



Elisabeth Hurliman, MD, PhD, is a PGY-4 dermatology resident at University of Minnesota department of dermatology.



Jennifer Hayes, MD, is a medical and cosmetic dermatologist in private practice in Sebastopol, Calif.



Hilary Reich, MD, is a dermatologic surgeon and cosmetic dermatologist, and assistant professor at the University of Minnesota department of dermatology.



Sarah Schram, MD, is a dermatologic surgeon and cosmetic dermatologist in private practice in Tuscon, Ariz., and affiliated faculty member at University of Minnesota.

Cosmeceuticals

Contributed by Elisabeth Hurliman, MD, PhD; Jennifer Hayes, MD; Hilary Reich MD; and Sarah Schram, MD.

INGREDIENT	FUNCTION	MECHANISM	ASSOCIATIONS/SIDE EFFECTS
Vitamin A/ Derivatives (retinal, retinol, retinoic acid, provitamin A, asthaxanthin, lutein)	Antioxidant (reduces free radicals, lowers concentration of matrix metalloproteinases → reduces collagen degradation)	Affects gene transcription → differentiation and growth of cells in the skin Normalizes follicular epithelial differentiation and keratinization	Comedolysis epidermal thickening, dermal regeneration, pigment lightening Side effects: Irritation, erythema, desquamation
Vitamin C (L ascorbic acid, tetrahexyldecyl ascorbate)	Secondary endogenous antioxidant in skin Lightens pigment (affects melanogenesis) Protects Vitamin E from oxidation Improves skin texture and hydration May interrupt melanogenesis by interacting with copper ions	Ascorbic acid: necessary cofactor for prolylhydroxylase and lysyl hydroxylase L-ascorbic acid: scavenges free oxygen radicals, stimulates collagen synthesis	L-ascorbic acid + alpha-tocopherol (vitamin E)= UVA and UVB protection Zinc, resveratrol, L-ergothioneine and tyrosine add to vitamin C bioavailability
Vitamin E/ Tocopherols, Tocotrienols	Primary endogenous antioxidant in skin Inhibits clotting, so do not use on fresh healing wound Main lipid-soluble antioxidant in humans	Prevents lipid peroxidation; scavenges free oxygen radicals	Alpha tocopherol is the most physiologically active isomer Alpha tocopherol inhibits cycloprimidine dimer formation via p53 tumor suppressor gene May reduce skin cancer
Flavonoids: soy, curcumin, silymarin (milk thistle extract), pycnogenol (French maritime bark extract)	Antioxidant	Prevents lipid peroxidation; scavenges free radicals	Soy: contains genestein and diadzein (phytoestrogens → increase skin thickness); UVA/B protection, anticarcinogenic Silymarin: contains silybin, silydianin and silychristin; UVB protection, anticarcinogenic Curcumin inhibits NF-kB Pycnogenol (pine bark extract) contains taxifolin, catechin & procyanidins
Co-Q10 Ubiquinone	Tertiary endogenous antioxidant in skin		
Ellagic Acid	Antioxidant	Inhibits UVA-mediated activation of cellular pathways in keratinocytes	Oral ellagic acid 5% increases sunscreen SPF by 25%
Polyphenols (green tea, pomegranate, resveratrol)	All antioxidants Resveratrol is also an anti-inflammatory	Reduces lipid peroxidation; scavenges free radicals	Green tea: contains epicatechin, epicatechin-3-gallate, epigallocatechin, and epigallocatechin-3-gallate; UVA/B protection, antiangiogenic, anti-carcinogenic Pomegranate: contains pantothenic acid, alkaloids, polyphenols and ellagic acid Resveratrol: phytoestrogen-like effect, found in grapes, cranberries, blueberries, bilberries & peanuts
Aloe Vera	Anti-inflammatory	May decrease the following: cyclooxygenase and lipoxigenase, proinflammatory cytokines and UVB-induced PGE2 release by keratinocytes	Mucilage (active plant ingredient) contains choline and choline salicylate Active ingredients: salicylic acid, carboxypeptidase, polysaccharides and aloesin May cause allergic contact dermatitis
Ginkgo	Anti-inflammatory	Not known	Contains bilobalides, ginkgolides, ginkgolic acid

Cosmeceuticals

Contributed by Elisabeth Hurliman, MD, PhD; Jennifer Hayes, MD; Hilary Reich MD; and Sarah Schram, MD.

