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REPORT

What's Missing from Your Sunscreen?

By Dale Kiefer



Commercial sunscreens reduce the amount of sunray exposure, but fail to protect against the damage caused by solar radiation that penetrates our skin every day. New research findings show how certain plant extracts can enhance protection against routine sun exposure and how they may also help reverse the cumulative effects of photoaging. This research also provides persuasive evidence that the proper use of these plant extracts may significantly reduce skin cancer risk. In this article, we discuss scientifically substantiated plant extracts that have shown potential in reversing sun damage in order to restore a more youthful appearance to the skin.

PREVENTION IS THE FIRST STEP

The most effective way to preserve one's skin health is to avoid exposure to the sun's damaging ultraviolet (UV) rays. Although this advice may seem obvious, a surprising number of people fail to grasp its importance. Ultraviolet A and ultraviolet B (UVA and UVB) radiation exert cumulative damaging effects on the tissues most responsible for maintaining the skin's youthful appearance. Scientists refer to this process as "photoaging."¹

Cosmetic concerns aside, it is important to remember that sun exposure is also associated with heightened risk of skin cancer. In fact, as one scientist aptly noted, "Ultraviolet radiation in sunlight is the most prominent and ubiquitous physical carcinogen (cancer-causing agent) in our natural environment."² Make no mistake: skin cancer is directly related to excess UV exposure. In fact, it has been estimated that 90% of all skin cancers result from exposure to solar ultraviolet radiation.^{3,4}

While this is especially true among fair-skinned, blue-eyed people who do not tan well, no one is safe from overexposure to the sun. Even riding in the car with the windows up is no guarantee against sunburn. Studies show that, while automobile and household window glasses screen out UVB rays, they provide inadequate protection from damaging UVA rays,^{5,6} which is one more reason to include a broad-spectrum sun-screen in your daily health regimen.



SKIN CANCER: PUBLIC ENEMY NUMBER ONE

Skin cancers account for more than 50% of all cancers. Even if one ignores potentially lethal melanomas, non-melanoma skin cancer remains the most common malignancy in humans. In the United States, the incidence of non-melanoma skin cancers—squamous and basal cell carcinomas—is equal to the incidence of malignancies in all other organs combined.⁷

As noted earlier, sunburn damage is cumulative; while some damage is bad, more damage is even worse. It is never too late to prevent additional damage, and it may be possible to significantly reverse some damage that has already been sustained.

This is because recent advances in skin-care science have yielded new approaches to skin repair and restoration. Researchers have discovered botanical extracts that penetrate the outer layers of the skin (epidermis) to reach the dermis, the living layer where skin is constantly repaired and renewed. These extracts have been clinically shown to activate the body's own repair mechanisms, prompting the reversal of ultraviolet-light-induced damage.

Several of these compounds—including phytochemicals derived from green tea, licorice root, milk thistle, and rosemary—have been available to consumers for several years. Now, scientists have identified an exciting new skin-protective agent called beta-glucans. Derived from oats, beta-glucans stimulate the dermal layers of skin to promote remarkable healing and repair from within.

PROMOTING SKIN COLLAGEN SYNTHESIS

Beta-glucans represent an exciting new development in the “wrinkle wars.” Beta-glucans combined with a collagen matrix are approved by the FDA for use in wound repair among burn victims,⁸ and beta-glucans have shown great promise in combating the potentially serious tissue damage associated with bedsores.⁹

It was long believed that the large size of beta-glucans made these bioactive molecules incapable of penetrating the outer layers of intact, erstwhile healthy skin. However, a unique process now allows scientists to extract smaller molecules of beta-glucans from whole grain oats. These “designer” beta-glucans nevertheless retain the immune-stimulating properties of beta-glucans used for oral applications. Moreover, as we shall see, they are adept at promoting collagen synthesis by directly stimulating connective tissue cells within the dermis.

