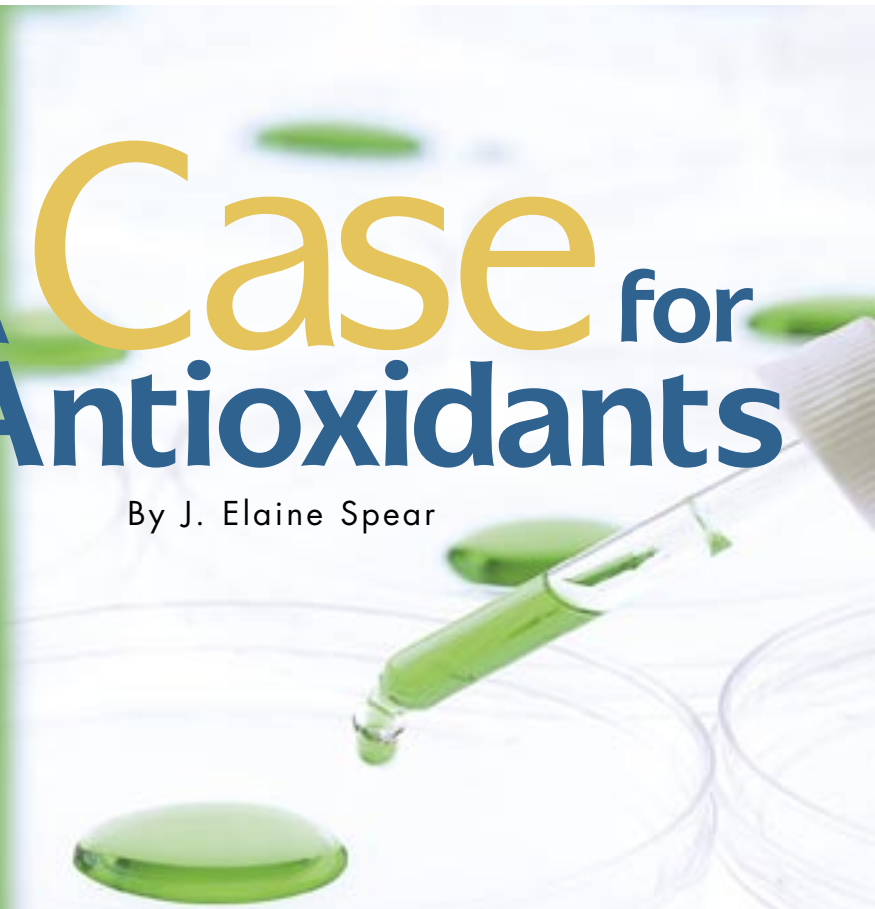




A Case for Antioxidants

By J. Elaine Spear



Unlike many skincare ingredients whose efficacy relies heavily on anecdotal evidence, there are volumes of scientific studies on the role of various

antioxidants as anti-inflammatory agents, inhibitors of acne, rosacea and eczema, and antiaging components of the skin. Beginning with green tea and *Centella asiatica* (gotu kola), and progressing through scores of other antioxidants, medical science is compiling reams of information on the therapeutic effects of these protective substances. In the world of esthetics, many of the findings are pointing to a new generation of super-antioxidants that could very well brighten the future of skin care.

Why are antioxidants so important? "The skin is the most environmentally stressed organ in mammals, especially in human beings," explains Howard Murad, M.D., in his research paper "Pomegranate Extract Both Orally Ingested and Topically Applied to Augment the SPF of Sunscreens" (written with William V.R. Shellow, M.D., *Cosmetic Dermatology*, Volume 14, No. 10). "Not only is skin subjected to toxic chemicals and hostile environments, it's also the only organ directly exposed to ultraviolet light in the presence of oxygen. The result is the creation of free radicals. In the skin, these radicals frequently trigger the release of inflammatory mediators that are commonly manifested as sunburn, cytoskeletal alterations [changes in the internal scaffolding of cells] and collagen breakdown that can also result in structural DNA changes, such as breaks in DNA strands."

