

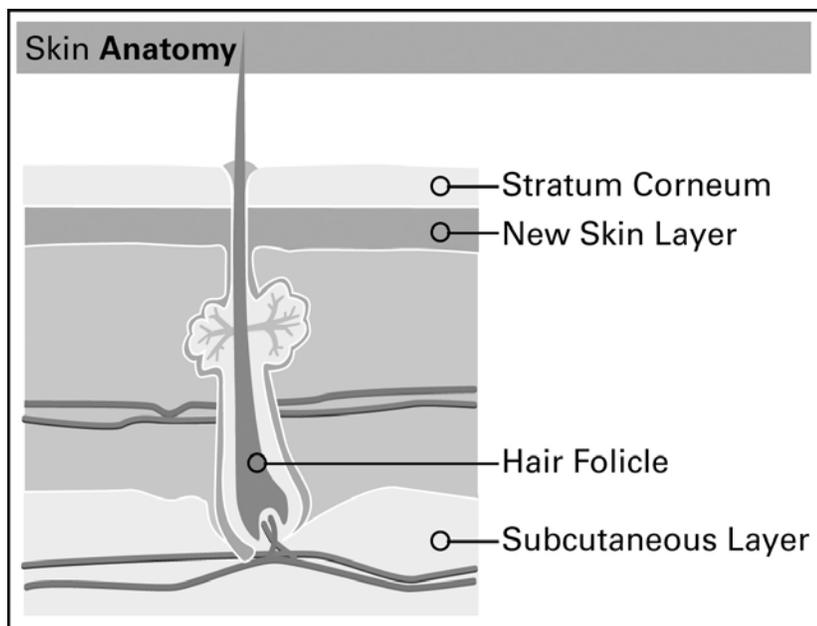
Photo Aging and Skin Care

By Simone Gloger, RNC, RHN, BS, Director of Nutrition Midtown 23rd and Lexington Ave.

The suitcase is packed and you are counting down the hours till your feet touch the warm soft sand and your body feels the warmth of the sun's rays. Sounds like paradise? Not when it is your skin that is paying the price.

In order to understand how the skin ages, one must understand the anatomy of the skin. The skin is a structure with two distinctly different layers, the top most epidermis and the underlying dermis. The epidermis is about as thick as a sheet of paper and the dermis typically ranges from 1/32 to 1/8 of an inch. Think of the epidermis as the grass covering your lawn and the dermis as the soil beneath. The dermis provides most of the structure to the skin and is responsible for the elasticity and firmness.

Consisting of a mesh of cells held in a matrix of proteins, fats, and other molecules, the dermis is sensitive to changes in tissue thickness or alterations of the matrix molecules. One of the factors that negatively affect the dermis is sun exposure (photo aging).



“Dermatologists estimate that 90 percent of skin damage is due to excess sun exposure and skin damage that occurs prior to the age of 18, increasing the risk of certain cancers.”²

The sun's ultraviolet rays (UVA and UVB) penetrate the skin, damaging the functional molecules in the cells, causing the cells to perform poorly or die off early. The skin that sheds off from sunburns' is layers of dead cells from the epidermis. It is well-known that chronic exposure to ultraviolet light found in sunlight leads to photo aging. Photo aging of the skin is characterized by coarseness, wrinkling, hyperpigmentation (discoloration), sallowness, laxity, easy bruising, atrophy or thinning, and ultimately the development of skin cancer, even the dreaded melanoma. There is good evidence that UV radiation induces the production of reactive oxygen species, otherwise known as oxygen free-radicals, which can overwhelm the skin's natural anti-oxidant defenses. These reactive oxygen species go on to damage proteins, cell membranes, and other macromolecules.¹ The damage to lipids (fats), proteins, and DNA in skin cells can build up over time and

become evident as photo aging usually as wrinkling. The extra cellular matrix which contains collagen and elastin also sustains cumulative damage that contributes to photo aging. Dermatologists estimate that 90 percent of skin damage is due to excess sun exposure and skin damage that occurs prior to the age of 18, increasing the risk of certain cancers.²

Sunscreens are commonly used to prevent photo aging of skin areas that are exposed to sunlight. Sunscreens are topical preparations that absorb, reflect or scatter UV. While externally it is important to put on your sunscreen, internally you can help protect yourself from the damaging rays by ingesting a broad spectrum of antioxidants. Let's stave off some of the damaging effects of the sun from the inside out.

