

Vitamin E

Midwest Laboratories had finished validation of the Vitamin E method using LC/MS as the method of analysis. The method allows the ability to quantitate the various forms of Vitamin E, namely α -tocopherol, β -tocopherol, γ -tocopherol, and δ -tocopherol. Since Vitamin E (tocopherol) is a combination of these four (4) forms, it is possible to measure both the total Vitamin E as well as the four (4) forms (α , β , γ , and δ).

Vitamin E (tocopherol) is a naturally occurring vitamin and is important as an antioxidant in the body; however, too much Vitamin E can cause health effects in animals and humans. Thus, it is important to know the amount of Vitamin E in the diet. Vitamin E can also be manufactured and is termed synthetic Vitamin E. Chemically, there is no difference between natural and synthetic, but there is a difference in how the body utilizes the vitamin. Currently, there are different ways to report the value of Vitamin E; namely by mass (mg Vit. E/kg) or activity (IU/kg).

The difference between natural Vitamin E and synthetic Vitamin E is the “form” of the vitamin. The “form” deals with the rotation of the molecule with two forms possible (d or l), which are also referred to as “right handed” and “left handed.” These differences occur in certain chemicals called chirals. Living organisms have evolved to prefer the d (or right handed), thus for Vitamin E, the d-form of α -tocopherol (d-alpha tocopherol) displays a greater biological activity than the left handed or l-alpha tocopherol. The synthetic Vitamin E would be racemic or contain both the “d” form and the “l” form, but the synthetic vitamin would not have the same biological activity as a natural Vitamin E.

When Midwest Laboratories analyzes a sample for Vitamin E, they use the racemic standard dl-alpha tocopherol, and the instrument measures a mass or amount of Vitamin E in the sample. The method cannot differentiate between the “d” form and the “l” form, just the amount present.

If the result is to be reported in IU, which is a measurement of the activity and is the industry standard, the source of the Vitamin E must be known. There are different conversion factors when converting synthetic or natural Vitamin E from a mass (mg/kg) to activity (IU/kg). For natural Vitamin E, the mg/kg is multiplied by 1.49, while for synthetic, the factor is 1.1. If there is a mixture, the activity would be a combination and would be calculated as follows:

$$\text{Total Vitamin E (mg/kg)} = 25 \text{ mg/kg}$$

$$\text{Synthetic Vitamin E} = 20 \text{ mg/kg}$$

$$\text{Natural Vitamin E} = 5 \text{ mg/kg}$$

Total Vitamin E activity would be:

$$\text{(Synthetic)} 20 \text{ mg/kg} \times 1.1 \text{ IU/kg} = 22 \text{ IU}$$

$$\text{(Natural)} 5 \text{ mg/kg} \times 1.49 \text{ IU/kg} = 7.45 \text{ IU}$$

$$\text{(Total Activity)} 22 + 7.45 = 29.4 \text{ IU}$$

Therefore, if you are the client requiring reporting in IU (activity) of Vitamin E, reporting results for Vitamin E, it is necessary to know if the sample is being fortified with synthetic, natural, or some other form of Vitamin E.