

Seed Oils and Essential Fatty Acids

Seed oils represent some of the earliest cosmetic products used by humans. For millennia, many of the same oils used for cooking and eating have also been used for healthy skin and hair. These oils are composed mainly of lipids that condition and nourish, soothe, moisturize, and return elasticity to the skin and hair.

Modern research has uncovered that these nutritional seed oils don't just contain lipids but bioactive lipids, called essential fatty acids (EFAs). The importance of these bioactive lipids in proper skin functioning is clear. Research has shown EFAs to play an important role in proper skin barrier function and anti-inflammatory and anti-irritancy activity.

At Naturopathica, we incorporate pure seed oils rich in EFAs extensively in our face and body products.

Essential Fatty Acids: the bioactive components of natural oils

Essential fatty acids (EFAs) are fatty acids that are required for normal health and well-being of the body but must be obtained through the diet, as we cannot synthesize them. There are two families of EFAs: omega-3 and omega-6. The Omega-3 family is comprised of alpha-linolenic acid (ALA) and its longer chain derivatives eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA); the Omega-6 family is comprised of linoleic acid (LA) and its longer chain derivatives such as gamma-linolenic acid (GLA) and arachidonic acid (AA).

The nutritional and health benefits of EFAs are extensive – they are required for normal health and well-being, growth and development, and treatment of numerous conditions. They are essential in the manufacturing and repair of cell membranes, enabling cells to obtain optimum nutrition, expel harmful waste products and repair itself. A primary function of EFAs is the production of prostaglandins, which regulate body functions such as heart rate, blood pressure, fertility, and play a role in immune function by regulating inflammation and encouraging the body to fight infection.^{1,2}

EFAs and the skin:

EFAs are necessary for proper skin function. Deficiencies include epidermal hyper-proliferation, abnormal lipid barrier structure and function, and altered production of anti-inflammatory compounds; resulting in a plethora of skin problems including atopic eczema, acne and psoriasis.¹

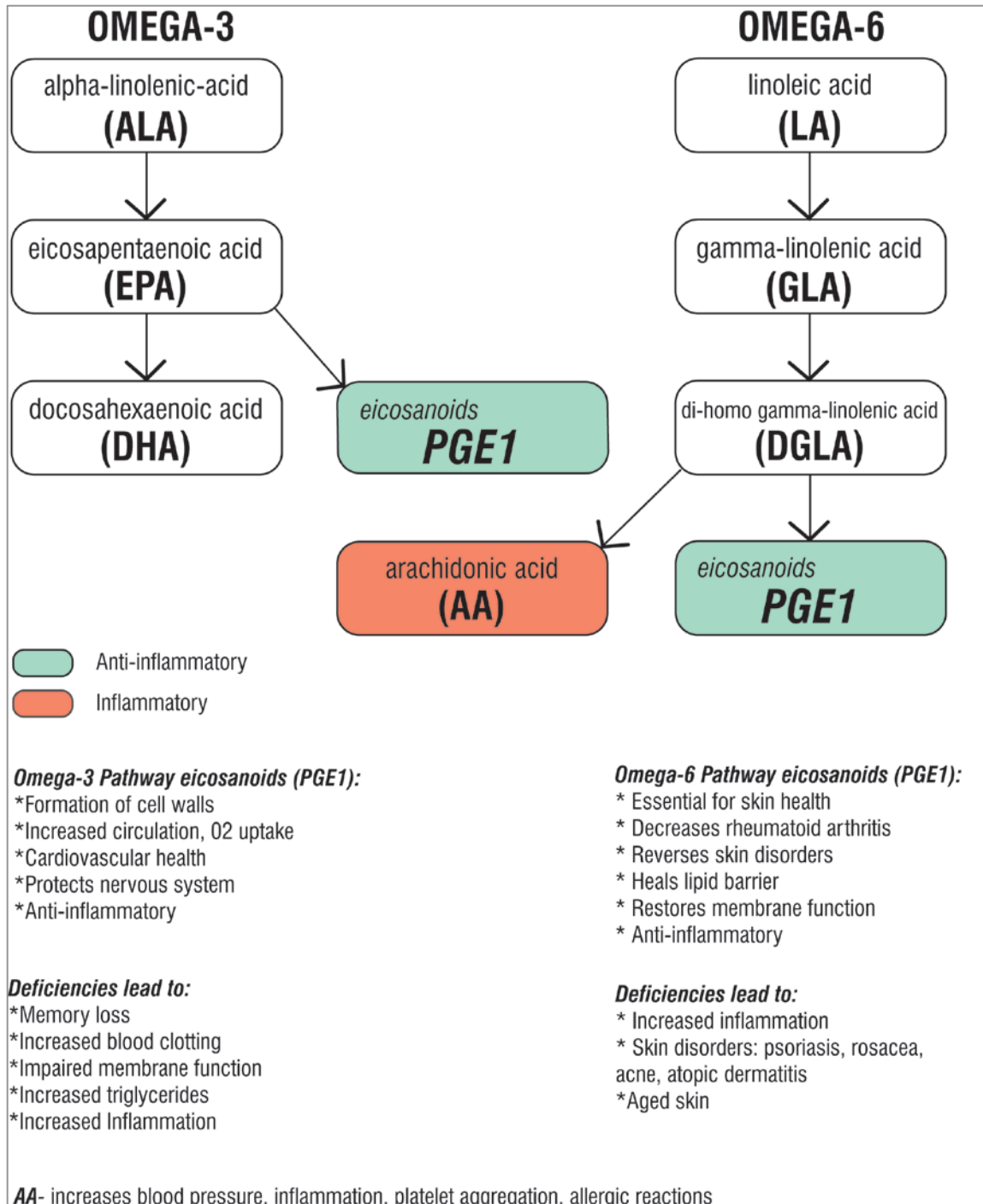
The symptoms in these skin disorders are reversible by the addition of EFAs in the diet, or by topical application. Increasing the levels of key EFAs increases cell membrane fluidity, enhances barrier function and repair, decreases trans-epidermal water loss, improves moisturization, cell signaling, cell immunity, and anti-inflammatory activity.³

