-tocopherol) is a fat-soluble vitamin and is a key component in the body's antioxidant system. Because vitamin E is fat-soluble, it exerts the greatest benefits in the lipid portion of cells (cell membranes). Cattle, as all animals, require oxygen for life. Oxygen is very reactive and can be a toxic element. Because of the potential toxic effects of oxygen on cells, organs, and the body, the body possesses a complex antioxidant system to protect the cells. Vitamin E provides many research-documented benefits including:

- Antioxidant protection
- Enhanced immune function
- Enhanced reproduction

Natural-source vitamin E is derived from vegetable oils, primarily soybean, canola, and sunflower oils. The vitamin E found in nature is known as d-alpha-tocopherol or more correctly, RRR-alpha-tocopherol. For maximum stability, RRR-alpha-tocopherol is converted to RRR-alpha-tocopheryl acetate for animal diets.

Synthetic vitamin E, commonly referred to as dl-alpha-tocopherol or all-rac-alpha-tocopherol, is a mixture of eight alpha-tocopherol stereoisomers in equal amounts. Only one of these stereoisomers, 12.5% of the total mixture, is RRR- or d-alpha-tocopherol, the

natural form. The remaining seven stereoisomers have different molecular configurations due to the chemical randomization in the manufacturing process.

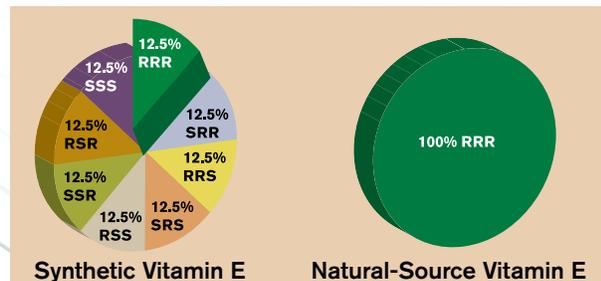
Natural-Source Vitamin E is Chemically Unique

Both natural-source vitamin E and synthetic vitamin E are absorbed in the body. However, after absorption, a specific transport protein in the liver known as RRR- α -Tocopherol Transport Protein (α -TTP) recognizes the natural d-alpha-tocopherol and gives it priority over the synthetic forms.¹⁻² The unrecognized forms of synthetic vitamin E are preferentially excreted.³

Natural-Source Vitamin E is Biologically Superior

Owing to this discriminatory process, d-alpha-tocopherol, the natural form, is retained better and for longer time in the body when compared to the synthetic form.³⁻⁴ Calves receive most of their vitamin E through the cow's colostrum (not through the placenta). Vitamin E along with selenium is needed to deter white muscle disease and help support the calf's

Stereoisomer Difference Between Synthetic and Natural-Source Vitamin E



D-alpha-Tocopherol Impacts Vitamin E Metabolism and Status

Research suggests that RRR-alpha-tocopherol can impact vitamin E status in the following ways:

- Higher circulating levels of alpha-tocopherol
- Increases alpha-tocopherol deposition in target tissues
- Reduced degradation and excretion of alpha-tocopherol
- RRR-alpha-tocopherol may work synergistically with other stereoisomers to improve overall antioxidant protection
- RRR-alpha-tocopherol is a more potent immune stimulator than synthetic vitamin E



immune system. Cows fed natural-source vitamin E had higher levels of alpha-tocopherol in their colostrum, and their calves had higher blood plasma levels than calves whose dams were on the same IU level of synthetic vitamin E.⁵

Feeding natural-source vitamin E to cattle has been shown to provide higher plasma levels and reduced the drop in alpha-tocopherol at calving compared to cows fed an equal IU level of synthetic vitamin E. Thus, feeding natural-source vitamin E pre- and post-calving should better protect cattle from some common post-calving disorders⁵ plus benefits reproductive and immune status.

References:

1. Human plasma and tissue alpha-tocopherol concentrations in response to supplementation with deuterated natural and synthetic vitamin E. *Am J Clin Nutr* 1998; 67:669-683.
2. Biokinetics of and discrimination between dietary RRR- and SRR-alpha-tocopherols in the male rat. *Lipids* 1987;22:163-172.
3. Absorption, lipoprotein transport and regulation of plasma concentrations of vitamin E in humans. *J Lipid Res* 1993;34:343-358.
4. Relative biological values of d-alpha-tocopheryl acetate and all-rac-alpha tocopheryl acetate in man. *Am J Clin Nutr* 1980;33:1856-1860.
5. Relative bioavailability of all-rac and RRR vitamin E based on neutrophil function and total α -tocopherol and isomer concentrations in periparturient dairy cows and their calves. *J. Dairy Sci.* 2008; 92:720-731

Beneficial Effects of Organic Selenium (Selenium Yeast)

The necessity of selenium in livestock nutrition is an established fact. It is important for optimum reproductive and immune function, and it has an overlapping role with vitamin E to protect body cells against oxidative damage. Selenium is also needed to help activate thyroid hormones. Selenium deficiency is a global problem and is linked to reproductive, growth, health, and defense mechanism challenges in animal and human health. A diet that is marginally deficient in selenium may predispose cattle to more subtle, long-lasting effects versus the easily observable "classical" white muscle disease, a sign of severe selenium deficiency (Table 1). Some of the symptoms of a selenium deficiency may be difficult to differentiate from other nutrient deficiencies.

Table 1 Potential Signs of a Selenium Deficiency

Muscle damage/weakness
Higher occurrence of illness
Decreased reproductive efficiency
Impaired growth

Sodium selenite (inorganic source) is the traditional source of supplemental selenium for livestock diets. Another source of dietary selenium is "organic" selenium, with the most common form being selenium-yeast. Regardless of source, the maximum amount of supplemental selenium that can be added to cattle diets is 0.3 ppm (FDA mandated upper limit). The FDA upper limit drives researchers to look for alternative selenium sources that are more bioavailable. Research

suggests selenium-yeast has a better bioavailability compared to inorganic selenium. The structure difference between organic and inorganic selenium products may account for the difference in bioavailability. About 65% of the selenium in selenium-yeast is in the form of selenomethionine, which is formed by replacing a sulfur atom in methionine with a selenium atom. When a selenium-yeast product is consumed, selenomethionine is absorbed and metabolized by livestock in the same way as the amino acid methionine.

Increasing Selenium in Key Tissues

Increasing the concentration of selenium in the protein of various tissues, milk, and colostrum may provide important benefits from performance and health standpoints. Late pregnant and early lactation cattle will likely derive the highest economic benefit from the use of selenium-yeast because selenium stores in the fetus and colostrum will also be increased with probable health benefits for the offspring.

Conclusion: Based on research, the inclusion of organic selenium (selenium-yeast) in livestock diets has shown to be especially beneficial pre- and post-parturition.

AMPT Advanced Mineral Technology utilizes Nova-E natural-source vitamin E and selenium-yeast to deliver a positive charge to beef mineral nutrition.

