Ageless Skin Care Ingredients

By Sandy Almendarez, Editor in Chief

While no one wants an old heart or liver, it’s the skin that get the most attention in the anti-aging category. As the body’s largest organ, it offers a first impression on the age of the person who bares it.

The skin consists of three layers: the epidermis, the dermis and the subcutis. The epidermis, the outside visible layer of skin, is constantly rebuilding itself with new cell growth occurring in the lower layer epidermis, which works its way to the surface in about four weeks and then sheds. Melanocyte cells in the epidermis produce melanin in response to the sun’s ultraviolet (UV) light, causing a tan, but also age-related dark spots.

Moving to the thick inner layer of the skin, the dermis has elastic fibers, which help the skin stay elastic (aka, wrinkle free).

The deepest subcutaneous layer is mostly made up of fat and connective tissue.

Research has shown healthy nutrition affects the processes and look of skin, but consumers can find it difficult to eat all of the nutrients they want to keep their skin youthful, so supplement and functional food manufacturers have the opportunity to include researched-backed botanicals and specialty nutrients into anti-aging skin care products.

Plant-Based Beautifiers

Carotenoids, yellow, orange and red pigments synthesized by plants, have been shown to be suitable photoprotectants (offer protection from the sun). Exposure of the skin to UV light either from the sun or irradiation induces photoaging through the up-regulation of matrix metalloproteinase (MMP) enzymes and breakdown of extracellular matrices (molecules that provide structural and biochemical support to cells).

A 2008 study found higher levels of lycopene, a carotenoid found in tomatoes, in the skin of volunteers aged between 40 and 50 years led to lower levels of skin roughness. The researchers used optical non-invasive in vivo methods to examine the structures of the furrows and wrinkles as well as the concentration of lycopene.

Twelve weeks of supplementation with 10 mg/d of a tomato extract (as Lyc-o-Mato from LycoRed) prevented erythema (skin redness caused by sun exposure) by 38 percent. In the same study, a tomato-extract based drink (as Lyc-o-Guard-Drink) reduced erythema by 48 percent.

Research has shown carotenoids work better when they are combined with a stabilizing antioxidant, such as vitamin E or olive oil. A 2002 study found that lycopene and beta-carotene, another carotenoid, did not protect on their own, but in the presence of vitamin E, their stability in culture was
improved and the rise in MMP expression was suppressed, suggesting a requirement for antioxidant protection of the carotenoids.³

Twelve weeks of 55 g/d of tomato paste (with 16 mg of lycopene) in olive oil protected against acute and potentially longer term aspects of photodamage compared to olive oil alone in a randomized controlled study with 20 healthy women (median age 33 years).⁴

The herb rosemary has also demonstrated an anti-aging effect to the skin.⁵ Carnosic acid, a phenolic diterpene from rosemary, inhibited UV-induced expression of MMPs in a concentration-dependent manner in human cell lines. Carnosic acid also reduced UV-induced reactive oxygen species generation and GADD45 expression, a marker for oxidative DNA damage.

Carnosic acid and carnosol, another anti-inflammatory compound in rosemary, regulated the expression of inflammation-associated genes in the skin.⁶ Specifically, both compounds reduced the expression of the anti-inflammatory markers interleukin-1 beta (IL-1β), tumor necrosis factor-alpha (TNF-α) and cyclooxygenase-2 (COX-2).

Olives and olive oils help skin health beyond stabilizing carotenoids. Hydroxytyrosol, the major antioxidant compound present in olive oil can also protect skin that’s been damaged by UV light.⁷ A 2005 study noted hydroxytyrosol prevented typical markers of oxidative stress, such as lipid peroxidation, in a UVA-irradiated human melanoma cell line. The protective effects were dose dependent, reaching a maximum at 400 µm of hydroxytyrosol, according to the study.

A 2011 study conducted by DSM Nutritional Products reported hydroxytyrosol inhibited production of the inflammatory markers nitric oxide (NO) and prostaglandin E₂ (PGE₂), “reflecting strong anti-inflammatory activity,” in white blood cells that were stimulated with lipopolysaccharide (found in bacteria).⁸ Hydroxytyrosol and olive vegetation water diminished secretion of the inflammatory markers cytokines and chemokines, leading the authors to conclude, “The effects of hydroxytyrosol on NO and chemokine production point to their impact on chronic inflammatory processes in endothelium or arthritis.”

