



# Nano-E®

Nanodispersed Natural-source Vitamin E

## Nano-E provides highly bioavailable natural vitamin E to horses through a unique delivery system.

The availability and necessity of vitamin E in equine diets is well established. When healthy horses are given frequent access to fresh green forage such as good-quality pasture, there is little need for supplementation of vitamin E. However, many horses today are managed without fresh forage in their diets. These horses can survive in such management systems, but they will likely not be consuming sufficient vitamin E for optimal health.

Vitamin E is first and foremost an antioxidant, an agent that keeps free radicals from forming and potentially weakening cells and tissues. In addition to its antioxidant responsibilities, vitamin E is vital to immune, cardiovascular, circulatory, neuromuscular, and reproductive functions. Therefore, supplementation with an effective vitamin E supplement is recommended for all horses that do not consume a significant quantity of green pasture.

### Natural Vitamin E is Preferred

Research has revealed that vitamin E varies in its potency, based on whether it is natural or synthetic. The chemical structures of synthetic and natural vitamin E differ. Natural vitamin E is recognized as “d-alpha-tocopherol,” and is made up of a single isomer. Synthetic vitamin E, termed “dl-alpha tocopherol,” contains a mixture of eight different isomers, four tocopherols and four tocotrienols. Of these eight, only one is molecularly equivalent to natural vitamin E. Sources of natural vitamin E, especially Nano-E, more effectively raise serum levels when compared to synthetic, as shown in Figure 1.

Alpha-tocopherol is the form of vitamin E that is most abundant in the body, and is therefore the most appropriate for use in supplementation.

To make alpha-tocopherol stable for use in most supplements, it must be chemically joined with an acid during manufacture, a process called esterification. The acid, in this case acetate, acts as a padlock or protective cap that shields alpha-tocopherol from the damages caused by exposure to oxidative forces. Without esterification, alpha-tocopherol can quickly denature, losing its antioxidant properties and rendering it ineffective.

Once ingested, esterified alpha-tocopherol is subjected to normal digestive enzymes. A certain group of enzymes called esterases are chemically capable of unlocking the padlock created through esterification. Once free, alpha-tocopherol is available for absorption with its antioxidant properties intact.

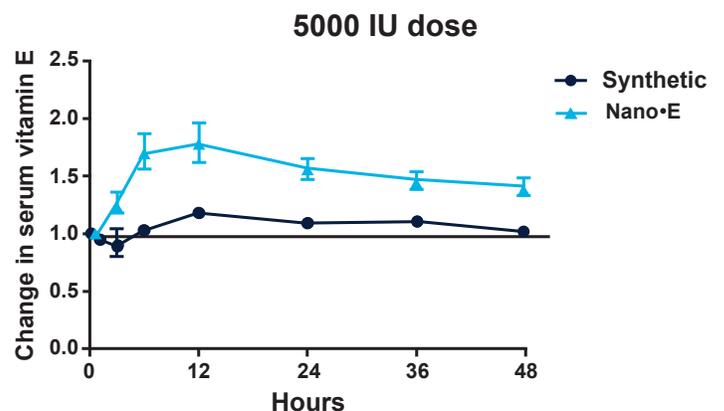


Figure 1. Nano-E, a source of natural vitamin E, more effectively raises serum vitamin E levels when compared to synthetic vitamin E. Dose response equals multiple of 0 hr value which is represented as 1.

## Delivering Vitamin E Efficiently

Fat-soluble vitamins like vitamin E must be offered to horses in such a way that maximizes absorption. Because it is not mixed with other ingredients, the vitamin E in Nano-E does not need to be protected by esterification, but it must become water-soluble or dispersible in liquid. This presents a challenge: As everyone knows, oil and water don't mix.

Researchers developed a method by which fat-soluble vitamins can be absorbed with great efficiency. Because of its oily nature, vitamin E is hydrophobic (water-shunning). To overcome this, researchers use proprietary technology to encapsulate the vitamin E in nanoparticles and then surround each nanoparticle with a hydrophilic (water-loving) outer layer. The hydrophilic outer layer, as illustrated in Figure 2, allows the nanoparticles to be rapidly and evenly released in water-based environments such as the gastrointestinal tract. The differences in bioavailability among vitamin E sources are shown in Figure 3.