Destructive Forces

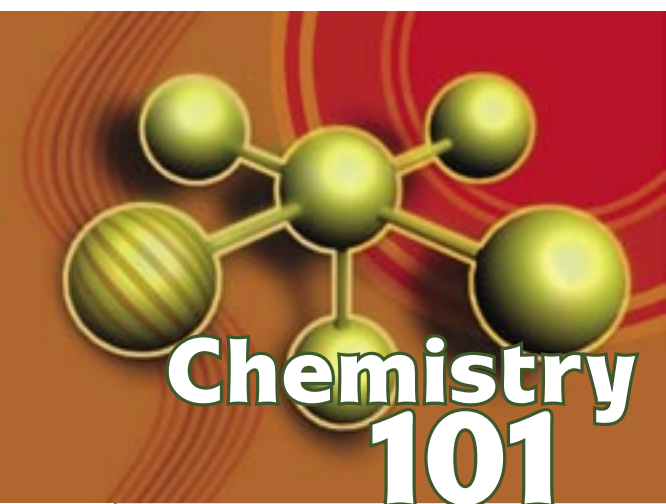
Scientists have suspected the role that free radicals play in skin aging since Denham Harmon, M.D., Ph.D., proposed the first theory of free-radical activity and aging in 1956. Since that time, free radicals have become suspect in the development of cancer, heart disease, arthritis, diabetes mellitus and at least 75 other diseases that aren't caused by germs. They're also believed to play a starring role in skin aging and skin cancers.

Signs of aging in the skin usually begin to appear at around age 30, although many women report seeing lines and wrinkles while still in their early 20s. (See "A Look in the Mirror" on page 98.) Taking a walk in the park, overindulging in a delicious meal, feeling overly stressed or simply spending a day at home with the curtains open can cause free-

radical activity and oxidative stress (the cumulative damage caused by free radicals) in the skin. Antioxidants are essential to all living tissues because they quench this free-radical activity and protect the skin against premature aging and disease.

As the study of antiaging and antioxidants continues to expand and mature, the views on how to protect the skin are becoming increasingly comprehensive. Instead of simply studying pigment or DNA damage, for instance, scientists are now looking at a host of factors that influence the health and aging of the skin.

"As the skin ages, the cell's mitochondria, which serve as the cell's 'power plants,' become less energetic, the immune function may decrease, structural components deteriorate and chronic inflammation may develop as well as decreased ability to repair DNA damage," says David McDaniel, M.D., director of the Institute of Anti-Aging Research at Virginia Beach, Virginia,



To understand the way free radicals and antioxidants interact, you must first understand a little bit about atoms and molecules. Here's a brief refresher course in Chemistry 101:

The human body is composed of many different types of cells, and those cells are composed of many different types of molecules. Molecules consist of one or more atoms that are joined by chemical bonds. Atoms consist of a nucleus composed of neutrons (uncharged particles) and protons (positively charged particles) that's surrounded by orbiting electrons (negatively charged particles). The number of protons in the atom's nucleus determines the number of electrons surrounding the atom.

Electrons are involved in chemical reactions; they're the substances that bond atoms together to form molecules. Electrons orbit an atom in one or more shells or pathways. The most important structural feature of an atom in determining its chemical behavior is the number of electrons in its outer shell. A substance that has a full outer shell of electrons isn't prone to entering into chemical reactions. Because atoms seek to reach a state of maximum stability, an atom with even one unpaired

electron will try to fill its outer shell by:

- Gaining or losing an electron to either fill or empty its outer shell.
- Sharing an electron by bonding together with other atoms to complete its outer shell.

Sometimes bonds split in a way that leaves a molecule with an odd, unpaired electron. When this happens, free radicals are formed. Free radicals are very unstable and react quickly with other compounds in an effort to regain stability. Generally, free radicals "attack" the nearest stable molecule by "stealing" one of its electrons. When the attacked molecule loses its electron, it becomes a free radical itself, starting a chain reaction. If this chain reaction is left unchecked, it will ultimately cause cell death.