Not only are EFAs used as cosmeceutical agents, they are also used as carrier oils and penetration enhancers for the absorption of other bio-actives.

Metabolism of EFAs in the body

The metabolism of EFAs in the body is a complicated process of interconnected reactions. Omega-3 (ALA) and omega-6 (LA) essential fatty acids are metabolized by a series of enzymes to longer chain polyunsaturated fatty acids and eicosanoids. Eicosanoids are important bioactive compounds including prostaglandins (PGE1), leukotrienes and hydroxy fatty acids. (Figure 1)

Figure 1: Essential Fatty Acid Metabolism in the Body



Omega-6 pathway:

In the omega-6 pathway (Figure 1), LA is desaturated to gamma-linolenic acid (GLA) and then converted to dihomogamma-linolenic acid (DGLA) and arachidonic acid. Arachidonic acid (AA) sits at the head of the "arachidonic acid cascade" that controls a wide array of bodily functions, especially those involving inflammation and the central nervous system.⁴ AA has the potential to increase blood pressure, inflammation, platelet aggregation and allergic reactions. DGLA, however, has the opposite and competing effect to AA. DGLA forms Eicosanoids such as prostaglandins (PGE1) that reduce inflammation and have been shown to be particularly important in skin health, healing the lipid barrier and decreasing rheumatoid arthritis, diabetes, and some cancers.

Several plant-based oils such as evening primrose oil, borage oil, and black currant seed oil are rich in GLA.

Omega-3 pathway:

The other competing cascade to AA is in the omega-3 pathway (Figure 1). Here ALA is converted to eicosapentanoic acid (EPA) and Docosahexaenoic acid (DHA). The eicosanoids produced from EPA (prostaglandins, PGE1) are prominent in counteracting AA in the body, and have been shown to be very important in preventing cardiovascular health, protecting the nervous system, formation of cellular walls and oxygen uptake.^{5,6}

Some of the highest concentrations of Omega-3's are in fish oil, flax oil, cranberry seed oil among others.

These two parallel cascades soften the inflammatory effects of AA and its products. Low dietary intake of these anti-inflammatory EFAs, is associated with a variety of inflammation-related diseases.

Today, a Western diet contains much less omega-3 EFAs acids than the diet of a century ago. This fact has led to the increased amounts of inflammatory diseases so prevalent today. Strong evidence suggests that many of these diseases are ameliorated by increasing dietary EFAs, especially omega-3s.^{7,8}

Metabolism of EFAs in the skin

EFAs metabolism is highly active in the epidermis and is able to convert GLA into DGLA. The skin cannot, however, desaturate LA into GLA, or DGLA into AA like the brain and liver, these products come from endogenous sources.

Evidence has shown high levels of LA or ALA alone do not ensure healthy skin, it is the levels of GLA that have been shown to affect skin health the most. Individuals suffering from inflammatory skin disorders such as psoriasis, acne, atopic dermatitis among others have abnormally low GLA levels.⁹

The anti-inflammatory products formed from GLA regulate water loss, protects the skin from injury and has potent anti-inflammatory properties.

