# Vitamin E–gene interactions in aging and inflammatory age-related diseases: Implications for treatment. A systematic review

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**Abstract**

Aging is a complex biological phenomenon in which the deficiency of the nutritional state combined with the presence of chronic inflammation and oxidative stress contribute to the development of many age-related diseases. Under this profile, the free radicals produced by the oxidative stress lead to a damage of DNA, lipids and proteins with subsequent altered cellular homeostasis and integrity. In young-adult age, the cell has a complex efficient system to maintain a proper balance between the levels of free radicals and antioxidants ensuring the integrity of cellular components. In contrast, in old age this balance is poorly efficient compromising cellular homeostasis. Supplementation with Vitamin E can restore the balance and protect against the deteriorating effects of oxidative stress, progression of degenerative diseases, and aging. Experiments in cell cultures and in animals have clearly shown that Vitamin E has a pivotal role as antioxidant agent against the lipid peroxidation on cell membranes preserving the tissue cells from the oxidative damage. Such a role has been well documented in immune, endothelial, and brain cells from old animals describing how the Vitamin E works both at cytoplasmatic and nuclear levels with an influence on many genes related to the inflammatory/immune response. All these findings have supported a lot of clinical trials in old humans and in inflammatory age-related diseases with however contradictory and inconsistent results and even indicating a dangerous role of Vitamin E able to affect mortality. Various factors can contribute to all the discrepancies. Among them, the doses and the various isoforms of Vitamin E family (α,β,γ,δ tocopherols and the corresponding tocotrienols) used in different trials. However, the more plausible gap is the poor consideration of the Vitamin E–gene interactions that may open new roadmaps for a correct and personalized Vitamin E supplementation in aging and age-related diseases with satisfactory results in order to reach healthy aging and longevity. In this review, this peculiar nutrigenomic and/or nutrigenetic aspect is reported and discussed at the light of specific polymorphisms affecting the Vitamin E bioactivity.