Antioxidants can neutralize or quench free radicals without risking the loss of an electron. In other words, they're impervious to the destructive nature of free radicals. But if antioxidants are unavailable or if the free-radical production becomes excessive, damage can occur.

and assistant professor of Clinical Dermatology and Plastic Surgery at Eastern Virginia Medical School. “The cell signaling system—essentially, the software that runs the cells—becomes disrupted and causes many dysfunctions within the cells. Because skin is a complex organ, premature aging can be caused on many different levels and by injuries from many different environmental factors. The common denominator they all have, though, is the creation of free radicals. If the skin’s own antioxidant capacity is depleted, then injury occurs.

“Wrinkles are actually the result of cumulative environmental injuries that were imperfectly repaired by the skin, creating microscopic scars,” McDaniel continues. “When these scars become significant enough, a wrinkle is born. Imperfect repair of these injuries leads to premature aging. Thus, the use of topical antioxidant creams to supplement the skin’s own natural defense system has tremendous benefit for preventing aging.”

Free-Radical Fighters

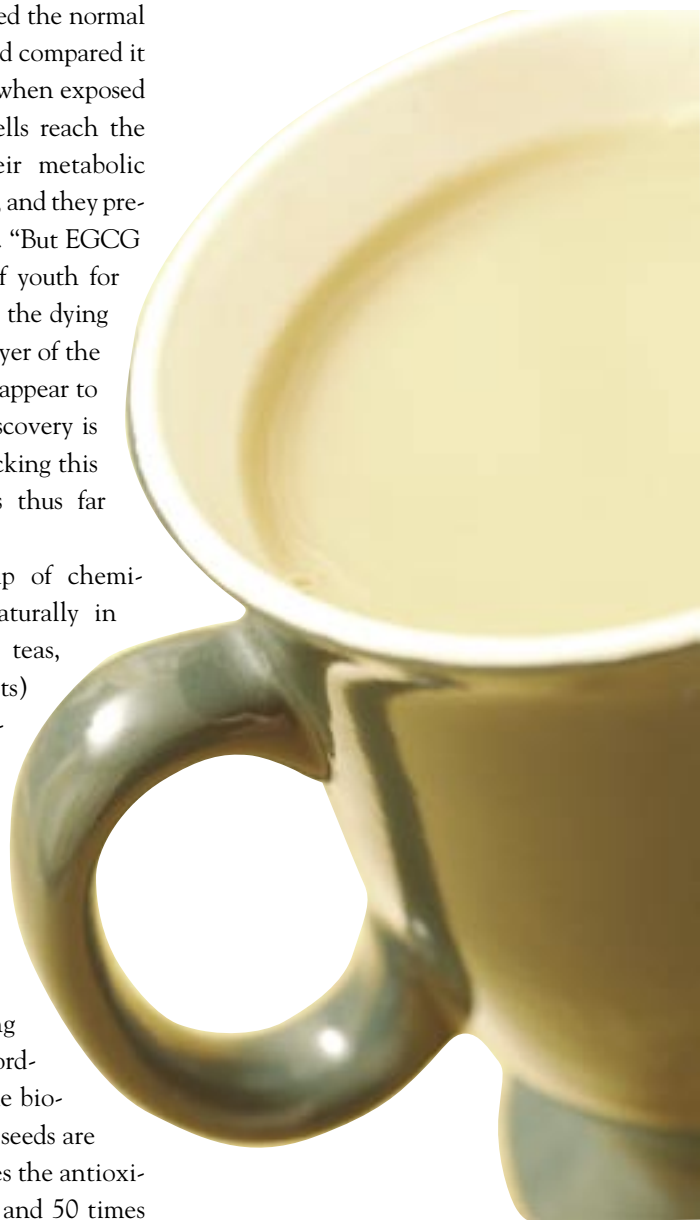
Tea drinking is an ancient tradition in China that dates back some 5,000 years. Long regarded in this culture as an aid to good health, tea is being studied by researchers for possible use in the prevention and treatment of a variety of skin cancers and other disorders. Scientific investigators are especially interested in the antioxidants—a class of polyphenols called catechins—that are found abundantly in green tea. The National Cancer Institute has been conducting clinical trials on the protective effects of green tea in pill form to combat sun-induced skin damage, as well as the topical application of green tea in shrinking pre-cancerous skin changes (www.cancer.gov/clinicaltrials).

