



# Antioxidants and Vitamins in Cosmetics

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Cosmetics are commercially available products that are used to improve the appearance of the skin. Since the late 1980s, consumer demand for more effective products that more substantively beautify the appearance has resulted in increased basic science research and product development in the cosmetics industry. The result has been more ingredients that may actually improve not just the appearance of the skin, but the health of the skin as well. We now have products that renew, restore, and rejuvenate—not just cleanse, protect, and moisturize. There is probably no greater focus of interest currently than the incorporation of vitamins and antioxidants in skin care products. There are considerable data to suggest the benefits of such ingredients in cosmetics. This article reviews the published data that support the usefulness of vitamins and antioxidants in cosmetics. Our job as dermatologists is to digest and assess the data so we can give knowledgeable recommendations to our patients.

The ingestion and absorption of vitamins and antioxidants, most importantly through diet, and secondarily through intake of manufactured supplements, is critical to the health of human beings. The skin is the largest organ; as our primary external barrier, it is on the forefront of the battle with external causes of damaging free radicals. Ultraviolet light and environmental pollutants are known initiators of free radicals. Free radicals are highly reactive molecules with an unpaired electron that result in damage to surrounding molecules and tissues. The most significant damage by free radicals is to biomembranes and to DNA. It is thought that additional, topical use of vitamins and antioxidants in cosmetics can better protect and possibly correct the damage by neutralizing these free radicals. In addition, some vitamins may be beneficial to the skin because of other actions such as effects of suppression of pigmentation and bruising, stimulation of collagen production, refinement of keratinization, or anti-inflammatory effects.

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## Vitamin A

Vitamin A, its derivatives, and beta-carotene (pro vitamin A) have been popular additives in cosmetics for years. Dietary sources of beta-carotene include carrots, tomatoes, and other yellow vegetables. Sources of vitamin A come primarily through animal foods such as egg yolk and liver. Beta-carotene, as a precursor of vitamin A, is a potent lipid-soluble antioxidant capable of quenching singlet oxygen, a highly reactive free radical. Singlet oxygen is capable of inducing DNA damage and of being mutagenic.<sup>1,2</sup> Beta-carotene has been shown to have topical photoprotective effects. It has been studied on mouse and guinea pig skin and demonstrated to protect against UVA radiation effects.<sup>3,4</sup> In addition, both beta-carotene and vitamin A were found to be photoprotective by decreasing lipid peroxyl radicals in UV-radiated murine skin.<sup>5</sup> Beta-carotene is so unstable, however, that other forms of vitamin A are commonly used in cosmetic formulations.

The primary benefit of vitamin A and its derivatives in cosmetic products has been their ability to normalize keratinization. The popular derivatives of vitamin A that are found in cosmetics include vitamin A alcohol (retinol), vitamin A esters (retinyl palmitate, retinyl acetate), vitamin A aldehyde (retinal), and tretinoin (retinoic acid). These are found in various concentrations in cosmetic formulations. The cosmetics benefits from vitamin A and its derivatives lie in their ability as retinoids to regulate epithelial cell growth and differentiation. This family of compounds called retinoids has been shown to have receptor-specific effects on the skin, resulting in decreased roughness and decreased facial wrinkling. For many years, in many circles, vitamin A has been called the "normalizer." Tretinoin (all-trans-retinoic acid) is considered the most bioactive retinoid for modulating skin function. For this reason, it is considered a drug in the United States, available in higher strengths only by prescription. It is the conversion of the other forms of vitamin A into tretinoin that affords them any cosmetic benefits to the skin.

Retinyl palmitate, a vitamin A ester, has been added to cosmetics for years. It has a large molecular weight and is stable in formulation. It is, however, considered the least effective topical retinoid. Retinyl palmitate must be enzymatically converted in the skin first to