

Natural Ingredients and Their Applications in Dermatology

Understanding the role of natural ingredients in therapeutic regimens may help physicians to harness these agents for maximum effect.

By Patricia K. Farris, MD

As society becomes increasingly high technology, we continue to face an age-old dilemma in philosophy and science: the tension between “Natural” and “Artificial.” In dermatology, this conflict manifests in discussions of skin care products, their ingredients and perceived benefits. Rigorously tested and reviewed pharmacologic compounds—almost all of which are synthetic compounds—comprise the bulk of the tools clinicians use for medical and cosmetic indications. Many synthetic cosmeceutical actives are incorporated into skincare regimens with good effect. Consider retinoids (such as tretinoin and tazorotene), antioxidants (such as idebenone), and peptides (such as Pal-KTTKS and argeriline). But natural actives are being incorporated into skin care products and there is good science to support their use. Because of their diverse biologic activities, natural actives may be useful for both cosmetic and medical dermatology indications.

Natural ingredients confer many benefits that can be elucidated with greater investigation of data on these ingredients. This article will examine a



select number of natural ingredients and consider the extent to which the data support their use in skin care lines.

Take-Home Tips. Natural ingredients are increasingly added to skincare products, and they may be useful adjuncts in the management of various dermatologic diseases. The benefits of products depend on the quality of ingredients and proper handling. Primary functions of natural ingredients may include: Antioxidant, Anti-inflammatory, Melanin-inhibiting, Collagen-boosting. These agents may be helpful in management of atopic dermatitis, erythema, photodamage, and more. ●

Natural Skincare Ingredients

Natural Ingredients in Skin Care	
Vitamin C, A, E	CoffeeBerry
Niacinamide	Grape see extract
Green tea	Pycnogenol
Kinetin	Lavender
Silibinin	Chamomile
Olive oil	Rosemary
Soy	Lycopene
Oatmeal	Polypodium leucotomos
Pomegranate	Grapefruit extract
Silymarin	Curcumin

Debating the Natural

The term “Natural” often carries a positive connotation in contemporary society. This may help to explain why consumers seem to prefer natural cosmeceutical products and view them as safe and effective. This may also explain why trusted consumer brands now tout natural ingredients in skin care products marketed for treating everything from aging skin to eczema. These products can be found in pharmacies, department stores, and retail outlets.

Many natural ingredients are botanicals. Plants have long been appreciated for their medicinal values and their use for treating skin problems dates back to ancient times. Plants grow and survive under a variety of conditions. For consistency and reliability of ingredients, manufacturers must draw from specific, controlled, crops. Harvesting conditions and the processes of extracting, and preserving ingredients are important considerations. When botanicals are processed an extract is formed containing the natural active ingredients. This must be done under specific conditions in order to maintain biologic activity. Many botanical actives are antioxidants, which are extremely unstable and susceptible to oxidation.

Natural extracts can confer multiple biologic

activities due to their complex composition. In order to evaluate a botanical active, gene array analysis may be used. This testing allows us to categorize active ingredients as their primary functions. Primary functions include antioxidant, anti-inflammatory, melanin-inhibiting, or collagen-boosting effects. Many botanicals have more than one function, making them applicable in a variety of dermatologic settings.

Once the primary functions are determined the botanical extract must be formulated into a cosmetically elegant product. Formulators often face challenges with physical properties like color, odor, solubility, and dispersion. In its final formulation the product will be tested for safety, efficacy and stability.

Oatmeal

Potentially useful for atopic dermatitis, winter itch, nummular eczema, ashly dermatitis, cercarial dermatitis, varicella, ichthyosis.

Colloidal oatmeal, comprised of ground de-hulled oats, contains a strong starch-protein complex. It has been used since the time of ancient Egypt to soothe and protect dry, irritated skin. Colloidal oatmeal has been used to treat atopic dermatitis and inflammatory skin diseases and is known to repair barrier dysfunction, reduce skin inflammation and irritation.

Colloidal oatmeal contains 60-65 percent polysaccharides that allow water to bind to the skin surface, creating a protective and smoothing film. Natural polymers called B-Glucans confer immunomodulatory and anti-infective properties and seem to help support barrier repair. Lipids (three to nine percent) enhance the barrier and provide anti-inflammatory effects, while proteins (10-18 percent) buffer acids and bases while also serving an anti-inflammatory function. Finally, colloidal oatmeal contains saponins, amphipathic glycosides that provide a soap-like action that can help cleanse the skin.

Colloidal oatmeal contains the antioxidants ferulic acid, P-coumaric, caffeic acid, and

Hydroxycinnamic. Additionally, colloidal oatmeal contains avenanthramides A, B and C that confer anti-inflammatory effects by inhibiting transcription factor NF- κ B thereby downregulating cytokine production.

Soy

Potentially useful for managing photodamage, photoprotection, retarding hair growth, reducing pigmentation, erythema.