INGREDIENT	FUNCTION	MECHANISM	ASSOCIATIONS/SIDE EFFECTS
Licorice Extract (glabridin)	Lightens pigment	Disperses melanin and inhibits tyrosinase	Contains liquiritin and isoliquertin, which disperse melanin and glabridin which inhibits tyrosinase
Kojic Acid	Lightens pigment	Inhibits tyrosinase	Hydrophilic fungal derivative
Aloesin	Lightens pigment	Inhibits tyrosinase	Hydroxymethylchromone inhibits tyrosinase competitively
Arbutin	Lightens pigment	Inhibits tyrosinase; may inhibit melanosome maturation	Gluconopyranoside
Selenium	Antioxidant	Cofactor for glutathione peroxidase and thioredoxin reductase	Protects against UV-induced erythema and skin cancer in mice
Zinc	Antioxidant	May replace harmful redox active elements. May induce synthesis of free radical scavengers	Reduces UV-induced sunburn in mice
Ferulic Acid (4-hydroxy-3-methoxy-cinnamic acid)	Antioxidant	Reduces lipid peroxidation, scavenges free radicals	UV absorber, synergistic with vitamins C, E and beta-carotene
Arnica	Anti-inflammatory	Not known	Reduces bruising, may help wound healing; may cause allergic contact dermatitis (Compositae family)
Matrikines		Regulatory peptide factors	
Niacinamide	Anti-inflammatory; collagen regulator (affects fibroblast metabolism) Lightens pigment	Inhibits mast cell histamine release Increases collagen and ceramide synthesis	Increased collagen synthesis in-vitro and normalization of glycosaminoglycan synthesis
Copper Cofactor	Regulates collagen	Transport protein cofactor; activates collagen synthesis	Functions with zinc → changes dermal fibers (more discrete, less clumped)

References:

1. Baumann, L. (2007). Less-known botanical cosmeceuticals. *Dermatologic Therapy*, 20(5), 330-342.
2. Bowe, W.P. & Pugliese S. (2014). Cosmetic benefits of natural ingredients, *Journal of Drugs in Dermatology* 13 (9), p. 1021-1025.
3. Bruce, S. (2008). Cosmeceuticals for the attenuation of external and intrinsic dermal aging. *Journal of Drugs in Dermatology*, 7 (2 suppl), s17-22.
4. Draelos ZD (2012). Cosmetics & cosmeceuticals. In: Bologna JL, Jorizzo JL & Schaffer JV (2012, Ed). *Dermatology*, Ch. 153, Elsevier, Saunders.
5. Geng A & Dufresne Jr. R.G. (2012). Complementary & alternative medicine. In: Bologna JL, Jorizzo JL & Schaffer JV (2012, Ed). *Dermatology*, Chapter 133, Elsevier, Saunders.
6. Kerscher, M. & Buntrock, H. (2011). Update on cosmeceuticals. *Journal der Deutschen Dermatologen Gesellschaft*, 9(4), 314-326.
7. Roy K. & Forman S.B. (2013). Miscellaneous topical agents. In: Wolverton, SE (Ed). *Comprehensive Dermatologic Drug Therapy*, Chapter 55, Elsevier, Saunders.
8. Sami N. (2013). Topical retinoids. In: Wolverton, SE (Ed). *Comprehensive Dermatologic Drug Therapy*, Chapter 41, Elsevier, Saunders.