Stephen Hsu, Ph.D., a cell biologist at the Medical College of Georgia, has also uncovered a wealth of information about green tea over the past five years. Most importantly, he has helped determine that the polyphenols in green tea help eliminate free radicals that can cause cancer by altering DNA. He has also reportedly found that polyphenols safeguard healthy cells while ushering cancer cells to their deaths!

Hsu is currently studying EGCG, the most abundant green tea polyphenol. Using pooled human keratinocytes (skin cells), he has observed the normal growth of the skin cells and compared it to the growth of the cells when exposed to EGCG. “Once skin cells reach the surface of the skin, their metabolic activity slows dramatically, and they prepare to die,” explains Hsu. “But EGCG seems to be a fountain of youth for skin cells. When exposed, the dying cells found in the upper layer of the epidermis re-energize and appear to start redividing.” Hsu’s discovery is only the first step in unlocking this mystery, but his findings thus far have been astounding.

Bioflavonoids (a group of chemical compounds found naturally in certain fruits, vegetables, teas, wines, nuts, seeds and roots) represent an entire family of antioxidants that are being included in many antiaging, anti-inflammatory skincare preparations—and for good reason. Ongoing scientific studies of bioflavonoids are yielding impressive findings; according to Murad’s paper, some bioflavonoids found in grape seeds are thought to possess 20 times the antioxidant power of vitamin C and 50 times

Scientific investigators are especially interested in the antioxidants that are found abundantly in green tea.

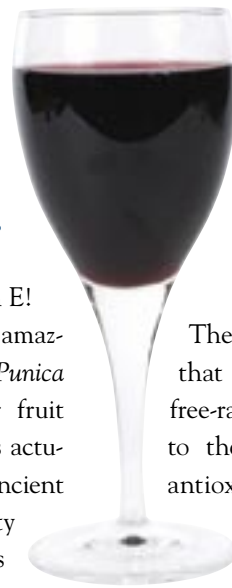


Findings show that pomegranate exhibits up to three times greater antioxidant activity than other bioflavonoids found in red wine.



the antioxidant power of vitamin E!

Research has also uncovered the amazing properties of pomegranate (*Punica granatum L*), a large globular fruit with juicy red pulp that has actually been used since ancient times to treat a variety of maladies. Findings from “Antioxidant Activity of Pomegranate Juice and its Relationship with Phenolic Composition and Processing” (Fil Mi, et al., *Journal of Agricultural and Food Chemistry* 2000; 48:4581-9) show that pomegranate exhibits up to three times greater antioxidant activity



than other bioflavonoids found in red wine or green tea, and appears to have a promising future in skin care.

Superheroes

There are a host of antioxidants that defend the skin against free-radical damage. According to the Mayo Clinic, common antioxidants include vitamin C (ascorbic acid), beta-carotene (a precursor to vitamin A) and vitamin E (tocopherol). These vitamins, along with antioxidants such as superoxide dismutase (SOD) and selenium, are currently found in many professional skincare preparations. For the past several years, coenzyme Q10 (a.k.a. ubiquinone or ubiquinol), a substance that’s



Research Assistance

The author and *DAYSPA* would like to thank the following companies for their assistance in locating the latest medical studies on topical antioxidants:

