

The Important Difference Between Vitamin K1 Z- and E-Isomers

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Vitamin K1 has long been known for its important role as a blood-clotting (coagulation) cofactor.¹ Furthermore, in a recent *LinkedIn* article I discussed research demonstrating that, like vitamin K2 as MK-7, vitamin K1 has also been shown to help in the reduction of arterial calcification^{2 3 4}. Additionally, research has shown that vitamin K1 may offer other benefits to human health and wellness, including mood modulation⁵, improved cognitive function scores⁶, healthy vision⁷ and bone health⁸. While this research offers the potential for some exciting applications for vitamin K1 beyond a blood-clotting cofactor, it is vital to understand that not all types of vitamin K1 are created equal. Specifically, there is a big difference between the Z- and E-isomers of vitamin K1.

Vitamin K1 isomers

The Vitamin K1 molecule has two geometrical isomers: cis- and trans-, also known as Z- and E isomers, respectively.⁹ Research¹⁰ indicates that only the trans/E-isomer is biologically active, while synthetic vitamin K1 may contain significant amounts of the inactive cis/Z-isomer. Even animal research¹¹ indicates that the cis- or Z-isomer has approximately 1% of the activity of the trans/E-isomer in vitamin K-deficient animals. The cis/Z-isomer also shows slower onset and rate of increase of the response.

Besides that, research¹² has also demonstrated the Z-isomer was associated with the mitochondrial fraction and the E-isomer with the endoplasmic reticulum fraction—which is where the vitamin K cycle takes place. Clearly, it is important that vitamin K1 be present where the vitamin K cycle takes place.

There are similar examples of isomer preference in the nutraceutical world. For example, resveratrol is also present in *cis*- and *trans*-isomers—and *trans*-resveratrol likewise has much greater activity than *cis*-resveratrol.¹³ Of course this isn't necessarily the same for all nutraceuticals. For example, ferret studies support the hypotheses that the *cis*-isomer of lycopene is substantially more bioavailable than all-*trans* lycopene.¹⁴

In any case, the research is very clear regarding the fact that the cis/Z-isomer of vitamin K1 is inferior. This is problematic considering that the Scientific Committee on Consumer Products, European Commission, Health & Consumer Protection Directorate-General¹⁵ has indicated that commercial products may contain up to 21% of the cis/Z-isomer of vitamin K1.

Nutraland USA's natural vitamin K1

Nutraland USA's natural vitamin K1 is derived from alfalfa, a plant source which is well-established for its natural vitamin K1 content.^{16 17} This powdered material provides 5% natural vitamin K1. In addition, the total vitamin K1 content contains not more than 0.5% Z-isomer (by HPLC). If you'd like to be able to make the claim that your vitamin K1 supplement is not only naturally derived from a plant source but is also contains no more than 0.5% of the Z-isomer, compared to up to 21% from synthetic vitamin K1, then you may want to consider Nutraland's vitamin K1 from alfalfa.

Note: The information presented in this article is for educational purposes only. It does not constitute recommendations for structure/function claims.

Nutraland USA offers clean, plant-based and sustainable branded ingredients supported by science. Our nutraceuticals are good for you, and good for the planet. For more information about how you can use natural vitamin K1 from alfalfa in your dietary supplements, contact gene.bruno@nutrallandusa.com; 949-988-7615.

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