Boswellia SAP

Science-based nutraceutical for healthy inflammatory response

Boswellia SAP provides a standardized dose of *Boswellia serrata* oleogum resin extract, used in traditional medicine for centuries for a number of ailments related to acute and chronic inflammation. Boswellic acids, especially 11-keto-β-boswellic acid (KBA) and 3-*O*-acetyl-11-keto-β-boswellic acid (AKBA) are the main active constituents responsible for the anti-inflammatory effects of *B. serrata*, are specific inhibitors of 5-lipoxygenase (5-LOX), and thereby suppress leukotriene synthesis. **Boswellia SAP** can be used to maintain healthy inflammatory response and reduce pain associated with osteo- and rheumatoid arthritis. **Boswellia SAP** could be very useful in the management of inflammatory bowel diseases (IBD) and to improve quality of life in patients during the remission phase. In addition, **Boswellia SAP** could help improve lung and immune function in asthma patients. **Boswellia SAP** can also be used to reduce peritumoural brain oedema, support neurorecovery following traumatic brain injury (TBI), and potentially as an adjunctive support in cancer treatment. Evidence supports the use of **Boswellia SAP** for promoting clinical benefits in blood-glucose control and lipid metabolism in type 2 diabetic patients.

ACTIVE INGREDIENTS

Each vegetable capsule contains:

Boswellia (*Boswellia serrata*) oleogum resin,
70% organic acid providing 35% boswellic acid . . . . . 380 mg

Other ingredients: Vegetable magnesium stearate and silicon dioxide in a non-GMO vegetable capsule composed of vegetable carbohydrate gum and purified water.

This product is non-GMO.

Contains no: Gluten, soy, wheat, corn, eggs, dairy, yeast, citrus, preservatives, or artificial colours and flavours.

Boswellia SAP contains 90 capsules per bottle.

DIRECTIONS FOR USE

Adults: Take 3 capsules daily or as directed by your healthcare practitioner.

INDICATIONS

Boswellia SAP can help:

- Promote healthy inflammatory responses.
- Relieve pain associated with arthritis.
- Manage IBD and improve the quality of life in patients.
- Lung and immune function in asthma patients.
- To reduce peritumoural brain oedema and support neurorecovery following traumatic brain injury.
- As an adjunctive support in cancer treatment.
- Control blood glucose levels and improve lipid metabolism in type 2 diabetic patients.

CAUTIONS AND WARNINGS

Consult a healthcare practitioner prior to use if you are pregnant or breast-feeding. Consult a healthcare practitioner if symptoms worsen. Hypersensitivity (e.g. allergy) has been known to occur; in which case, discontinue use. Some people may experience mild gastrointestinal disturbances such as diarrhoea, abdominal pain, heartburn, nausea, and vomiting; in which case, discontinue use.

PURITY, CLEANLINESS, AND STABILITY

All ingredients listed for each **Boswellia SAP** lot number have been tested by an ISO 17025 accredited third-party laboratory for identity, potency, and purity.

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

NFH®

351, Rue Joseph-Carrier, Vaudreuil-Dorion, Quebec, J7V 5V5
T 1 866 510 3123 • F 1 866 510 3130 • nfh.ca

For healthcare professional use only.

INTRODUCTION

Boswellia serrata (Salai guggul / frankincense) is a moderate- to large-sized deciduous tree that grows in the dry mountainous regions India, Northern Africa, and the Middle East.[1] *B. serrata* yields a gummy oleoresin exudate, and the extracts prepared from this resin have been traditionally used for centuries in Ayurvedic medicine as an antiarthritic, astringent, stimulant, expectorant, and antiseptic.[1][2] The oleoresin contains monoterpenes (-thujene), diterpenes (incensole, incensole oxide, *iso*-incensole oxide, serratol), triterpenes (as α- and β-amyrins), pentacyclic triterpenic acids (boswellic acids), and tetracyclic triterpenic acids (tirucall-8,24-dien-21-oic acids).[2] The pharmacological effects of B. serrata have been mainly attributed to boswellic acids, especially 11-keto-β-boswellic acid (KBA) and 3-*O*-acetyl-11-keto-β-boswellic acid (AKBA).[1]

