

C

**VITAMIN C
CONCENTRATE**

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COSMECEUTICAL SIGNIFICANCE

Healthy skin contains high ascorbic acid (vitamin C) concentrations which support numerous skin barrier functions such as stimulating collagen synthesis, protection against ultraviolet-induced photodamage, adding to the innate immunity function of the skin and reducing dermal pore size to improve skin appearance. In addition, vitamin C fundamentally impacts ameliorating skin pathologies like psoriasis, progressive purpura, allergic contact dermatitis and acne. Moreover, vitamin C is present in the dermis and epidermis, with the latter having higher vitamin C concentrations. Exposure to pollutants and UV rays can cause degradation of dermal vitamin C. Hence, vitamin C concentrations are drastically lower in aged and photodamaged skin. The bioavailability of orally administered vitamin C can be considered insufficient to restore dermal vitamin C requirements. Therefore, topical application of the synergistic antioxidant combination of vitamins C and E can benefit skin health by restoring dermal barrier function via different physiological pathways.

SKIN BARRIER RESTORING ACTION OF C (VITAMIN C CONCENTRATE)

Collagen synthesis booster

Cosmeceutical features:

↑ skin thickness, ↓ wrinkle formation, ↑ cutaneous hydration, ↓ acne scarring

Physiology: ↑ ability of fibroblasts to synthesize collagen I and III, ↑ assembly of collagen fibers, ↑ elastic microfibrils, ↑ production of mucopolysaccharides, ↑ MMP-I, ↓ UV-induced collagen breakdown, ↑ ceramides, ↑ prolyl and lysyl hydroxylase enzymes, ↑ stability of tertiary collagen structures

Complexion corrector

Cosmeceutical features:

↓ pigmentation, ↑ skin tone

Physiology: ↓ melanin production, ↓ tyrosinase, ↓ hydroxylation of tyrosine to DOPA, ↓ DOPA to ortho-quinone

Increased skin immunity

Cosmeceutical features: ↑ skin barrier, ↓ redness, ↓ swelling, ↑ protection against oxidative damage, ↓ infection occurrence, ↑ tissue remodeling

Physiology: ↑ MMP-I, ↑ differentiation of keratinocytes, ↑ accumulation in neutrophils, ↑ protection of oxidant-sensitive caspase-dependent apoptotic process, ↑ glutathione regeneration, ↑ NFκB (pro-inflammatory factor), ↑ leukocyte chemotaxis, ↑ proliferation and migration of fibroblasts, ↑ HIF-1, ↑ Glycosaminoglycan synthesis, ↑ synthesis of barrier lipids

Reduce pore size

Cosmeceutical features:

↓ reduced pore size, ↑ skin tone, ↑ skin texture, ↑ overall skin appearance

Physiology: ↑ ultrastructural organization of SC, ↑ differentiation of keratinocytes, ↑ ceramides

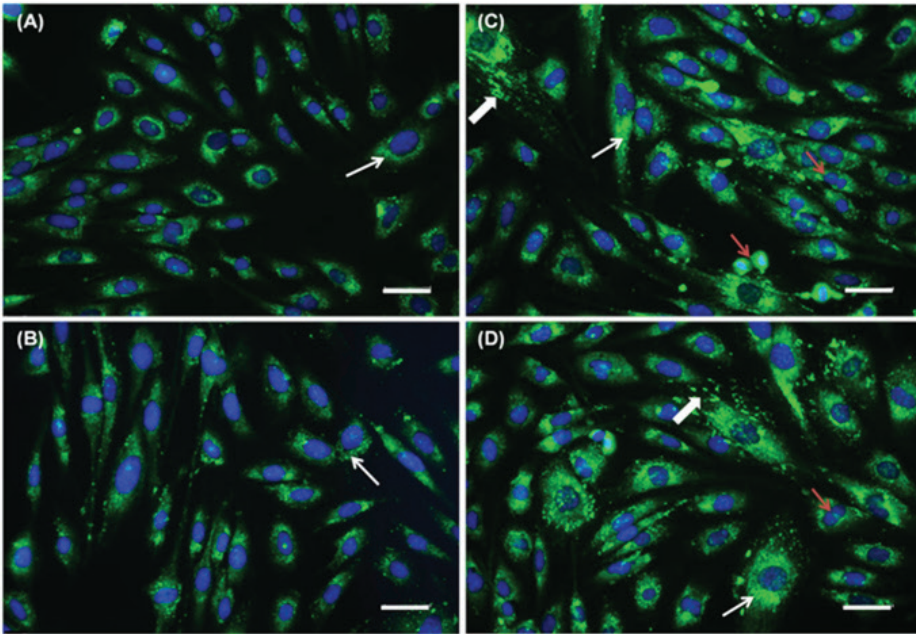


Figure 1. Immunolocalization of type I collagen in fibroblasts treated with ascorbic acid for 48 h: **(A)** the control (cell culture medium), **(B)** a 100 μM ascorbic acid solution, **(C, D)** a specialized formulation comprising 100 μM ascorbic acid. Thin arrows indicate evidence of positive intracellular labeling for type I collagen, and thick arrows signify intense labeling of collagen type I in the extracellular matrix. Red arrows display multiple dividing cells. Cells were analyzed via fluorescence microscopy with a 20x objective. Scale bars=50 μm (Maione-Silva *et al.*, 2019).

List of abbreviations

DOPA:	Dihydroxyphenylalanine
HIF-1:	Hypoxia-inducible factor-1
MMP-I:	Metalloproteinase-I
NF κ B:	Nuclear Factor κ B
SC:	Stratum corneum
UV:	Ultraviolet

**Table 1: Summary of ingredients included in C
(Vitamin C Concentrate)**

INGREDIENT	CLASSIFICATION	REASON FOR INCLUSION
Stabilized ascorbic acid (Vitamin C)	Water soluble vitamin, antioxidant	Collagen synthesis booster, improving the appearance of pigmentation, improving skin immunity, pore size reduction and regeneration of oxidized tocopherol acetate (synergistic action).
Tocopherol acetate (Vitamin E)	Lipid soluble vitamin, antioxidant	Stabilization of ascorbic acid, reduces lipid peroxidation, synergistic photoprotection and inhibition of melanocyte production when combined with ascorbic acid.

WARNINGS

Topical reactions to ascorbic acid and tocopherol acetate are considered rare. If redness, itching, and dryness accompany ascorbic acid application consider applying lower concentrations of ascorbic acid and increasing the concentration gradually to achieve optimal topical effects. The product must be stored in an airtight container, protected from light, and kept at or below 25°C.

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