Much of the damage caused by sunlight is due to the formation of free radicals, normal chemicals that are altered by the energy in UVA and UVB rays. Free radicals wreak

havoc on enzymes and the DNA. The body protects against free radical damage through the actions of antioxidants. These can be antioxidants found in your food or supplements.

Lycopene

Lycopene is a red, fat-soluble pigment found in vegetables, and most commonly found in tomatoes. It is one of a family of pigments called carotenoids and acts like an internal sunscreen because it migrates to the skin where it is protective.

Green Tea (EGCG)

Skin cells are in a constant state of renewal as newly formed cells push towards the outer layer of skin. Once they reach the surface of the skin, their metabolic activity slows dramatically. They prepare to die, while forming a water proof, sheet like structure. As they die off (about a month into their cycle) they are replaced by another wave of migration cells, starting the process all over again. EGCG the catechin polyphenol found in green tea seems to be a fountain of youth for skin cells. One study compared the normal growth of human skin cells to the growth of cells exposed to EGCG. To their astonishment, the researchers found that EGCG reactivates dying skin cells.¹¹ Researchers found that when exposed to EGCG, the old cells found in the upper layers of the skin appear to start dividing again.¹² Green Tea has also been shown to be helpful in preventing cancer-causing UV (ultraviolet) radiation from mutating the DNA of skin cells. Unlike normal sunscreen preparations, green tea does not physically block ultraviolet light. Rather it appears to protect cells from damage.¹³ Animal and human studies suggest that green tea polyphenols are photoprotective in nature, and can be used as pharmacological agents for the prevention of solar UVB light-induced skin disorders including photo aging, melanoma and nonmelanoma skin cancers.¹⁴ One study implanted human melanoma in nude mice and gave one group of mice a combination of Green Tea Extract, Vitamin C, Lysine, Proline, and Arginine along with their regular diet. The combination of Green Tea extract, Vitamin C and Amino Acids decreased

Beta Carotene

Beta-carotene protects plants from the free radicals that are produced during photosynthesis. It has been used in the treatment of patients with a genetic light-sensitive skin disorder called erythropoietic protoporphyria (EPP), which is characterized by a burning, swelling, and redness of the skin when exposed to sunlight. Results of a 7-year study showed that 84 percent of individuals increased their tolerance to sunlight without manifesting symptoms.³ A more

recent study found that beta-carotene is taken up into the cell in a dose dependent manner, where it then interacts with UVA radiation in the cell and provides the cell protection from photoaging associated mtDNA (Mitochondrial DNA) mutation making it applicable to everyone.⁴

Lutein

Lutein is a xanthophyll carotenoid with potent antioxidant activity. It is found in dark leafy vegetables such as spinach, plus various fruits and egg yolks and it is structurally similar to beta carotene. Studies show that supplementing with oral Lutein protects from the sunburn reaction and helps to reduce UV-induced inflammation.⁵ Its Similar to our eyes, the lutein we consume is deposited throughout our skin.⁶ A recent human clinical study showed 10mg of Lutein daily increased skin hydration, elasticity of the skin and lipid content.⁷

Astaxanthin

Astaxanthin is a red pigment that occurs naturally in a wide variety of living organisms. Astaxanthin forms when green algae are subjected to stress like UV light from the sun, producing a deeply pigmented carotenoid like Lutein and Lycopene, to protect itself from environmental challenges. Astaxanthin works in a similar way to protect human skin from environmental damage by building up under the skin as a protective shield. It is truly a super antioxidant because it is 50-100 times stronger than vitamin E, and actually assists the action of vitamin E and C in their antioxidant activity. Other analyses show that Astaxanthin is an efficient absorber of specific ultraviolet sunlight rays that may contribute to skin aging and skin cancer.⁸