In India, the spice turmeric is featured in curry and has been used in Ayurvedic remedies to address several conditions. Modern research has shown how it improves skin health. For instance, one study from 2013 reported curcumin, the active ingredient in turmeric, repaired photodamaged skin, including pigmented changes, thinning of the skin and premalignant lesions, but the researchers noted the repair process took many months.⁹ The researchers noted that curcumin inhibited phosphorylase kinase (PhK), an enzyme responsible for activating inflammatory pathways in injury-activated scarring. In photodamaged skin, PhK can promote the survival of precancerous cells and allow for subsequent tumor transformation. A review from 2010 reported curcumin blocks multiple targets on pathways directed against solar-induced injury.¹⁰ The researcher noted science has shown curcumin has the potential to reduce photoaging skin and cancer caused by UV radiation.
A color-free compound derived from yellow curcuminoids, (the biologically active principles extracted from curcumin) also showed efficacy as a skin whitener, which is used in cosmetic applications to reduce hyperpigmentation, age spots and sun damage. The ingredient—SabiWhite® from Sabinsa—added to a cream at 0.25 percent, was as effective as 4-percent hydroquinone cream in depigmenting skin in a randomized, double blind, placebo-controlled study in 50 human subjects.

**Boswellia serrata**, a tropical tree, has also long been used in Ayurveda to address issues such as arthritis, infections, depression, diabetes and cancer. Boswellic acids (BAs) extracted from the gum resins of boswellia have been shown in modern research to stimulate fibroblasts benefitting skin health. A 2010 randomized, double blind, placebo-controlled study reported a base cream containing 0.5-percent BAs improved the Dover’s global score for photoaging, tactile roughness and fine lines, as well as increased elasticity in female volunteers who applied the cream daily for 30 days.

And a 2014 study found a combination of four herbs, including *Boswellia Carteri*, *Agrimonia Eupatoria*, *Nelumbo Nucifera Gaertn* and *Pollen Typhae Angustifoliae* significantly enhanced wound healing by relieving inflammation and increasing formation of tissue in a rabbit ear scar model. It also reduced scar formation by increasing collagen maturity.

**Lychee fruit**, a tropical and subtropical fruit tree native to the Guangdong and Fujian provinces of China, helps the dermis and appearance of the epidermis, according to several unpublished research trials. Women aged 26 to 60 who supplemented with 100 mg of lychee fruit (as Oligonol from Maypro) twice per day for 12 weeks in an unpublished open-label controlled study experienced a reduction of the estimated skin age and an improvement in wrinkles in the eye area. Results were more visible in participants who were older than 40 years, and half of participants reported noticeable reductions of skin roughness and wrinkles.

A different study presented at the 2008 International Congress on Nutrition and Integrative Medicine (ICNIM) found topical application of Oligonol improved skin parameters associated with aging. In the study with five volunteers, 10-percent Oligonol solution was used topically twice a day on the left half of the face, while a placebo was used on the right half of the face. After two months, Oligonol showed strong UV protection activity and antioxidant activity, reduced skin wrinkles and skin thickness, and improved skin elasticity and pigmentation.

In 2010, a study presented at Experimental Biology Annual Meeting reported oral supplementation with Oligonol positively affected the appearance of skin photoaging, wrinkling, hyperpigmentation and lentigines (liver spots). In the open-label controlled pilot trial, healthy sedentary males who supplemented with 100 mg of Oligonol twice daily for three months had a reduction in fine lines (72.7 percent of participants); reduction of deep wrinkles and sleep wrinkles (18.2 percent of participants); and a consistent lightening and brightening of complexion, along with less redness, blotchiness, freckles and brown-pigmented blotches.
The root of *Pueraria mirifica* has been used in Thailand for more than 700 years, and Bio-Botanica—which supplies patented extract of Pueraria called Puresterol—said the root has been touted in legon to have anti-aging properties. “A paper translated from Siamese in 1931, mentions the use of the root, Pueraria Tuberous Root, to ‘make the skin smooth like a six year old child and allow you to live 1,000 years and prevent suffering from parasites, while also enhancing memory,’” according to the company.