Topical administration of GLAs (and other EFAs) may offer improved absorption to oral, supplying EFAs to the site of action more efficiently.

EFAs Improve skin barrier function

Topical EFAs have been shown to improve the structure and function of cell membranes and improve skin barrier function. Improving skin barrier function reduces trans-epidermal water loss, leaving the skin more hydrated, moisturized and protected.¹⁰ While other moisturizers may improve skin dryness, roughness and water loss, they are often temporary and do not biologically strengthen the integrity of the skin barrier as EFAs do.

EFAs are protective agents against environmental insults such as detergents, bacteria, contact allergens¹¹ or decreased humidity. They also enhance barrier recovery and wound healing after injury or stress.

EFAs are natural penetration enhancers

EFAs have a fluidizing effect of fatty acids on cell membranes, which may be responsible for their skin penetration enhancement effects. The combination of its own physiological activities combined with their ability to increase transport of bioactive agents across the skin, allows for synergistic activity with other bio-actives.

Through these beneficial influences on the skin barrier function and penetration, EFAs help improve the structure, function and appearance of aged skin and are extremely useful in anti-aging formulas.

EFAs have strong anti-inflammatory / anti-irritant action

The strong anti-inflammatory and anti-irritant effects EFAs have on skin have numerous applications for various skin issues including damage and photo aging induced by UV radiation. Exposure to UV radiation causes inflammation by inducing enzymes to produce inflammatory compounds derived from AA.¹² EPA (omega-3) and GLA (omega-6) fatty acids work competitively to produce anti-inflammatory prostaglandins (PGE1) that combat AA.

Oils high in GLA (such as evening primrose oil and borage oil) and EPA modify the response to UV radiation, providing some protection against sunburn. Significant reductions in UV damage was found with GLA supplementation in a group of arthritic patients.¹³

The moisturization, protective, barrier recovery, anti-inflammatory and anti-irritant effects of EFA makes them ideal as carriers, moisturizers, protectants and anti-aging ingredients in a wide range of personal care products.

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Borage Seed Oil:

Essential Fatty Acids:

Gamma Linolenic- 20-26%

Linoleic- 37%

Pressed from the seeds of the Borage plant (*Borago officinalis*), Borage Seed Oil is rich in Omega-6 essential fatty acids (EFAs), and is has the highest concentration of gamma-linoleic acid (GLA) than any other natural source. Because of its extremely high levels of GLAs, borage Seed Oil has many uses. GLA is required for healthy skin functioning. Studies have shown borage oil to be effective in the reversal of many skin disorders, such as psoriasis, eczema, acne, rosacea, with significant reduction in itching, dryness and inflammation. (1-3). Metabolites formed from GLA improve cellular membrane function and restore the skin lipid barrier, leaving it more hydrated, moisturized and protected from injury or stress. Borage oil has been widely studied for its ability to calm and reduce inflammation. GLA is converted to powerful prostaglandins that have potent anti-inflammatory and anti-irritant activities, protecting the skin from the damaging effects of UV radiation that lead to inflammatory skin conditions as well as skin aging.

All of these activities make borage oil an undeniably beneficial ingredient for skin health as well as a potent anti-aging cosmeceutical.

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Evening Primrose Oil:

Essential Fatty Acids:

Gamma Linolenic- 10%

Linoleic- 75%

Evening Primrose Oil is pressed from the seeds of the Evening Primrose wildflower, *Oenothera biennis*. Traditionally used to treat against conditions such as sore throats, hemorrhoids, and bruises, this oil has once again become popular for its many healthful properties and is now a common dietary supplement and skin care ingredient.

Evening Primrose Seed Oil is rich in omega-6 fatty acids, with high levels of linoleic acid (LA) (75%) and gamma linoleic acid (GLA) (10%). The body uses LA to produce GLA, which is required for healthy skin functioning. Metabolites formed from GLA improve cellular membrane function and restore the skin lipid barrier, leaving it more hydrated, moisturized and protected from injury or stress. Because of its ability to dilute sebum production, evening primrose oil is good at calming acne flare-ups, while at the same time hydrating skin.

Evening primrose oil has been widely studied for its ability to calm and reduce inflammation. Several human trials have demonstrated its efficacy in treating skin conditions such as eczema, pruritus, xerosis and inflammation.¹ GLA is converted to powerful prostaglandins that have potent anti-inflammatory and anti-irritant activities, protecting the skin from the damaging effects of UV radiation that lead to inflammatory skin conditions as well as skin aging.

