

## Essential Fatty Acid Supplementation Improves Skin Texture and Overall Health

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An increasing number of holistic practitioners recommend essential fatty acid supplementation to their patients to enhance their overall health status or as part of the complementary treatment of various health conditions. For example, many health practitioners recommend essential fatty acids for the prevention of heart disease and cancer. With respect to the former, studies suggest that omega-3 fats (from fish and flaxseed oil) serve as precursors to the formation of the type of prostaglandin hormones (PG-3) that dilate blood vessels, reduce inflammation of the arterial wall and inhibit abnormal platelet coagulation, all of which are associated with a reduced incidence of cardiovascular events. Cancer studies also show that the prostaglandin hormones made from omega-3 fats reduce the rate of cellular proliferation, which reduces the chances of genetic mutations and the development of some cancers. Additionally, supplementation with essential oils that contain gamma-linolenic acid (GLA) and/or omega-3 fats has been shown to be useful in the management of arthritis and inflammatory conditions; diabetic neuropathy; eczema; psoriasis; PMS; fibrocystic breast disease; menopausal symptoms; attention deficit disorder; and other conditions.

However, one of the frequent side-effects reported by patients using essential fatty acid supplements for the above-noted health reasons is that their skin becomes softer and smoother. As such, many patients ask their health practitioners how this positive effect on their skin has occurred, and why their esthetician or dermatologist didn't tell them about this amazing intervention years ago. The following provides the scientific rationale enabling you to explain to your patients why their skin has become softer, smoother, silkier and more moist (even if it was previously dry, rough and scaly) after only one to two months of daily essential fatty acid supplementation.

### Prostaglandin Hormones and the Skin

In recent years, researchers have been able to determine the reason essential fats are so critical to the formation of soft, smooth skin texture and the management of certain skin conditions. Investigative studies have shown that the link between fabulous skin texture and intake of essential oils is explained by the effect essential fats have on the synthesis of prostaglandin hormones within epidermal cells.

It has now been confirmed that, like many other tissues, developing skin cells (below the surface) extract essential fats from the bloodstream and convert them into mini-hormones known as prostaglandins. Scientific investigation reveals that different types of unsaturated fats are used by skin (epidermal) cells to make different types of prostaglandin hormones. For instance, we now know that prostaglandin series-2 makes the skin dry, rough and/or scaly, whereas prostaglandin series-1 and series-3 make the skin soft, smooth and moist. Unfortunately, the North American diet is loaded with the types of unsaturated fat that favor the production of prostaglandin series-2. As a result, most people do not achieve the degree of skin softness and smoothness available to them, even if they have good genetics regarding skin texture. In fact, each patient you encourage to

supplement his or her diet with the right combination of flaxseed oil, borage oil and fish oil will notice a marked improvement in skin texture within the first two months of supplementation. The reason for this is that the entire epidermis replaces itself every 45-74 days. (As we age, the turnover rate approaches 74 days, whereas younger individuals exhibit faster turnover rates.) Consequently, health- and skin-care professionals should be aware of the mechanism of action through which essential fatty acid supplementation acts to improve skin texture and appearance.<sup>1-4</sup>

#### PG-2: the Undesirable Prostaglandin

Within epidermal cells, prostaglandin series 2 (PG-2) is formed from the unsaturated fat known as arachidonic acid, found in rich concentrations in high-fat meat and dairy products. Additionally, overconsumption of linoleic acid (an unsaturated fat found in corn oil, sunflower seed oil, safflower seed oil and mixed vegetable oils) encourages its conversion to arachidonic acid by the body, adding to the latter's cell membrane concentrations. Higher cell membrane concentrations of arachidonic acid, facilitated by overconsumption of the above-mentioned foods, tends to favor the synthesis of PG-2, contributing to poor skin texture and appearance. Unfortunately, the typical North American diet is a rich source of arachidonic acid and linoleic acid; thus, most individuals produce too much PG-2 in their epidermal cells, which results in skin texture and appearance that is much less smooth and soft than is attainable; contributes to a host of poor complexion problems; and aggravates skin problems such as eczema and psoriasis.<sup>2,4</sup>