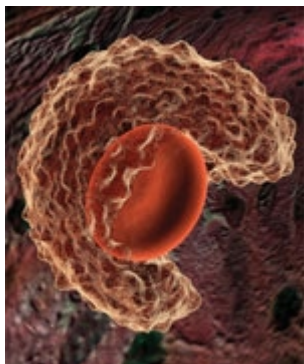
BETA-GLUCANS FOR DERMAL REPAIR

Oral supplementation with beta-glucans has been shown to enhance the activity and effectiveness of the body’s immune system.¹⁰

Beta-glucans accomplish this by stimulating the activation of macrophages, or white blood cells.¹¹ Macrophages identify, engulf, and destroy bacteria and cancer cells. Macrophages possess specialized receptors that are programmed to recognize and interact with beta-glucans. A given beta-glucan molecule fits into a receptor like a key into a lock, which then “turns on” the macrophage. In the skin, macrophages are enlisted to remove dead cells and help repair wounds. This is where topically applied beta-glucans come in.

TAILOR-MADE BETA-GLUCANS

Scientists have developed a novel form of beta-glucans that readily penetrate the outer layer of the skin (the stratum corneum), moving down through the epidermis to the living dermal tissue. They believe that these beta-glucans work to benefit the skin in several ways.



Macrophage cell

First, when applied topically, they form a thin film over the stratum corneum, locking in moisture. Second, they are thought to penetrate deeper layers and circulate in the spaces between live skin cells (keratinocytes) and connective tissue cells (fibroblasts). Here, scientists believe that they stimulate fibroblasts to produce procollagen and collagen, probably by eliciting the release of certain growth factors.¹² This reverses some of the undesirable changes in skin associated with aging and cumulative sun damage—changes that are directly related to loss of collagen and procollagen.¹ Finally, both systemic and topically applied beta-glucans have been shown to help speed

the healing of burn-induced tissue damage, in part by restoring depleted levels of antioxidants.¹³

It has long been thought that beta-glucans indirectly affect collagen synthesis by stimulating macrophages to release cytokines (proteins that act as cellular mediators), thus stimulating fibroblasts to produce more collagen.^{9,12,14,15} However, more recent research shows that fibroblasts themselves are studded with specific receptors for beta-glucans.^{16,17} When glucan molecules bind with these receptors, fibroblasts release proteins known as transcription factors, which initiate genetic transcription. Transcription is the first step in the cellular process that produces new molecules tailored to perform specialized tasks.^{12,14}

Specifically, beta-glucans stimulate fibroblasts to activate genes involved in collagen synthesis¹⁸ and to release an array of growth factors that are intimately associated with wound repair and the production of healthy new skin tissue.¹⁶ The result is smoother, more youthful-looking skin.

NATURE’S ARSENAL AGAINST PHOTOAGING

Beta-glucans are just one of many natural substances that directly benefit skin. The active ingredients in commercial sunscreens are usually limited to zinc oxide or titanium dioxide to serve as a physical barrier against UV radiation, often in combination with avobenzone or dioxybenzone, which provide approved sun-protection-factor (SPF) ratings.¹⁹ There are, however, naturally occurring compounds that protect against light-induced damage and help skin repair and regenerate from within.

According to leading photoaging researchers at the University of Alabama at Birmingham, “In recent years, considerable interest has been focused on identifying naturally occurring botanicals, specifically dietary, for the prevention of photocarcinogenesis.”²⁰ Noting that grape seed

proanthocyanidins, silymarin (from milk thistle), and green tea polyphenols, among other botanicals, show great promise, they add, “These botanicals may favorably supplement sunscreen protection and may provide additional antiphotocarcinogenic protection, including protection against other skin disorders caused by solar UV radiation.”²⁰

This investigative team recently published a review of research that shows how the above-mentioned botanical compounds act to prevent and even reverse some of the damage associated with UV exposure. Researcher Santosh K. Katiyar de-tails several molecular mechanisms by which these botanical compounds protect against cancer, concluding, “The new information regarding the mechanisms of action of these agents supports their potential use as adjuncts in the prevention of [UV-induced cancers].”²¹

