GLA SAP

Science-based borage oil for optimal support of prostaglandin balance

Borage oil contains the omega-6 fatty acid γ-linolenic acid (GLA) at a higher concentration than any other oil source. The essential fatty acids contained in borage oil, when absorbed by the body, are converted to prostaglandins. Prostaglandins are important for regulating many functions in the body including inflammation, the allergic response, and hormone and steroid production. GLA has been well-researched and shown to reduce symptoms associated with dysmenorrhea, fibrocystic breast disease, rheumatoid arthritis, atopic dermatitis/eczema, and asthma. GLA supplementation has also demonstrated the ability to prevent weight gain in previously obese patients.

SUPPLEMENT FACTS

Serving Size: 1 Softgel	**Amount Per Serving**	**% Daily Value**
Borage (*Borago officinalis*) seed oil, hexane-free	1,200 mg	**
Linoleic acid (37%)	444 mg	**
gamma-Linolenic acid (GLA) (22%)	264 mg	**

**Daily Value not established

Other ingredients: Mixed tocopherol concentrate (from non-GMO sunflower), bovine gelatin, glycerin, and purified water.

This product is non-GMO.

Contains no: Gluten, soy, wheat, corn, dairy, yeast, preservatives, artificial flavor or color, starch, or sugar.

GLA SAP contains 90 softgels per bottle.

DIRECTIONS FOR USE

Adults: Take 2 softgels twice daily or as directed by your healthcare practitioner.

INDICATIONS

- Symptoms of fibrocystic breast have demonstrated improvement with **GLA SAP**.

GLA SAP:

- Is expected to reduce symptoms of dysmenorrhea and PMS.
- May increase anti-inflammatory prostaglandin synthesis while inhibiting proinflammatory prostaglandins and leukotrienes.

and can be used to:

- Treat atopic dermatitis/eczema.
- Assist in treatment of rheumatoid arthritis.
- Help prevent weight gain in previously obese patients following major weight loss.

FORM AND DOSE TO GUARANTEE EFFICACY AND SAFETY

The borage oil contained in **GLA SAP** is a naturally occurring organic source.

PURITY, CLEANLINESS, AND STABILITY

All ingredients listed for all **GLA SAP** lot numbers have been tested by a third-party laboratory for identity, potency, and purity.

*** These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.**

Scientific Advisory Panel (SAP): adding nutraceutical research to achieve optimum health

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WHAT ARE OMEGA-6 FATTY ACIDS?

Omega-6 fatty acids (n–6) are polyunsaturated fatty acids and are considered essential fatty acids (EFAs) because they cannot be synthesized by humans, thus must be obtained from the diet. The n–6 fatty acids include arachidonic acid (AA), exclusively found in animal products, and γ-linolenic acid (GLA) and linoleic acid (LA), both almost exclusively available from plant sources. Plant sources of n–6 EFAs include nuts, seeds, grains, safflower, sunflower, sesame, corn and cottonseed. Due to the high content of animal products and AA in the standard Western diet, EFA imbalance is commonplace. High AA intake ultimately leads to a skewed formation of the prostaglandin-2 series (PG_2) and the hormones leukotrienes (LT; 4-series) via the phospholipase A_2 biochemical pathway. Both PG_2 and LT_4 are proinflammatory and have been linked to chronic inflammation, arthritis, cardiovascular disorders, asthma, mood disorders, obesity and cancer.

WHY IS BORAGE OIL A SUPERIOR n–6 SOURCE?

Borage oil (BO) is a vegetable oil that is a rich source of n–6 EFA. BO contains approximately 25–35% γ-linolenic acid (GLA), linoleic acid (LA), oleic acid, palmitic acid, stearic acid, and eicosanoic acid. GLA, if not acquired in the diet, is typically derived from LA via the rate-limiting enzyme δ-6-desaturase, a process which is positively modulated by zinc, magnesium, vitamin B_6, vitamin B_3, and vitamin E. GLA is in turn metabolized to DGLA, and ultimately anti-inflammatory metabolites, including most notably the prostaglandin-1 series (PG_1). Supplementation of BO provides GLA directly to the biochemical pathway, overcoming the rate-limiting δ-6-desaturase enzyme. Proper n–6 EFA balance and metabolism is critical for the maintenance of cellular health and a balanced inflammatory response.