Experimental studies also show that skin cells that exhibit a high concentration of arachidonic acid are more prone to undergo cancerous and inflammatory changes upon exposure to ultraviolet light than skin cells with higher concentrations of omega-3 fats. This appears to be due to the fact that the conversion of arachidonic acid to PG-2 produces an effect whereby skin cells divide at a much faster rate, making them more prone to cancerous mutations and inflammatory responses. Conversely, omega-3 fats, derived from flaxseed and fish oils, have been shown to slow the division rate of skin cells via their effects on promoting the formation of PG-3, which reduces the incidence of mutations and inflammatory response by skin cells, even when exposed to ultraviolet light. Thus, omega-3 fat supplementation is not only an important intervention to improve skin texture, but may help guard against the development of skin cancer and slow skin aging.<sup>5</sup>

#### PG-1 and PG3: Making the Skin Silky-Soft

In contrast to the deleterious effects of PG-2 on the skin, prostaglandin series 1 (PG-1) and prostaglandin series 3 (PG-3) make the skin soft, smooth, silky and moist. The key building block for PG-1 is gamma-linolenic acid (GLA), an unsaturated fat found in high concentrations in borage oil (22-percent yield, whereas evening primrose oil is only a 9-percent yield). GLA can also be formed in the body from linoleic acid, but individuals with certain conditions (diabetes, eczema) have been shown to have a defect in the enzyme that converts linoleic acid to GLA (delta-6 desaturase enzyme). Moreover, consumption of alcohol, refined sugars and hydrogenated fats tends to inhibit the conversion of linoleic acid to GLA.

The aging process also slows the conversion of linoleic acid to GLA as the delta-6 desaturase enzyme becomes more sluggish. As such, most, if not all individuals have suboptimal cell membrane concentrations of GLA. Consequently, GLA supplementation (e.g., borage oil) has been shown to improve skin texture and various skin conditions (eczema) in human studies, via its conversion to PG-1 within epidermal cells.<sup>2,6-9</sup> Also note that suboptimal intake of vitamin B6, zinc and magnesium, which is common, slows the conversion of linoleic acid to GLA, as these nutrients

act as coenzymes in this biochemical reaction.<sup>2,3</sup>

PG-3 also makes the skin very smooth, soft, silky and moist. PG-3 is formed from the omega-3 unsaturated fat known as eicosapentaenoic acid (EPA), found in cold-water marine fish such as salmon; mackerel; anchovies; sardines; and tuna, and supplements that contain EPA. The body can also convert the omega-3 unsaturated fat alpha-linolenic acid (ALA) into EPA, increasing the production of PG-3. ALA is found in rich concentrations in flaxseed oil (58-percent yield). Thus, supplementation with flaxseed oil and/or a high-yield fish oil have been shown to significantly increase production of PG-3, improving skin texture and appearance, as well as certain skin conditions (psoriasis and eczema). Fish oil also contains docosahexaenoic acid (DHA), which the body can convert into EPA (and therefore, PG-3) if required. DHA is also used to promote the development and function of the brain and is required for vision.<sup>2,3,10-12</sup>

PG-3 is considered important for total-body wellness, as it also reduces the risk for heart attacks by dilating blood vessels and reduces abnormal blood clotting. PG-3 has been shown to reduce cancer risk by slowing down the cell division rates (more rapid cell division leads to increased genetic mutations and thus, increased formation of cancer cells, with less time for DNA repair enzymes to correct the mistakes).<sup>2</sup> This has also been shown to be true with respect to skin cancer in experimental studies, whereby higher PG-2 levels in skin cells produced a significantly higher yield of cancer development upon exposure to ultraviolet light. PG-3 is also known to reduce inflammation (including skin inflammatory responses), a role it shares with PG-1.<sup>5</sup> Thus, supplementation with borage oil, flaxseed oil and a high-yield fish oil (30-percent EPA, 20-percent DHA) is not only beneficial to improve skin texture and appearance, and to treat certain skin conditions, but is also of value in the global prevention of heart and cardiovascular disease, cancer, and in the management of inflammatory conditions such as arthritis, Crohn's disease, colitis, diabetic neuropathies and skin inflammatory conditions.<sup>2</sup>