A 2014 study concluded that Pueraria can "play a role in decelerating the skin aging process and could be formulated for anti-wrinkle skincare products." Purple tea is derived from a crossbred variety of the common tea leaf, *Camellia sinensis*, from which black, white and green teas are derived. It contains red and purple anthocyanins, which are related to similar anthocyanin compounds found in blueberries, raspberries and purple grapes. The tea contains EGCG and other catechins found in regular green tea, but also contains a unique compound, 1,2-di-galloyl-4,6-hexahydroxydiphenoyl-D-glucose (GHG). In an unpublished study, men who ingested capsules containing lab-extracted Purple Tea with GHG™ (from Maypro)—equivalent to 100 mg of purple tea with GHG—for four weeks, experienced increased collagen levels in their cheeks.

**Beta-glucans**, sugars in the cell walls of bacteria, fungi, yeasts, algae, lichens and plants, such as oats and barley, are known for their use in immune health, but other research has shown their benefits to skin as a moisturizer and wound healer. For instance, a single application of 0.5-percent oat beta-glucan solution showed, despite its large molecular size, beta-glucans deeply penetrated the skin into the epidermis and dermis. The clinical study of 27 subjects also found beta-glucans significantly reduced wrinkle depth and height, and overall roughness after eight weeks of treatment. “The study supports the use of oat beta-glucan in the care and maintenance of healthy skin and the cosmetic treatment of the signs of aging,” the authors concluded.

A 2014 review of beta-glucans’ effects on skin reported they “possess skin regenerative properties, which involve revitalizing immune cells in skin, regeneration of collagen-producing cells, strengthening skin’s ability to deal with adverse environmental effects and promotion of anti-aging and anti-wrinkles.”

**Phytoceramides**, are plant lipids that play a role in skin hydration. An unpublished randomized, double blind, placebo-controlled clinical trial found 70 mg/d of Ceramosides oil or 30 mg/d of Ceramosides powder (products from SEPPIC that contain phytoceramides) demonstrated a skin hydration effect in 15 days. Eighty-five percent of participants noticed a reduction of scales, and 80 percent felt an improved skin appearance, while 65 percent of the subjects who took a placebo didn’t feel any improvement.

A different double blind unpublished clinical trial showed Ceramosides oil and powder improved skin moisturization by more than 16 percent vs. placebo in 15 days (23 percent vs. baseline), and more than 21 percent vs. placebo after two months (36 percent vs. baseline). The reduction of wrinkles was significant after two weeks, and skin elasticity was improved by more than 18 percent vs. placebo in 15 days and more than 26 percent vs. placebo after two months.
Vitamins, Collagen and Specialty Nutrients

**Vitamin E** is comprised of eight fat-soluble compounds (alpha-, beta-, gamma- and delta-tocopherol, and alpha-, beta-, gamma- and delta-tocotrienol), with research showing benefits to skin, especially from tocotrienols. A 2008 mouse study reported dietary tocotrienols protected the skin from damage induced by UVB irradiation more strongly than alpha-tocopherol. The study found sesamin (sesame lignans) enhanced tocotrienol effects.

Studies have also shown tocotrienols reduce skin pigmentation. Treating cells with delta-tocotrienol decreased melanin content by 44 (25 microM dose of delta-tocotrienol) to 50 percent (50 microM dose) after 48 hours, and by 14 to 21 percent after 72 hours, compared to control levels. In mouse melanoma B16 cells, melanin content was significantly reduced after treatment with 50 and 100 mcg of delta-tocotrienol, but not 10 mcg of delta-tocotrienol in a 2009 study. The activity and amount of tyrosinase (enzymes responsible for melanin synthesis) also significantly decreased in cells treated with 10, 50, and 100 mcg of delta-tocotrienol.

A 2012 study found topical pre-treatment with vitamin E protected skin against photosensitivity, and reduced reactions to irradiation compared to those treated with vitamin A or a control. The 30 patients who used a topical agent containing 10-percent tocopherols and 0.3-percent tocotrienols before undergoing irradiation suffered less skin damage than patients that used a topical of retinol or a control.