Note: When comparing other sources of GLA (such as evening primrose oil), it is important to consider the stereospecificity of these oils as they are distinct and thereby metabolized differently. GLA is concentrated at the *sn*2 position in BO and at the *sn*3 position in evening primrose oil.

Inflammation plays an important role in health and the pathophysiology of disease. An inflammatory component can be seen in most chronic diseases of modern society, including cancer, diabetes, heart disease, arthritis, Alzheimer's disease, etc. The link between diet and disease has become essential in our understanding of the progression of chronic disease. GLA is crucial in the balance of n–6 EFAs and for the production of anti-inflammatory eicosanoids (prostaglandins of series-1 and leukotrienes of series-3).

Further exacerbating the inflammatory process is a deficiency in omega-3 (n–3). Thus, a deficiency in both GLA and n–3 contributes to increased incidence of inflammatory disease.[1] GLA and its metabolites also affect expression of various genes, whereby regulating the level of gene products plays a significant role in immune function and modulation.[2] Supplementing equal amounts of borage oil and fish oil over a 4-week trial improved the n–6:n–3 ratio by 40%, and decreased expression of inflammatory LT_4 by 31%.[1] This study also reported a decreased expression of PI3K and PI3Ky, along with a reduced expression of several other proinflammatory cytokines.[1] This suggests that borage oil has clinical effects by regulating the expression of signal transduction genes, and genes for proinflammatory cytokines.[1] Other studies exploring the molecular mechanism of GLA in macrophages suggest that GLA inhibits the inflammatory response through inactivation of nuclear factor-κB (NF-κB) and activator protein-1 (AP-1) by suppressing oxidative stress and signal transduction pathways.[3]

SKIN

Human skin is not able to synthesize GLA from the precursor LA or AA; therefore, deficiency of anti-inflammatory n–6 can readily be seen in the skin as lack of integrity, dryness, and itchiness. Supplementing GLA-rich BO allows for efficient metabolism and production of anti-inflammatory cytokines. The metabolite 15-hydroxyeicosatrienoic acid (15-HETrE) has antiproliferation and anti-inflammatory effects[4] by inhibiting the formation of LT_4.[5] Animal studies confirm that borage oil contributes to the release of 15-HETrE in the epidermis[6, 7] as it has a stereospecificity of *sn*2.

These anti-inflammatory effects have been evident in human skin disorders such as atopic eczema. A double-blind study shows that supplementation of 500 mg borage oil (23% GLA) decreased serum levels of IgE, increased levels of GLA, and DGLA, and decreased the use of topical corticosteroid cream.[8]

Atopic Dermatitis Area and Severity Index (ADASI) is used to evaluate the severity of atopic eczema. Improved ADASI scores were reported in 71% subjects who were taking BO compared to 20% who were given placebo.[9]

A study using female subjects showed that supplementing BO for 12 weeks helped to decrease irritation (monitored by reddening on surface and blood flow), decreased roughness and scaling of the skin, and decreased transdermal water loss.[10] The effects of 360–720 mg BO supplementation in elderly individuals improved the ratio of DGLA:AA by 23% in two months.[11] This translated into decreasing measures of dryness from 42% to 14%, decreased itchiness, and improved transdermal water loss.[9]

PERIODONTITIS

In studying the effects of periodontitis, probing depths and β-glucuronidase levels were measured. Subjects given 3000 mg BO daily (for 12 weeks) showed statistical significance when compared to placebo.[12] Results of this study also suggest that borage oil was more effective than fish oil in treating periodontitis.