Grape Seed Extract

Grape Seed extract is high in Oligomeric Proanthocyanidins (OPC's) and is a powerful antioxidant. It can help reduce the damage done by free radicals,



the growth of melanoma by 57% without any adverse effects. The combination inhibited matrix metalloproteinases, and VEGF secretion by the melanoma cells in a separate laboratory analysis (these agents allow the cancer to spread). In the lab the combination inhibited the growth of the cells by 64% to 95% depending on the concentration.¹⁵ Other studies suggest that certain green tea polyphenols may help prevent skin cancer if they are applied directly to the skin.¹⁶ In addition, green tea may offer synergistic benefits if combined with standard sunscreen.

strengthen and repair connective tissue and promote enzyme activity. OPC's help protect the skin from ultra violet radiation damage that leads to wrinkles and skin cancer. Because it stabilizes collagen and elastin, OPC can help improve the elasticity and youthfulness of the skin. OPC's strengthens the connective tissue and fat chambers. People taking grape seed extract have noticed that it helps reduce hyper-pigmentation and old scars.⁹ In one study, researchers exposed hairless mice to ultraviolet radiation (just like sunlight); these mice have little or no ability to protect themselves from ultraviolet radiation and are commonly used in skin research. They were split into two groups; one group received a standard diet while the second group received the standard diet with the addition of Grape Seed Proanthocyanidins. In the mice receiving Grape Seed Extract supplying OPCs there were 65 fewer cancerous tumors and if they did occur they were up to 78% smaller.¹⁰

Pomegranate

Pomegranate is a rich source of two types of polyphenolic compounds, anthocyanidins (such as delphinidin, cyanidin, and pelargonidin) and hydrolysable tannins (such as punicalin, pedunculagin, punicalagin, gallagic and Ellagic acid and esters of glucose) and possesses strong antioxidant and anti-inflammatory properties.¹⁷ A Japanese study found that ellagic acid potentially suppresses lipid peroxidation, thus helping to guard against damage from ultraviolet radiation.¹⁸ Pomegranate may also help to protect against skin cancers. Numerous studies have found that applying pomegranate extract topically, significantly reduced the incidence and number of skin tumors that formed in experimental models of skin cancer.¹⁹

Milk Thistle (Silymarin)

Silymarin is a naturally occurring polyphenolic flavonoid compound derived from the seeds of the milk thistle plant

Silybum marianum. Silymarin consists of a mixture of three bioflavonoids found in the fruit, seeds, and leaves of the milk thistle plant: silybin, silydianin, and silychristine.²⁰ The beneficial effects of silymarin are primarily the result of its main active constituent silybin, which was shown to be bioavailable in the skin and other tissues following systemic administration. A wide range of in vivo animal studies suggests that silymarin possesses antioxidant, anti-inflammatory, and immunomodulatory properties that may help prevent skin cancer as well as photoaging.²¹ Silymarin scavenges reactive oxygen species, inhibits sunburn cells, apoptosis, and lipid peroxidation.

Superoxide Dismutase (SOD)

Superoxide dismutase (SOD) is the enzyme that neutralizes the superoxide radical. It is a chain-breaking antioxidant, meaning it can stop a chain reaction of free radical damage even while it is occurring. The SOD takes apart dangerous superoxide and converts it to hydrogen peroxide and oxygen. Hydrogen peroxide is much weaker than superoxide, but still dangerous. SOD requires the enzyme catalase then to remove the hydrogen peroxide molecules. Catalase is abundant in our body's red blood cells and helps to remove hydrogen peroxide from our system and from our tissues. This prevents formation of the more toxic free radicals.²² SOD has a different mode of action to vitamins. It is thought to be more powerful than antioxidant vitamins as it activates the body's production of its own antioxidants, including catalase and glutathione peroxidase. SOD's versatility is demonstrated by its ability to protect the skin against damage caused by ultraviolet light. In a randomized, double-blind placebo-controlled study, scientists exposed the forearms of 50 volunteers to ultraviolet light once a week for four weeks. Starting two to three days before the first exposure, the participants took a



