Vitamin C and Skin Health

Vitamin C, technically called ascorbic acid, naturally occurs in citrus fruit, tomatoes, potatoes and leafy green vegetables. Vitamin C is an important nutrient for the human body, its deficiency can cause scurvy, the disease marked by bleeding gums and bleeding under the skin.

by Dr. Wade Cheng, RL

Pure vitamin C appears as white crystals and is stable to the air when dry. Vitamin C is quite soluble in water and is readily oxidized in an aqueous solution upon exposure to air and light. Just as the name ascorbic acid implies, vitamin C aqueous solution is acidic and its pH is approximately 2.0 at 5% concentration.

Commercially available, vitamin C is usually in a dry form either in capsules or tablets sold at health food stores for oral supplements. The vitamin C activity of 0.05 mg of U.S.P. (US pharmaceutical grade) ascorbic acid is defined as the reference standard called one International Unit (I.U.).

Vitamin C is difficult to formulate in skin care products due to its instability in aqueous solutions. As a consequence, vitamin C was commercially not involved in cosmetic products in the past. Recent scientific studies have disclosed that vitamin C is critical for skin health in several aspects.

Oxygen and other free radicals are strong oxidants that are chemically very aggressive to oxidize other substances. These free radicals are the major factor causing pre-mature skin aging. Anti-oxidants are able to detoxify these free radicals into non-harsh substances to the skin. Vitamin E is an excellent anti-oxidant and has been used in cosmetic industries for many years. Vitamin C is a potent anti-oxidant as well. Vitamin E is lipophilic, i.e., oil soluble. In contrast, vitamin C is hydrophilic, i.e., water soluble. Therefore vitamin C provides a new and complementary avenue for anti-oxidation. The union

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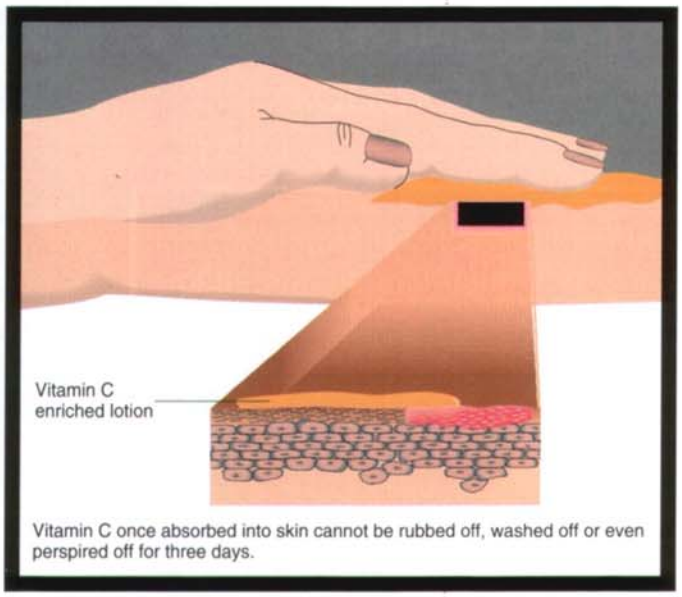
of vitamin E and vitamin C can provide a powerful synergistic effect.

Recent dermatological studies have revealed that vitamin C has surprising photoprotective properties. The vitamin C concentration in sun damaged skin has been found to be considerably lower than that in normal skin. Experiments also show that the skin gets considerably less damage if a significant amount of vitamin C is applied topically before sun exposure. Furthermore, the skin recovers quickly from sun damage after topical application of vitamin C. These findings indicate that topical vitamin C can be utilized to prevent and repair skin's sun damage.