The greatest benefit of this unique delivery system is an increase in the bioavailability of vitamin E. The more vitamin E that is absorbed into the bloodstream, the more available it is for use as a body-wide antioxidant essential for tissue repair and for its imperative roles in various body systems.

### Liposome Encapsulation

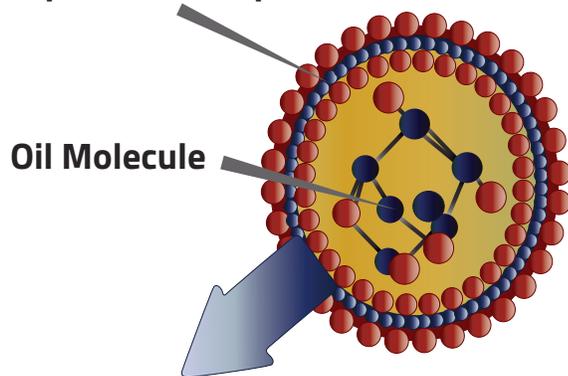


Figure 2. Each water-soluble vitamin E nanoparticle in Nano-E is encapsulated or surrounded by liposomes, which allows the nanoparticle to mix evenly throughout a water-based environment such as the gastrointestinal tract.

## Research Confirms Efficacy

Controlled studies and Kentucky Equine Research indicate that Nano-E is superior to synthetic and other natural vitamin E sources.

## Appropriate for Use in Many Horses

**Confinement.** Horses that do not have access to pasture may not be consuming optimal levels of Vitamin E. Nano-E provides this essential vitamin in a form that is easily absorbed, and is appropriate for horses of all ages that are stabled due to training schedules, travel, or injury.

**Performance.** Horses asked to work strenuously benefit from Nano-E. A regular schedule of training and competition makes performance horses susceptible to muscle damage, which is due largely to oxidative stress. Nano-E provides fast-acting antioxidant protection for hard-working horses.

**Breeding.** Appropriate for broodmares and stallions, Nano-E provides optimal antioxidant protection. Broodmares benefit from increased fertility and increased transfer of passive immunity to their foals. Vitamin E supplementation has been linked to increased libido and semen quality in stallions.

**Neurological problems.** Veterinarians and researchers have found that vitamin E supplementation often helps in the recovery of certain neurological problems. Nano-E provides natural-source vitamin E in a form that is quickly absorbed.

**Stressful events.** Prior to relocation, long-distance travel, weaning, or other stress-inducing events, Nano-E provides a boost to antioxidant and immune defenses.

**Convalescence.** Following injuries such as lacerations, puncture wounds, or burns, the addition of Nano-E to the diet will increase antioxidant activity and enhance recovery.

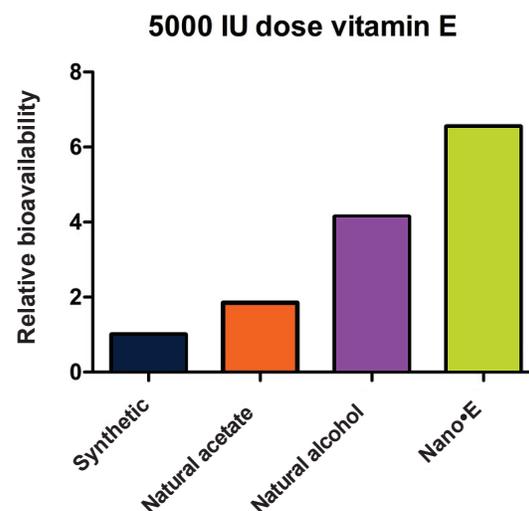


Figure 3. Differences in relative bioavailability of various vitamin E sources. Nano-E is more bioavailable than other common sources of vitamin E. Synthetic bioavailability equals 1.