Another double blind, placebo-controlled study showed supplementation of 40 mg of a full spectrum tocotrienol/tocopherol complex (as EVNol SupraBio™ from ExcelVite) in combination with 2 mg of astaxanthin (as AstaReal, from Fuji Health Sciences) significantly improved dry skin characteristics of subjects during winter months. These subjects reported improved elasticity, reduced swelling under the eyes and better skin feeling after the study period. In contrast, skin conditions of placebo subjects generally worsened by the end of the study.

A deficiency of **biotin**, aka vitamin B7, leads to hair loss and scaly skin around body orifices, but adding more to the diet beyond sufficiency can also benefit skin health. Sixty percent of dogs with fur and skin conditions (dull coat, brittle hair, loss of hair, scaly skin, pruritus or dermatitis) experienced a reduction of symptoms after they received 5 mg of biotin/10 kg body weight/d for three to five weeks in a 1989 study. And an improvement was noted in an additional 31 percent.

BioCell Collagen® contains a naturally occurring matrix of hydrolyzed collagen type-2 and low-molecular-weight hyaluronic acid (HA) and chondroitin sulfate. A 2012 study found 1 g/d of BioCell Collagen for 12 weeks led to a significant reduction of skin dryness/scaling and global lines/wrinkles in healthy females who displayed visible signs of natural and photoaging in the face.

Collagen peptides administered to pigs at 0.2 g/kg of body weight for 62 days increased the fibroblast density and enhanced formation of collagen fibrils in the dermis in a 2006 study. “These results suggest that prolonged ingestion of collagen peptides improves the mechanical properties of the...
dermis to resist external mechanical insults by enhancing the formation of collagen fibrils," the study authors reported.

A double blind, placebo-controlled trial from 2014 found a composition of different collagen peptides derived from porcine or bovine type-1 collagen (as Verisol® from Gelita) significantly improved skin elasticity in women aged 35 to 55 years who received either 2.5 g/d or 5.0 g/d of the collagen peptides for eight weeks compared to placebo. Verisol also improved skin moisture and skin evaporation in a subgroup analysis, but data failed to reach a level of statistical significance. A separate double blind, placebo-controlled study from 2014 found oral intake of Verisol reduced skin wrinkles and had positive effects on dermal matrix synthesis in women aged 45 to 65 years. Women who received 2.5 g/d of the bioactive collagen peptide for eight weeks had a 20-percent statistically significant reduction of eye wrinkle volume, a 65-percent statistically significantly higher content of procollagen type-1 and 18-percent statistically significantly higher content of elastin was observed in comparison to the placebo group after four and eight weeks of intake. A positive long-lasting effect was observed four weeks after the last Verisol dose.

Gelita said unpublished preclinical research on its Verisol showed it demonstrated an antioxidant effect and increased the antioxidant enzyme manganese-dependent superoxide dismutase (MnSOD) in healthy human dermal cells, and the effect was even more pronounced in irritated cells. Further, the company said orally administered Verisol increased RNA expression of MnSOD in healthy and skin-irritated mice in a different unpublished study. In addition, inflammatory processes after irritation were down regulated in Verisol-treated animals seen by a decreased expression of inflammatory cytokines, TNF-a, IL-1b and IL-6.

In two unpublished clinical studies, Sol® C (a different branded collagen peptide ingredient from Gelita), showed benefits to skin after topical application. Topical use of 2.5-percent and 5-percent Sol C cream twice a day for two weeks increased skin moisture by 15 percent and increased skin hydration on the forearm compared to an area of the women's skin that wasn’t treated. The other unpublished placebo-controlled, double blind, randomized clinical study reported 2.5-percent Sol C cream increased skin hydration by 21 percent on average in healthy women with dry skin; a cream without the Sol C increased skin hydration by 8 percent. A significant skin hydration effect by Sol C administration was also observed 24 hours after application in comparison with the base cream.