Soy is a complex botanical containing phyosterols, fatty acids, lecithins, and saponins. Soy contains small proteins such as soybean trypsin inhibitor (STI) and Bowman-Birk inhibitor (BBI) that are believed to be responsible for the skin lightening properties. These proteins inhibit the cleavage of protease-activated receptor 2 (PAR-2), which is expressed on keratinocytes but not melanocytes. Inhibition of PAR-2 prevents melanosome transfer and inhibits skin pigmentation.

Soy isoflavones genistein and daidzein are phytoestrogens that have weak estrogenic effects. Several studies have suggested that genestein may confer anti-photocarcinogenic, and anti-aging properties.

In a double-blind, vehicle controlled study, researchers examined the effects on photoaged skin of a soy-based moisturizer (Aveeno Positively Radiant, Johnson & Johnson) in 63 women.¹ Subjects applied the moisturizer or vehicle twice a day for 12 weeks with evaluations at baseline, weeks one, two, four, eight, and 12. Researchers noted positive effects in two weeks and determined a statistically significant improvement compared to baseline in mottled pigmentation, blotchiness, dullness, fine lines, overall texture, overall skin tone, and overall appearance at 12 weeks.

Green Tea Extract

Potentially useful for photoaging, photoprotection, and photocarcinogenesis.

Green tea extract contains the polyphenols epicatechin (EC), epigallocatechin (EGC), epicatechin-3-

gallate (ECG), and epigallocatechin-3-gallate (EGCG). EGCG accounts for 40 percent of green tea polyphenols (GTPs) and is believed to be the most biologically active.

These polyphenols modulate a number of biologic pathways and are antioxidants, anti-inflammatory, and anti-carcinogenic. Topical EGCG in mice was found to reduce UVB induced inflammation and skin swelling, as well as reduce UVB-induced erythema.² Moreover, results showed that EGCG also protected against UVB-induced antioxidant depletion.

Green Tea Polyphenols (GTPs) have also been associated with chemoprevention in preliminary studies.³⁻⁵ Animal models have shown prevention of skin cancer for oral and topical GTPs and suggest that topical GTP may prevent conversion of benign skin tumors into squamous cell carcinomas.⁴ Another study suggested that GTPs can also protect human skin fibroblasts in vitro against UV-induced DNA damage.⁵

More recently, green tea extracts were studied in human skin. In a 2001 study, volunteers applied 0.2mL of GTP 5% solution dissolved in ethanol/water to the skin and then received a 2-MED dose 30 minutes later.⁶ They returned at 24, 48, and 72 hours, at which points researchers performed biopsies. Analysis showed that EGCG and ECG were the most effective GTPs, as they reduced UVA and UVB erythema, reduced sunburn cells, as well as protected langerhan cells and protected against DNA damage.

Clinical studies have looked at the potential antiaging benefits of green tea. In a double-blind, placebo controlled study, volunteers applied 10% green tea cream and ingested 300mg green tea oral supplementation BID.⁷ Researchers graded wrinkling, roughness, dryness, and global assessment at eight weeks. A limited number of skin biopsies were performed at the end of the study. Investigators found no statistically significant difference in physician grading in any of these parameters of photoaging. However, histology showed increased levels of elastin in green tea-treated patients.

Natural Skincare Ingredients

Possible Roles for Natural Ingredients

Primary functions may include:

- Antioxidant
- Anti-inflammatory
- Melanin-inhibiting
- Collagen-boosting

Many botanicals have more than one function, making them applicable in a variety of dermatologic settings.

Possible uses may include:

- Atopic dermatitis
- Winter itch
- Nummular eczema
- Ashy dermatitis
- Cercarial dermatitis
- Varicella
- Ichthyosis
- Managing photodamage
- Photoprotection
- Retarding hair growth
- Reducing pigmentation
- Erythema
- Photocarcinogenesis

In a double blind, randomized placebo controlled study, the effects of oral GTP 250mg BID versus non-treatment was evaluated in women with photoaging 25 to 75 years old over a two-year period.⁸ Researchers evaluated facial photodamage in 56 women at zero, six, 12, and 24 months and biopsy specimens of sun-exposed forearms were evaluated at zero and 24 months. In treated patients they found significant improvement in overall solar damage at six months and significant improvement in erythema and telangectasias at 12 months. There were no significant differences in any other parameters of photoaging at any time point during the study. The placebo group did not show any significant improvement in these parameters at six or 12 months. Histology revealed no difference between treated patients and controls.

Investigators concluded that long term supplementation with GTPs did not improve clinical or histologic photoaging parameters.

An Emerging Role

The emerging role of natural ingredients in dermatology is evidenced by our improved understanding of the science behind these products. These products are now accepted by dermatologists as effective additions to our therapeutic armamentarium for treating common conditions like hyperpigmentation, photoaging, rosacea, and atopic dermatitis. ■

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Dr. Farris serves as an advisor/consultant to Beiersdorf, Medicis, Ortho Dermatology, Neutrogena, Unilever. She also serves as a spokesperson for Guthy-Renker.

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