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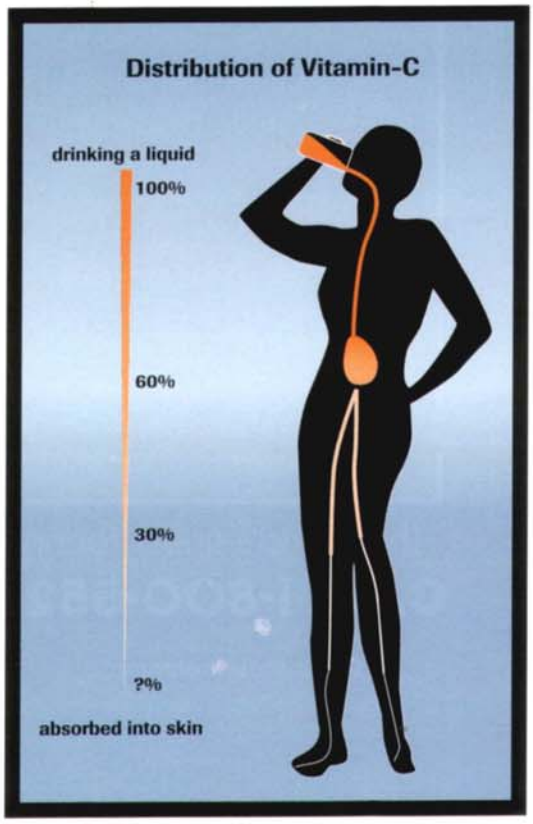
Traditional sunscreens are formulated to absorb UV rays. Sunscreens can only reduce but not eliminate skin's sun damage. The degree of damage actually depends on the intensity of sunlight and the length of exposure. For instance, exposure to sunlight with a sunscreen of SPF10 would generally get 10% sun damage— 10% compared to no sun protection. The sun damage due to incomplete protection of sunscreens can be minimized by topical vitamin C. Therefore, vitamin C can be added into sunscreens to provide additional protection. It should be clearly understood that vitamin C does not absorb UV rays and is not a substitute for sunscreens.

Special dermatological studies have revealed that vitamin C does have an anti-pigmentation function. Tyrosinase is the critical catalyst in melanin synthesis. Vitamin C can inhibit the activity of tyrosinase to suppress the production of melanin. The efficiency is approximately 5.9% of hydroquinone— the most popular skin bleaching agent. Topical vitamin C at moderate concentration can prevent undesirable pigmentation such as freckles and brown spots and significantly improve skin tone.

Vitamin C also plays an important role in collagen synthesis. Presumably, topical vitamin C might stimulate fibroblast to produce more collagen. The detailed mechanism is not well understood yet and is still a subject for further studies. However, the effect of vitamin C on collagen production is not a primary benefit and is not comparable to alpha-hydroxy acids.

The human body cannot synthesize vitamin C itself and directly relies on food intake. In humans, the total pool of vitamin C is approximately kept at 1,500 mg. Bodily functions and activities consume a considerable amount of vitamin C. Physical or emotional stress cause even more vitamin C to be depleted from the skin. Skin is particularly vulnerable to vitamin C deficiency. Topical delivery of vitamin C is much more efficient than massive doses or oral supplements. Experiments have proven that vitamin C once absorbed into the skin, can not be rubbed off, washed off or even perspired off for three days.

Although vitamin C is very unstable in an aqueous solution, the ester form of vitamin C is relatively stable, particularly when combined with a metal iron (chelate).



In a chelate, the structure of vitamin C is stabilized via stronger chemical bonds and steric hindrance which makes it difficult for oxygen and other reactive substances to attack the weak points of vitamin C. Recently a number of vitamin C chelates with magnesium and other groups have been successfully synthesized. These vitamin C chelates or derivatives are relatively stable in aqueous solution so as to be suitable for cosmetic formulation. After topical application, these chelates are readily absorbed by skin and release vitamin C promptly. Different from free vitamin C, the chelates of vitamin C are not so acidic (pH between 5.0 - 6.0) and are very safe to skin. Magnesium ascorbyl phosphate is a typical vitamin C chelate and is stable in aqueous solution under normal conditions.

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Currently there are a few topical vitamin C products available on the market. In general, all of these products deliver vitamin C to the skin and are very useful for skin health. However, the actual performance and skin compatibility depends upon the state of art in the formulation.

Topical application of vitamin C has multiple skin benefits and provides a new dimension for anti-aging technology. ■

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