ANTI-INFLAMMATORY AND IMMUNOMODULATORY EFFECTS

Boswellic acids, the main constituents responsible for the anti-inflammatory property of *B. serrata*, are specific and nonredox inhibitors of 5-lipoxygenase (5-LOX), and they do not affect 12-lipoxygenase and cyclooxygenase (COX) activities.[2] The main mechanism considered underlying their anti-inflammatory effect is through the suppression of leukotriene synthesis by inhibiting 5-LOX. Among the known boswellic acids, AKBA is reported to possesses the most potent inhibitory activity on 5-LOX.[1][2] *B. serrata* also exerts immunomodulatory actions including decreased cytokines (interleukins and TNF-α) levels and diminished complement system and leukocyte elastase activities, reduction of ROS formation, and P-selectin–mediated recruitment of inflammatory cells.[3]

ARTHRITIS

In a randomized, double-blind study, 30 patients with osteoarthritis of the knee consumed 3 capsules of *B. serrata* extract (333 mg of extract per capsule) or placebo for 8 weeks in a crossover fashion. A significant decrease in knee pain, increased knee flexion, and increased walking distance was reported. Also, the frequency of swelling in the knee joint was profoundly decreased.[4] In another randomized, double-blind study, 75 osteoarthritis patients consumed either 100 mg (n = 25) or 250 mg (n = 25) of *B. serrata* extract daily, or a placebo (n = 25), for 90 days. The treatment group supplemented with 250 mg of the extract reported significant improvements in pain score and functional ability as early as 7 days after the start of treatment. In addition, substantial reduction in synovial fluid matrix metalloproteinase-3 was found in the treatment groups compared to placebo.[5] Similarly, in another study with 60 osteoarthritis patients receiving either 100 mg (n = 30) of *B. serrata* extract or placebo (n = 30) daily for 30 days, the treatment group exhibited clinically and statistically significant improvements in pain scores and physical function score compared to placebo at 5 days of treatment.[6]

INFLAMMATORY BOWEL DISEASE

Treatment of bowel disease symptoms with *B. serrata* extract has been a long tradition.[1] Based on the anti-inflammatory properties observed in animal models and in vitro studies, *B. serrata* extract has been suggested for the treatment of inflammatory bowel diseases (IBD).[1] IBD, especially Crohn's disease and ulcerative colitis (UC), affect more than four million people in the world.[3] Intestinal mucosa of patients suffering from IBD synthesizes increased amounts of leukotrienes LTB_4, LTD_4, and LTE4, inducing contraction of the smooth muscle of the gastrointestinal tract.[1][3] Especially, IL-1 and TNF-α have been implicated in intestinal inflammations.[7]

Ulcerative Colitis

UC is a chronic inflammatory disease with remissions and exacerbations affecting almost the entire colon.[1] In an open-label, observational study in patients with UC in remission phase (n = 43), an oral daily dosage of *B. serrata* extract attenuated the symptoms associated with mild UC in remission compared to the controls.[8] In another study, patients suffering from UC grades II and III receiving *B. serrata* preparation (350 mg thrice daily for 6 weeks) showed improved remission rate compared to the controls receiving sulfasalazine.[9]

Crohn's Disease

In a double-blind, parallel-group study in 102 patients with Crohn's disease, 44 patients were randomized to receive *B. serrata* extract, while 39 patients received mesalazine. The study results showed that *B. serrata* extract was as effective as the standard medication for the treatment of Crohn's disease during its active state.[10]

Collagenous Colitis

In a randomized, placebo-controlled, double-blind study, supplementation with 400 mg of *B. serrata* extract three times a day for 6 weeks resulted in better quality-of-life and histology in 25 patients compared to the placebo.[11]

ASTHMA

The beneficial effects of *B. serrata* extract were demonstrated in a 6-week, double-blind, placebo-controlled study where 80 patients with bronchial asthma were randomized to receive either 300 mg of *B. serrata* extract or placebo three times daily. Significant improvements in lung and immune function were observed in the *B. serrata* group compared to the placebo group.[12]