WHAT'S MISSING FROM YOUR SUNSCREEN?: WHAT YOU NEED TO KNOW

- Ordinary sunscreens protect against sunburn by blocking ultraviolet rays that burn the skin, yet most fail to protect against all the adverse consequences of ultraviolet light, such as wrinkles, photoaging, and skin cancer.
- Scientists have begun investigating natural chemoprevention agents to offset ultraviolet-light-induced changes in the skin. One of the most promising of these is beta-glucans. Naturally found in oats, mushrooms, and yeast, beta-glucans are large, sugar-like molecules that promote the health of the skin and the immune system.
- A novel preparation of oat-derived beta-glucans helps boost skin health by enhancing moisture levels, supporting the production of collagen connective tissues, and speeding skin repair and renewal.
- Other agents for optimal skin protection include green tea, grape seed extract, rosemary, milk thistle, and licorice. These agents offer antioxidant, anti-inflammatory, and DNA-protective effects that can help prevent or reverse the damaging effects of ultraviolet light on the skin.
- By incorporating powerful natural agents in your skin-protection regimen, you can preserve your skin's youthful appearance while protecting yourself against all-too-common skin cancers



GRAPE SEED EXTRACT

One such agent is grape seed extract, or, more specifically, grape seed proanthocyanidins. Chemically speaking, proanthocyanidins are a group of potent antioxidants synthesized by plants as protection from a variety of threats, including UV radiation.²² Grape seed is an excellent source of these natural antioxidants.²³



Studies conducted at Ohio State University Medical Center showed that topical application of grape seed proanthocyanidins accelerated the closure and healing of wounded skin in lab rodents.^{22,24} Noting that wounds treated with grape seed extract demonstrated a variety of indicators of superior healing, the scientists concluded, “Topical application of [grape seed proanthocyanidins] represents a feasible and productive approach to support dermal wound healing.”²²

More recently, this same investigative team reported that mice fed grape seed proanthocyanidins had significantly fewer skin tumors after exposure to UVB light than did their counterparts that did not receive supplemental grape seed extract. The few tumors that did appear in supplemented mice were significantly smaller. Grape seed appeared to fight oxidative stress, as mice receiving the extract experienced far less decline in important natural antioxidants, such as glutathione and catalase, than non-supplemented mice. Oxidative stress, in which radiation generates free radicals in the skin, is believed to play a central role in the promotion of skin cancer.²⁵

Dr. Katiyar, who led the study, stated:

“These polyphenols have anti-inflammatory and antioxidant properties. Because of these characteristics, polyphenols have been shown to inhibit, reverse, or slow down the risk of UV-induced skin carcinogenesis. As in other organ systems, aging in the skin results in progressive dysfunction. Clinical conditions associated with age-dependent dysfunction include increased ease of wounding, poor wound healing, skin cancer, and infectious disease susceptibility. Clinically, the photoaging component of skin aging accounts for the development in sun-exposed areas of wrinkling, mottled hyperpigmentation and depigmentation, coarsening of the skin, roughness, poor elastic recoil, and bruisability.”²⁶

Dr. Katiyar believes natural polyphenols from green tea, grape seed extract, and milk thistle “can inhibit the process of skin

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GREEN TEA EXTRACT

Green tea is possibly one of the world's oldest sun-protective agents, having been consumed as a "functional food" for at least 4,000 years.²⁷⁻²⁹ Studies have shown that green tea and green tea extract prevent photoaging both from within (taken orally) and without (when applied topically).³⁰⁻³⁵

Numerous studies have shown that topically applied green tea extract (or applications of the main bioactive green tea polyphenol, epigallocatechin-3-gallate or EGCG) can prevent the development of skin cancers in lab rodents specially bred for these types of investigations. Mechanisms of action appear to include enhanced DNA repair and retention of robust immune function. Unprotected skin exposed to excessive UV radiation invariably suffers a significant suppression of immune function, a deficit believed to play a role in UV-induced cancers. Furthermore, topical EGCG interferes with tumors' ability to supply themselves with blood, and stimulates immune system T cells, which function to destroy aberrant cells. Thus, green tea acts to thwart cancer at several stages in its development and spread.³⁶⁻³⁸