Collagen (Hydrolyzed Collagen) Plus Vitamin C

Collagen is the primary structural protein found in connective tissues (including the skin, bones, cartilage, tendons, and ligaments). Hydrolyzed collagen consists of water soluble peptides which are sources of the amino acids glycine, L-proline and L-hydroxyproline.²⁴ Hydrolyzed collagen is collagen that has been enzymatically or chemically processed to make it more digestible and more easily absorbed by the body.²⁵ Studies also show that collagen protein requires vitamin C for 'hydroxylation,' a process that allows the molecule to achieve the best configuration and prevents collagen from becoming susceptible to damage.²⁶ Adding vitamin C to a culture of skin cells (fibroblasts) dramatically increases the synthesis of collagen. In addition, as a water-soluble antioxidant, vitamin C is in a unique position to 'scavenge' free radicals before these destructive substances have a chance to damage the skin. Preliminary evidence also suggests that cream containing vitamin C may improve the appearance of fine lines and wrinkles on severely sun-damaged skin.²⁷ Although most animals can make vitamin C in their bodies, humans have lost this ability in the course of evolution. Instead we must obtain vitamin C from food—mainly fruits and vegetables—or through supplementation. Individuals who suffer gastric upset from taking vitamin C capsules can take the buffered form of vitamin C which is easier on the stomach.

daily supplement containing either SOD or a placebo. Individuals receiving SOD, even those with fair skin, were able to withstand eight times more ultraviolet light exposure before they developed sunburn compared to those who received placebo. Other benefits of SOD were less skin inflammation and more rapid healing of redness after burning occurred. The scientists concluded that SOD effectively prevents the consequences of oxidative stress resulting from excessive sun exposure, and that this effect is particularly important for fair-skinned individuals.²³

Alpha Lipoic Acid

Alpha lipoic acid is an advanced antioxidant that is soluble in both water and lipid (fat). This dual solubility allows the skin to access it very quickly and explains why alpha lipoic acid is recognized as the Universal Antioxidant. Some researchers claim its antioxidant powers as 400 times more potent than those of vitamin C or E.²⁸ Significantly, it does not deplete or diminish the strength of vitamins C and E, which are naturally present in cells, and actually helps to increase their levels. Alpha lipoic acid also plays a role in enhancing cell energy, which contributes to a healthy youthful glowing complexion. Applied topically, it is perfect for people who are prone to allergic reactions from other types of skin products. It works to improve the overall appearance of the skin, but works best treating lines, wrinkles, under-eye-bags, puffiness, enlarged pores, acne scars, and shallow or dull skin.³

Zinc

Zinc is pivotal in maintaining healthy skin because it helps vitamin C to make collagen, and supports the tissue rebuilding action of vitamin A. Taking a multivitamin ensures that you are getting some of these antioxidants and trace minerals necessary for different enzymatic reactions to take place in the body.

To gain the antioxidant advantage in the fight against free radicals and photo aging, it would be impossible to consume enough food to obtain all the antioxidants and phytonutrients. For example, you would need to consume seven pounds of spinach daily to get one milligram of alpha lipoic acid, one of the key antioxidants. When considering that the recommended minimum amount of alpha lipoic acid you should be getting every day is 100 milligrams, the nature of the problem becomes apparent.

Great skin is not simply about fancy sunscreens and creams. Great skin comes from the inside and is the result of a healthy lifestyle and supplement choices. As much as we need to spend time in the sun for our physical and emotional health, we also need to be sure that we protect ourselves from the harmful consequences of too much exposure. As our studies on nutrition and photo aging progress, the benefits of antioxidants appear more and more obvious. To our great advantage, taking a variety of the proper supplements on a daily basis can provide the necessary antioxidants needed to look and stay younger.