PERITUMOURAL BRAIN EDEMA

Adminsitration of *B. serrata* extract is useful in the management and treatment of peritumoural brain oedema. Preliminary clinical evidence suggests that *B. serrata* extract could reduce oedema and improve neurological symptoms as well as muscle strength.[1][13][14][15]

TRAUMATIC BRAIN INJURY

B. serrata contains the bioactive incensole acetate (IA), that is considered to possess neuroprotective properties and has been shown to profoundly reduce posttraumatic brain injury (TBI) cognitive/motor complications and ischaemic neuronal damage in mice.[16] In a 12-week clinical study, the effect of *B. serrata* extract on neurorecovery following diffuse axonal injury (DAI) was investigated in DAI patients.[16] Although *B. serrata* extract did not significantly affect general outcome, the study results demonstrated a positive enhancement of the cognitive outcome in the patients, suggesting the usefulness of *B. serrata* in TBI therapy including neurorecovery following mild TBI such as concussion.[16]

CANCER

Boswellic acids from *B. serrata* have been shown to exhibit antineoplastic activity through their antiproliferative and proapoptotic properties in multiple human cancer-cell lines. Especially, AKBA has been shown to inhibit the growth of a number of tumour cells, including glioma, colon cancer, leukemia, human melanoma, hepatocellular carcinoma, and prostate cancer.[17][18][19][20][21] One of the proposed mechanisms of action for boswellic acids in the induction of apoptosis in cancer cells is through the activation of proapoptotic Bcl-2 family and caspase-3, and upregulation of cell death receptors DR4 and TNFR1 levels, leading to caspase-8 activation. Overall, *B. serrata* extract demonstrates potential as a useful anticancer agent, with significantly lower toxicity on normal liver tissue.[21]

DIABETES AND LIPID METABOLISM

In a study investigating the effect of orally administered 900 mg of *B. serrata* extract daily for 6 weeks in 60 type 2 diabetic (T2D) patients, a significant increment in blood HDL levels as well as reductions in total and LDL cholesterol, fructosamine, and hepatic enzymes were observed in the intervention group compared to the control group.[22] In another study, T2D patients on metformin were treated with *B. serrata* extract (400 mg twice a day) or placebo for 12 weeks. Significant reductions in fasting blood glucose, HbA_{1c}, insulin, and improvement in lipid parameters, without any adverse effects, were observed compared to the placebo.[23]

SAFETY

B. serrata extracts are well-tolerated, and most human studies report no adverse side effects.[1][4][5][6][12][23] Noteworthy, *B. serrata* extracts have been found to cause no disruption to glycosaminoglycan synthesis compared to nonsteroidal anti-inflammatory drugs that could potentially result in articular damage in arthritic conditions.[24]