ROSEMARY

Rosemary, a perennial herb used as both a culinary and medicinal plant for thousands of years, is packed with a broad array of beneficial compounds, including cancer-fighting chemicals, antioxidants, and anti-inflammatories.³⁹⁻⁴¹ Italian scientists recently identified several rosemary compounds that exhibit potent anti-inflammatory action.⁴¹ Two of these compounds—carnosic and ursolic acids—have been shown to be of particular benefit to skin.⁴²⁻⁴⁴

Rutgers University researchers showed that topical application of both carnosic and ursolic acids significantly inhibits tumor growth in a mouse model of human skin cancer. Tumor inhibition was as high as 99%, depending on the concentration of the rosemary extract.⁴² More recently, Indian scientists studied the effects of feeding rosemary extract to specialized lab mice, which serve as surrogate models for human skin cancer. "[The] . . . extract could prolong the latency period of tumor occurrence [and] decrease tumor incidence, tumor burden, and tumor yield," the researchers concluded.⁴⁵



MILK THISTLE EXTRACT

Milk thistle contains silibinin and silymarin, two flavonoid compounds used for many years to treat liver disease in Europe and Asia. These unique compounds have recently come under increased scrutiny by scientists due to their well-documented antioxidant, anti-inflammatory, and immune-enhancing properties. Numerous studies have shown that these extracts combat skin cancer through a variety of mechanisms, including protecting DNA against damage, decreasing oxidative stress, and lessening inflammation.⁴⁶⁻⁶¹

Researchers at the University of Michigan noted recently, "Melanoma is one of the few tumors that have increased in incidence over the last few decades."⁴⁹ They suggested that silymarin and green tea are among "several promising agents" that could be harnessed to "significantly decrease the morbidity and mortality from this deadly cancer."⁴⁹

"Silymarin possesses exceptionally high protective effects against [skin] tumor promotion," concluded investigators at Case Western Reserve University.⁵³ As such, silymarin is a superb choice for inclusion in sun protection products. It is exceptionally well tolerated and protects against skin cancers through diverse mechanisms. "Silymarin may favorably supplement sunscreen protection and provide additional anti-photocarcinogenic protection," wrote Dr. Katiyar, in the *International Journal of Oncology*.⁴⁶

LICORICE ROOT EXTRACT

Licorice root has been used medicinally since prehistoric times.⁶² In Chinese medicine, it is one of the oldest and most frequently employed botanicals, with recognized anti-inflammatory, anti-viral, anti-ulcer, and cancer-preventive properties.⁶³ Japanese researchers showed that licorice constituents inhibit the growth of melanoma cancer cells growing in culture. More recently, Japanese scientists demonstrated that a licorice constituent induces a variety of cancer cell types (from liver and stomach cancer to leukemia cells) to undergo apoptosis, or cellular suicide.⁶⁴

Today, scientists are interested in licorice extract's ability to promote skin health and avert cancer. Middle Eastern scientists conducted a double-blind study of licorice gel as a treatment for atopic dermatitis, a chronic inflammatory disease of the skin. They concluded, "Licorice extract could be considered as an effective agent for treatment of atopic dermatitis."⁶⁵ Italian researchers studying the licorice constituent glycyrrhizin concluded, "Glycyrrhizin treatment might offer protection from the damage induced in humans by UVB radiation."⁶⁶

CONCLUSION

Maintaining youthful-looking skin and protecting against cancer require a multipronged approach, one that incorporates both UV blockers and bioactive botanicals for protection from the sun's aging effects. Simple sunscreens may be inadequate to achieve this level of defense. For total protection and restoration of skin, consider daily use of products that provide scientifically substantiated, natural skin-rejuvenating agents.

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