#### Vitamins and Minerals as Co-Factors for Prostaglandin Synthesis

It should be noted that certain vitamins and minerals are required as co-factors in the enzymatic reactions that allow skin cells to convert essential oils (flaxseed, borage and fish oils) into PG-1 and PG-3. For example, the conversion of ALA to EPA requires optimal nutritional status of vitamin B<sub>6</sub>, zinc, magnesium and niacin (vitamin B<sub>3</sub>), as coenzymes. The synthesis of PG-1 and PG-3 also requires optimal intake of vitamin C, vitamin E and selenium. These antioxidants affect cyclooxygenase, the final enzyme in the conversion of essential fats to PG-1 and PG-3.

Also note that supplementation with omega-3 fats (ALA, EPA and DHA) inhibits the conversion of GLA to arachidonic acid by inhibiting the delta-5 desaturase enzyme. Therefore, ALA, EPA and DHA not only increase the synthesis of PG-3, but help to inhibit the cell membrane buildup of arachidonic acid, and thus, PG-2 synthesis.<sup>2,3</sup>

#### Conclusion

Clinical and investigative studies confirm that supplementation with a combination of flaxseed, borage and fish oils (at the correct dosages) is an important step to improving skin texture, skin complexion and the treatment of certain skin disorders (eczema, psoriasis and some cases of acne), due to their effects on promoting the synthesis of PG-1 and PG-3 within developing skin cells. In addition, higher skin cell concentrations of omega-3 fats (from fish and flaxseed oil) may offer additional protection against ultraviolet light-induced skin cancer and photoaging of the skin, according to emerging experimental data. Thus, essential fatty acid supplementation represents an

important component of lifelong skin care management. Health care professionals should keep in mind that optimal doses of certain vitamins and minerals are required to facilitate the efficient conversion of GLA (from borage oil) to PG-1 and ALA and EPA (from flaxseed and fish oil, respectively) to PG-3.

The chart at the right is a practical guide to help translate this information into a step-by-step daily formula for your patients. This guide provides an effective formula for appropriate essential fatty acid supplementation, regardless of what health or skin condition is the primary target of the intervention.

1. To reduce the buildup of arachidonic acid (and thus PG-2 synthesis), avoid or restrict intake of high-fat meat and high-fat dairy products. (Chicken, turkey and fish are good alternatives, as well as nonfat milk and yogurt, and cheeses that are less than 4 percent milk fat.) Substitute olive oil, canola oil and peanut oil in place of corn oil, sunflower seed oil, safflower seed oil and mixed vegetable oils, for salad dressings, stir-fries and sautéed vegetables. Consume alcohol in moderation, if at all, and reduce intake of refined sugars and hydrogenated fats.

2. To enhance the production of PG-1 and PG-3 (which improve the softness and smoothness of the skin and help alleviate certain skin conditions), supplement the diet with an all-in-one essential fatty acid supplement providing 400 mg each of flaxseed, borage and fish oils (1,200 mg capsule). For best results, take 2-3 capsules per day. The fish oil should yield 30-percent EPA and 20-percent DHA content. Patients should also be encouraged to eat more fish.

3. To facilitate the conversion of essential fats to PG-1 and PG-3, a high-potency multivitamin formula that provides the following daily dosages should be taken: vitamin C: 1,000 mg; vitamin E: 400 IU (all natural); betacarotene: 10,000 IU; selenium: 100 mcg; zinc: 15 mg; vitamin A: 2,500 IU; and a B-50 complex (as well as all other vitamins and minerals from vitamins A to zinc).

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