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Rosehip Seed Oil:

Essential Fatty Acids:

Linoleic- 44.1%

Linolenic- 33.9%

Rosehip seed oil is extracted from the seeds of a native Chilean rose species, *Rosa Mosqueta* and it is believed to be one of the best oil available for anti-aging and skin rejuvenation.

Several scientific studies have shown strong evidence supporting the use of Rosehip Seed oil.

One extensive study tested the effects of rosehip seed oil on 180 patients with various issues such as facial scarring, acne scarring, wrinkles, UV radiation damage, dermatitis, and other skin related problems. Results of these tests showed rosehip seed oil to regenerate the skin, reduce scars and wrinkles, prevent the advancement of new wrinkles, and helped skin to regain its natural color and tone.

Another well-known study in 1988 was conducted on twenty women between the ages of 25-35 with extensive premature aging to their skin due to UV overexposure. After four months of applying rosehip seed oil daily, their wrinkles and sun spots had almost completely disappeared, and the skin had a fresher and healthier look.

Rosehip Seed oil is an excellent natural moisturizing oil with strong regenerative, anti-inflammatory and anti-aging properties. Much of this can be attributed to its high content of omega-6 and omega-3 essential fatty acids. It is particularly rich in the omega-6 fatty acid, linoleic acid (LA). The body uses LA to produce GLA, which is required for healthy skin functioning. Metabolites formed from GLA improve cellular membrane function, restore the skin lipid barrier, and significantly reduces inflammation through prostaglandin formation. Leaving skin hydrated, moisturized and protected from injury or stress caused by UV radiation or other insults. It also provides immediate relief for dry skin and eczema.

Rosehip seed oil is also an excellent source of topical trans-retinoic acid (vitamin A) as well as Vitamin C. These vitamins help to delay the effects of skin aging, assists with cell regeneration, and promotes collagen and elastin levels to increase. This results in firmer, smoother, and more youthful skin with greater elasticity.

Rosehip seed oil is considered a “dry” oil, meaning that it soaks into the skin easily, and does not leave a greasy residue. It is a wonderful hydrator, and penetrates dry or damaged skin immediately.

Cranberry Seed Oil:

Essential Fatty Acids

Linoleic – 35-45%

Alpha-linoleic acid – 28-35%

Cold pressed from the seeds of the cranberry fruit (*Vaccinium macrocarpon*) cranberry seed oil is rich in essential fatty acids and contains significant amounts of omega-3 and omega-6 acids that are, uniquely, at equal ratios (1:1). Cranberry is

rich in Linoleic acid (LA), an omega-6 fatty acid. The body uses LA to produce GLA which is required for healthy skin functioning. Metabolites formed from GLA improve cellular membrane function and restore the skin lipid barrier, leaving it more hydrated, moisturized and protected from injury or stress. GLA also produces prostaglandins and other compounds that have potent anti-inflammatory and anti-irritant activities. These powerful anti-inflammatory agents are also produced from the omega-3 fatty acid alpha linoleic acid (ALA), which is also rich in cranberry seed oil.^{1,2} The mixture LA and ALA make for a powerful team in combating the signs of aging through their anti-inflammatory activities and by promoting a healthy skin barrier that leads to greater moisture retention, protection, greater elasticity and smoothness.

In addition, cranberry seed oil is high in antioxidants including tocotrienols and tocopherols (Vitamin E family), that help to eliminate free radicals, which cause oxidative stress which leads to premature aging. These tocotrienols have been shown to be highly effective in protecting the skin from stress caused by sunlight.³

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Pomegranate Seed Oil:

Essential Fatty Acids:

Conjugated linoleic acid (CLA, punicic acid) – 65%

Pomegranate seed oil is an extremely rich and nutritious oil that is commonly used in cosmetic products to revitalize dull or mature skin, assist with wrinkles, and to soothe minor skin irritations. It is one of the only plant sources of conjugated fatty acids and it contains an abundant amount of punicic acid, a compound closely related to conjugated linoleic acid (CLA). The punicic acid found pomegranate seed oil and has been called a "super CLA" whose effect is even more potent than CLA. These conjugated fatty acids give it strong anti-inflammatory properties and provides significant relief from minor skin irritations, including dry skin, eczema, psoriasis and the effects of UV radiation. Studies have shown pomegranate seed oil to promote regeneration and strengthening of the epidermis by stimulating keratinocyte proliferation.¹

In addition, pomegranate seed oil contains high levels of anti-oxidants that fight free radical oxidative damage that leads to skin aging. Pomegranate seed oil is a wonderful anti-aging seed oil that has extensive skin benefits such as anti-inflammatory, regenerative, moisturizing and protective.

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