

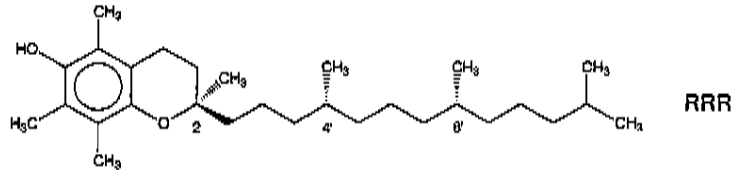
## Natural vs. Synthetic

Here is the difference



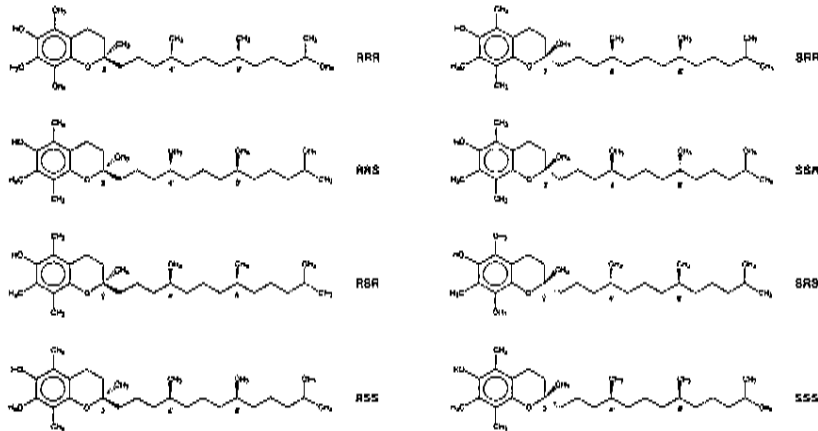
### The chemical difference

Natural-source Vitamin E is derived from vegetable oils, primarily soybean, corn, canola and sunflower oils. The Vitamin E found in nature is commonly known as d-alpha-tocopherol or RRR-alpha-tocopherol, but other natural forms exist. Esters of natural-source alpha-tocopherol (i.e. acetate, succinate) are also available. However, only the alpha isomer is currently recognized as measurable for nutrition and supplement labeling.



*This is the only natural alpha form of Vitamin E*

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 the 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 manufacturing process.



### Differences in effectiveness



Most manufactured vitamins produced as synthetics are made with the same molecular configuration as the natural. The synthetic molecules look and behave exactly the same as the natural molecules. Therefore, there is no difference in the effectiveness of the vitamins. **This is not so for Vitamin E.** As can be seen above, there are differences in the molecular structures of the two forms. These differences affect how well the vitamin is retained in the body and, in turn, its biological availability.<sup>1</sup>

<sup>1</sup>Human plasma and tissue alpha-tocopherol concentration in response to supplementation with deuterated natural and synthetic vitamin E. *Am J Clin Nutr* 1998; 67: 669-683.

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Numerous studies support the following differences between natural-source and synthetic Vitamin E:

- Both natural-source Vitamin E and synthetic Vitamin E are absorbed widely in the body. However, after absorption, a protein in the liver recognizes the natural d-alpha-tocopherol and gives it priority over synthetic forms.<sup>2-3</sup> The unrecognized forms of synthetic Vitamin E are preferentially excreted.<sup>4</sup>
- Owing to this discriminatory process, d-alpha-tocopherol, the natural form, is retained better and for longer in the body compared to the synthetic form. The bioavailability (available for use by the body) is approximately 2:1 for natural-source Vitamin E over synthetic Vitamin E.<sup>5-6</sup> To compensate for the lower retention of synthetic Vitamin E, a person would have to ingest twice the amount of synthetic Vitamin E (by weight) to match the bioavailability of the natural form.
- Pregnant women transfer natural-source Vitamin E to their babies approximately three times more efficiently than synthetic Vitamin E.<sup>7</sup>
- ADM's natural-source Vitamin E products parallel the Vitamin E found in our food supply. They are available either as d-alpha-tocopherol or a mixture of all four d-isomer tocopherols found in the human body (alpha, beta, gamma, delta). Even though d-alpha-tocopherol has the highest biological activity of the four, recent studies indicate that the beta-, gamma- and delta-tocopherols may have benefits that were previously unknown.<sup>8</sup> Synthetic Vitamin E is presently available only as alpha-tocopherol. Only natural-source Vitamin E products can be formulated to contain the entire combination of alpha-, beta-, gamma- and delta-tocopherols found in food.

### **The natural advantage**

As the information above indicates, a number of recent studies have shown significant differences between natural-source and synthetic Vitamin E. They have also shown that natural-source Vitamin E is more efficiently used by the body than its synthetic counterpart. Simply put, the human body appears to have a preference for natural-source Vitamin E over synthetic Vitamin E.<sup>9</sup>

ADM produces only natural-source Vitamin E. In fact, ADM is the world's largest producer of natural-source Vitamin E. With a strong commitment to nutraceuticals and expertise in the fields of research, production and marketing, ADM is a company dedicated to natural-source products. You can be assured that ADM produces only the highest quality natural-source Vitamin E.

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<sup>2</sup> Biokinetics of and discrimination between dietary RRR- and SRR-alpha-tocopherols in the male rat. *Lipids* 1987; 22: 163-172.

<sup>3</sup> Human plasma and tissue alpha-tocopherol concentration in response to supplementation with deuterated natural and synthetic vitamin E. *Am J Clin Nutr* 1998; 67: 669-683.

<sup>4</sup> Absorption, lipoprotein transport and regulation of plasma concentrations of vitamin E in humans. *J Lipid Res* 1993; 34:343-358.

<sup>5</sup> Ibid.

<sup>6</sup> Relative biological values of d-alpha-tocopheryl acetate and all-rac-alpha-tocopheryl acetate in man. *Am J Clin Nutr* 1980; 33: 1856-1860.

<sup>7</sup> Transport of deuterium-labeled tocopherols during pregnancy. *Am J Clin Nutr* 1998; 67: 459-464.

<sup>8</sup> Tocopherols and the etiology of colon cancer. *J Nutr Cancer Inst* 1997; 89: 1006-14.

<sup>9</sup> Human plasma and tissue alpha-tocopherol concentration in response to supplementation with deuterated natural and synthetic vitamin E.

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