References

- 1 Gwarty, Dan MD. Anti-aging Skin Care Guide-The Latest Secrets to Youthful Skin. Fitness RX. Oct 2006 pgs. 108-115.
- 2 Gwarty, Dan MD. Anti-aging Skin Care Guide-The Latest Secrets to Youthful Skin. Fitness RX. Oct 2006 pgs. 108-115.
- 3 Mathews-Roth MM, et al. Beta Carotene Therapy for Erythropoietic Protoporphria and Other Photosensitivity Diseases. Arch Dermatol. Sept1977;113(9):1229-32.
- 4 Eicker J, et al. Betacarotene supplementation protects from photoaging-associated mitochondrial DNA mutation. Photochem Photobiol Sci. Jun2003;2(6):655-9
- 5 Lee Erica, Faulhaber, Hanson, Kerry., et al. Dietary Lutein reduces Ultraviolet radiation-Induced Inflammation and Immunosuppression. Journal of Investigative Dermatology. 2004;122:510-517
- 6 www.luteininfo.com 2007
- 7 www.luteininfo.com 2007
- 8 <http://www.medicalnewstoday.com/medicalnews.php?newsid=19341>. Article Date: 27 Jan 2005 - 14:00 PDT
- 9 www.health-n-energy.com/grapeseed.htm 2007
- 10 http://media.invitehealth.com/2007/2007_03_27.html
- 11 Harley Deriso, Christine. Green Tea Research Translates into Skin Care Products. Medical College of Georgia—News Release. 2004.
- 12 Harley Deriso, Christine. Green Tea Research Translates into Skin Care Products. Medical College of Georgia—News Release. 2004.
- 13 Katiyar SK, Matsui MS, et al. Polyphenolic antioxidant (-)-epigallocatechin-3-gallate from green tea reduces UVB-induced inflammatory responses and infiltration of leukocytes in human skin. Photochemistry and Photobiology. 1999; 148-153.
- 14 Katiyar SK. Skin photoprotection by green tea:antioxidant and immunomodulatory effects. Department of Dermatology , University of Alabama of Birmingham, Birmingham,AL 2003Sept;3 (3): 234-42.
- 15 InVite Health [radio Study] <http://media.invitehealth.com/2006/01.html>. 2006.
- 16 Katiyar SK, Ahmad N, Mukhtar H. Green tea and skin. Archives of Dermatology. 2000; 136:989-994.
- 17 Life Extension [Pomegranate] http://www.lef.org/magazine/mag2007/jan2007_cover_skin_01.htm. Like Extension is a registered trademark of the Life Extension Foundation.
- 18 Life Extension [Pomegranate] http://www.lef.org/magazine/mag2007/jan2007_cover_skin_01.htm. Like Extension is a registered trademark of the Life Extension Foundation.
- 19 Life Extension [Pomegranate] http://www.lef.org/magazine/mag2007/jan2007_cover_skin_01.htm. Like Extension is a registered trademark of the Life Extension Foundation.
- 20 Pepping J. Milk Thistle: Silybum marianum. American Journal of Health-System Pharmacy. 1999; 56:1195-1197
- 21 Katiyar Sk, Korman NJ, Mukhtar H, Agarwal R. Protective effects of Silymarin against photocarcinogenesis in a mouse skin model. Journal of the National Cancer Institute 1997; 89:556-566.
- 22 <http://www.nutraingredients.com/news/ng.aspsod-supplement-may>
- 23 Muth, et al. Influence of an orally effective SOD on hyperbaric, oxygen-related cell damage. Free Radical Research. 2004; 927-9
- 24 [http://en.wikipedia.org/wiki/Hydrolyzed_collagen_\(hydrolysate\)](http://en.wikipedia.org/wiki/Hydrolyzed_collagen_(hydrolysate)) Last Modified 15:22, 10 February 2007
- 25 [http://en.wikipedia.org/wiki/Hydrolyzed_collagen_\(hydrolysate\)](http://en.wikipedia.org/wiki/Hydrolyzed_collagen_(hydrolysate)) Last Modified 15:22, 10 February 2007
- 26 Gaby SK, Singh VN. Vitamin C-Vitmain Intake and Health: A Scientific Review. 1991:103-143.
- 27 Traikovich SS. Use of topical ascorbic acid and its effects on photo damaged skin topography. Archives of Otolaryngology-Head and Neck Surgery. 1999;125:1091-1098.
- 28 Perricone, Nicholas. The Wrinkle Cure, Chapter 6. 'Alpha Lipoic Acid: Nature's Most Powerful Antioxidant and Inflammatory.' Pp.67-80. New York: Time Warner, 2000.
- 29 Perricone, Nicholas. The Wrinkle Cure, Chapter 6. 'Alpha Lipoic Acid: Nature's Most Powerful Antioxidant and Inflammatory.' Pp.67-80. New York: Time Warner, 2000.