ASTHMA

Asthma may be an acute or chronic inflammatory condition. Leukotrienes are implicated in the pathogenesis of asthma, and many pharmaceuticals used to treat asthma alter leukotriene levels. Studies show that supplementation of 2.0 g/d GLA (borage oil) had positive effects on reducing the inflammatory markers in polymorphonuclear granulocytes (PMN).[13] In another study, 1.5 g/d GLA (borage oil) decreased LT synthesis within 2 weeks, and after a 2-week washout, LT levels returned to baseline.[14]

Circulating DGLA is efficiently incorporated in the PMN lipids.[15] Supplementing BO proved to increase levels of DGLA and 15-HETrE.[13] DGLA released from PMN is metabolized to 15-HETrE. Studies show that providing DGLA and/or 15-HETrE before PMN stimulation inhibits the production of LT_4.[5, 10] Furthermore, enhanced anti-inflammatory effects are seen in PMNs because they lack δ-5 desaturase, therefore PMN content of AA does not increase.[14] It is also recognized that GLA can be beneficial in treating acute lung injury by improving gas exchange, respiratory dynamics, and requirement for ventilation.[16]

ARTHRITIS

Arthritis is an inflammatory condition that may be experienced as subtle symptoms of discomfort to extreme pain during flare-ups. Diets rich in AA aggravate arthritic conditions via an increase in proinflammatory mediators such as PG_2 and LT_4. Pharmaceutically, non-steroidal anti-inflammatory drugs (NSAIDs) are used to inhibit the cyclooxygenase pathway which promotes the production of PG_2. NSAIDs do not have any impact on the production of LT_4, which are metabolized via 5-lipoxygenase. The addition of GLA in the diet intake has been shown to have anti-inflammatory effects by inhibiting levels of LT_4 via production of 15-HETrE. Supplementation of BO has shown to be effective at decreasing inflammation in human studies.[17]

A double-blind study showed that GLA was effective at increasing levels of prostaglandin E, thereby increasing cAMP and suppressing TNF-α,[18] which has been shown to be a central mediator of inflammation and the joint destructive process in rheumatoid arthritis. As a prostaglandin E agonist, there has been speculation that GLA supplementation may have teratogenic characteristics and labor-inducing effects, and should therefore be contraindicated in pregnancy.

PMS

Dysmenorrhea (menstrual pain) is a condition experienced by women of reproductive age. Poor conversion of DGLA to prostaglandin E_1 has been exhibited in dysmenorrheic subjects when compared to control subjects.[19] Results of this study suggest that dietary modifications, including supplementation with GLA, may be an effective alternative to pharmaceutical interventions in the management of dysmenorrhea.[19]

WEIGHT MANAGEMENT

The incidence of obesity in North America has been increasing. Proper absorption and metabolism of nutrients has become a focus in the literature. Specifically, the metabolism of EFAs and their balance — as they contribute to cell membrane integrity — is a topic receiving increasing attention. Lipid levels influence lipogenesis and insulin sensitivity. Adiposity is positively correlated with CRP levels, waist girth and visceral fat,[20] suggesting that adiposity contributes to low-grade chronic inflammation. Polyunsaturated fatty acids are essential to the diet, and *n*-3 EFAs and GLA have been shown to decrease inflammation. GLA has been implicated in the maintenance of a healthy weight and body composition. In a comparative study, subjects received either 5 g BO or 5 g olive oil (control) daily. Measured results after 12 months showed that subjects supplemented with borage oil regained one quarter the body weight compared to controls.[20] A follow-up study involved controls crossing over from olive oil to borage oil. Results showed weight gain between 15 and 33 months to be 6.48 ± 1.79 kg (GLA-GLA) and 6.04 ± 2.52 kg (control-GLA),[20] demonstrating that GLA is effective at maintaining weight.

SIDE EFFECTS AND SAFETY

BO is generally well tolerated and few side effects are reported. Minor gastrointestinal complaints may include soft stools, flatulence and belching. Headaches have been sparingly reported. Caution is advised in combining interventions that are antihypertensive, anticoagulant, antiplatelet, or with the use of NSAIDs. Caution should also be taken if pregnant.

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