An unpublished study from 2014 found collagen peptides extracted from fish collagen (as TruMarine™ Collagen from Nippi Collagen) provided anti-aging benefits and dermal rejuvenation and may upregulate skin collagen metabolism. The randomized, placebo-controlled, double blind trial reported 5 g/d of TruMarine for eight weeks significantly improved wrinkles, texture, tone and smoothness, resulting in a more youthful appearance in women aged 35 to 65 years. The number of wrinkles decreased by 8 percent, the number of texture variations decreased by 10 percent, the number of age spots (brown and red skin lesions) decreased by 5 percent, and the number of pores on the face reduced by 7 percent.
In another double blind, placebo-controlled unpublished study, healthy women aged 40 to 54 years drank a beverage containing 5 g/d or 10 g/d of Nippi Collagen peptides. After three weeks, 41 percent of the women in the 5 g/d group and 62 percent in the 10 g/d group reported their skin and complexion to be in “an improved condition with better texture and moisture.” After seven weeks, 81 percent in the 5 g/d group and 74 percent in the 10 g/d group confirmed that their skin was noticeably “better, more hydrated and lifted” than it had been at the start of the study.

Marine collagen increased skin’s water absorbing capacity in a different unpublished double blind trial with volunteers who drank a beverage containing 10 g/d for two months. Subjects who received the peptides reported an improvement in skin moisture, texture and hydration.

Hyaluronic acid (HA), a compound distributed widely throughout connective and skin tissues helps benefit skin health by increasing the body’s ability to retain water.

A randomized, double blind, placebo-controlled clinical study conducted in 2014 found ingested HA increased skin moisture and improved treatment outcomes for patients with dry skin. HA was also reported to be absorbed by the body distributed, in part, to the skin.28

A low-molecular weight HA (as Injuv® from Soft Gel Technologies) significantly improved normal wound healing compared to placebo in an unpublished mouse study. Injuv also showed dramatic improvements of several physiological parameters, including face moisture, skin smoothness and firmness in a separate unpublished pre-clinical trial in women aged 22 to 65 years. In the study, participants received Injuv via six 70-mg tablets standardized to 9-percent HA, which provided 37.8 mg/d of HA for 45 days. Another unpublished study found supplementation with Injuv (two 70-mg soft gels twice daily) for 30 days improved skin moisture content in participants aged 30 to 50 years compared to baseline measurements, as well as when compared to placebo.

A different unpublished study presented at the Hyaluronan International Conference in 2013 reported HA (as Hyabest (S) LF-P HA from Kewpie) increased skin moisture and suppressed damage to the skin caused by UV rays, including wrinkle formation and skin dryness. Using hairless mice, researchers tested the oral intake of Hyabest (S) LF-P HA for six weeks at 200 mg/d. A review from 2014 looked at the role of the enzyme superoxide dismutase (SOD) in skin disorders, and reported studies have shown its ability to inhibit the expression of oxidative stress, play an efficient role in wound healing and acne, and reduce cellulite in women.29 The authors added that it is a useful and natural solution to skin disorders.

Seven of 10 patients with polymorphic light eruption (PLE), the most common UV-induced skin disorder, who supplemented with 140 IU/d of SOD (as SOD B® from Bionov), vitamin C, vitamin E, coenzyme Q10 (CoQ10), beta-carotene and astaxanthin had a significant reduction of the manifestations of PLE in a study from 2006.30

Patients with vitiligo, a disease that causes the loss of skin color in blotches, who used topical SOD B ointment showed repigmentation after six months of treatment.31 Sixty percent of patients showed
repigmentation, 18 percent showed total repigmentation and 42 percent showed partial repigmentation.

SOD B was an efficient strategy to prevent UV-induced skin cell death in an unpublished 2000 study using human cell lines. Cell that were incubated with SOD B at three different moments of UV exposure (24 hours before exposure, during exposure and 24 hours after exposure) had a dose-dependent reduction in cell death, with the maximum protective effect of SOD B when it was administered 24 hours before exposure.

And oral supplementation with SOD (as SOD B) two weeks before UV irradiation reduced the production of pro-inflammatory TNF-a in mice bearing human transplant skin in an unpublished study from 2000.

With the importance skin has to looks throughout life, addressing its health is a no-brainer in anti-aging products. Using clinically researched ingredients in supplements and functional foods can help brands substantiate claims to consumers who desire to look ageless.

References:


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