Allergan (www.allergan.com)
AminoGenesis (www.aminogenesis.com)
Atzen (www.atzen.com)
Aveda (www.aveda.com)
Biodroga (www.biodroga.com)
BiON (www.bion-research.com)
Dermalogica (www.dermalogica.com)
Dr. Irena Eris (www.eris-usa.com)
Echo 2 Plus (www.echo2plus.com)
Eminence (www.eminenceorganics.com)
MD Skincare (www.mdskincare.com)
Murad (www.murad.com)
The Neostrata Company (www.neostrata.com)
Pevonia (www.pevonia.com)
Plantogen (www.plantogen.com)
Revenir (www.revenirbeauty.com)
Sothys (www.sothys-usa.com)

found in most tissues of the human body, has been hailed as the top super-antioxidant—an insatiable new breed of free-radical fighters that’s already taking the cosmetic market by storm. Today, a new antioxidant called idebenone (pronounced “ee-dee-bee-known”) is being touted as the forerunner of a second generation of super-antioxidants that will be released in the marketplace over the next few years.

Allergan, a recognized global leader in pharmaceuticals, is marketing idebenone under the trade name PREVAGE. Originally, idebenone was used to control oxidative stress associated with organ transplants. Recognizing that oxidative stress is also a fundamental cause of visible signs of aging, research scientists conducted several studies throughout 2004 to test the protective and antiaging powers of PREVAGE on the

in vitro (in 'vitro) ► adjective & adverb Biology (of processes or reactions) taking place in a test tube, culture dish, or elsewhere outside a living organism: [as sg] in vitro fertilization.



PREVAGE was released to the medical market as a topical antiaging/anti-inflammatory drug in January 2005.

skin. The results were so impressive that PREVAGE was released to the medical market as a topical antiaging/anti-inflammatory drug in January 2005.

A six-week clinical study to evaluate the use of PREVAGE performed by Allergan's independent testing lab yielded these results:

- A 27% reduction in the appearance of fine lines and wrinkles
- A 22% reduction in skin roughness or dryness
- A 37% increase in skin hydration
- A 30% improvement in the appearance of the skin

As a result of consistent findings in both in vitro (laboratory) and in vivo (human test subjects) testing, Allergan is successfully marketing a 1%-strength version of PREVAGE (soon to be called PREVAGE MD) to the global medical field. TRUE Cosmetics, based in San Francisco, has been licensed to sell and distribute a 0.5% strength of idebenone to the professional esthetic market (TRUE Cosmetics Anti-Aging

hinted that more PREVAGE products may follow.

"Idebenone appears to have significant antiaging benefits, yet it's safe and gentle," says McDaniel. "And unlike retinoids, it actually calms the skin due to its anti-inflammatory properties. In my practice, I'm now prescribing Retin-A and Avage in conjunction with PREVAGE," says McDaniel. "Typically, we begin PREVAGE about two weeks prior to starting the retinoid. Also, since idebenone has both antioxidant and antiaging effects, we'll often use the retinoid at maximum strength, but



A Look in the Mirror

Even though clients under age 30 are considered young by any standard of measurement, a study commissioned by *Allure* magazine found that more than 70% of women stated they saw their first wrinkles before they were 30 years old and nearly 46% saw their first wrinkles before they were 25 years old.

At what age did you notice your first wrinkles?

Age	Percentage
20 years or younger	20.2%
21-25 years	25.5%
26-30 years	26.8%
31-35 years	16.2%
36-40 years	6.4%
41 years or older	6.0%

Collection with Idebenone). In May 2005, Elizabeth Arden announced a partnership with Allergan to produce a 0.5% PREVAGE cream that will be sold in high-end cosmetic boutiques and department stores beginning in early 2006. A recent press release has

only twice weekly. Very few patients find this regimen irritating, and the annoying flaking and peeling of retinoids are usually absent or very diminished."

As scientists continue to write new chapters in the volumes detailing the antiaging properties of antioxidants, generations to come will reap the benefits of those discoveries. The advanced skincare products arising from the next crop of super-antioxidants could very well mean that your clients' great-grandchildren need never

face the visible signs of aging. ♦

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