REFERENCES

1. Ammon, H.P. "Boswellic acids and their role in chronic inflammatory diseases." *Advances in Experimental Medicine and Biology.* Vol. 928 (2016): 291–327.
2. Safayhi, H., et al. "Boswellic acids: Novel, specific, nonredox inhibitors of 5-lipoxygenase." *Journal of Pharmacological and Experimental Therapy.* Vol. 261, No. 3 (1992): 1143–1146.
3. Catanzaro, D., et al. "*Boswellia serrata* preserves intestinal epithelial barrier from oxidative and inflammatory damage." *PLoS One.* Vol. 10, No. 5 (2015): e0125375.
4. Kimmatkar, N., et al. "Efficacy and tolerability of *Boswellia serrata* extract in treatment of osteoarthritis of knee—A randomized double blind placebo controlled trial." *Phytomedicine.* Vol. 10, No. 1 (2003): 3–7.
5. Sengupta, K., et al. "A double blind, randomized, placebo controlled study of the efficacy and safety of 5-Loxin for treatment of osteoarthritis of the knee." *Arthritis Research and Therapy.* Vol. 10, No. 4 (2008): R85.
6. Vishal A.A., A. Mishra, and S.P. Raychaudhuri. "A double blind, randomized, placebo controlled clinical study evaluates the early efficacy of aflapin in subjects with osteoarthritis of knee." *International Journal of Medical Science.* Vol. 8, No. 7 (2011): 615–622.
7. Stange, E.F., et al. "[Therapy of Crohn diseases—Results of a Consensus Conference of the German Society of Digestive and Metabolic Diseases]" (article in German). *Zeitschrift für Gastroenterologie.* Vol. 35, No. 7 (1997): 541–554.
8. Pellegrini, L., et al. "Managing ulcerative colitis in remission phase: Usefulness of Casperome®, an innovative lecithin-based delivery system of *Boswellia serrata* extract." *European Review for Medical and Pharmacological Sciences.* Vol. 20, No. 12 (2016): 2695–2700.
9. Gupta, I., et al. "Effects of *Boswellia serrata* gum resin in patients with ulcerative colitis." *European Journal of Medical Research.* Vol. 2, No. 1 (1997): 37–43.
10. Gerhardt, H., et al. "[Therapy of active Crohn disease with *Boswellia serrata* extract H 15]" (article in German). *Zeitschrift für Gastroenterologie.* Vol. 39, No. 1 (2001): 11–17.
11. Madisch, A., et al. "*Boswellia serrata* extract for the treatment of collagenous colitis. A double-blind, randomized, placebo-controlled, multicenter trial." *International Journal of Colorectal Disease.* Vol. 22, No. 12 (2007): 1445–1451.
12. Gupta, I., et al. "Effects of *Boswellia serrata* gum resin in patients with bronchial asthma: Results of a double-blind, placebo-controlled, 6-week clinical study." *European Journal of Medical Research.* Vol. 3, No. 11 (1998): 511–514.
13. Janssen, G., et al. "Boswellic acids in the palliative therapy of children with progressive or relapsed brain tumors." *Klinische Pädiatrie.* Vol. 212, No. 4 (2000): 189–195.
14. Streffer, J.R., et al. "Response of radio chemotherapy associated cerebral edema to a phytotherapeutic agent, H15." *Neurology.* Vol. 56, No. 9 (2001): 1219–1221.
15. Kirste, S., et al. "*Boswellia serrata* acts on cerebral edema in patients irradiated for brain tumors: A prospective, randomized, placebo-controlled, double-blind pilot trial." *Cancer.* Vol. 117, No. 16 (2011): 3788–3795.
16. Moein, P., et al. "The effect of *Boswellia serrata* on neurorecovery following diffuse axonal injury." *Brain Injury.* Vol. 27, No. 12 (2013): 1454–1460.
17. Glaser, T., et al. "Boswellic acids and malignant glioma: Induction of apoptosis but no modulation of drug sensitivity." *British Journal of Cancer.* Vol. 80, No. 5–6 (1999): 756–765.
18. Liu, J.J., and R.D. Duan. "LY294002 enhances boswellic acid-induced apoptosis in colon cancer cells." *Anticancer Research.* Vol. 29, No. 8 (2009): 2987–2991.
19. Liu, J.J., et al. "Keto- and acetyl-keto-boswellic acids inhibit proliferation and induce apoptosis in Hep G2 cells via a caspase-8 dependent pathway." *International Journal of Molecular Medicine.* Vol. 10, No. 4 (2002): 501–505.
20. Huang, M.T., et al. "Anti-tumor and anti-carcinogenic activities of triterpenoid, β-boswellic acid." *BioFactors.* Vol. 13, No. 1–4 (2000): 225–230.
21. Yadav, V.R., et al. "Boswellic acid inhibits growth and metastasis of human colorectal cancer in orthotopic mouse model by downregulating inflammatory, proliferative, invasive and angiogenic biomarkers." *International Journal of Cancer.* Vol. 130, No. 9 (2012): 2176–2184.
22. Ahangarpour, A., et al. "Effect of *Boswellia serrata* supplementation on blood lipid, hepatic enzymes and fructosamine levels in type 2 diabetic patients." *Journal of Diabetes and Metabolic Disorders.* Vol. 13, No. 1 (2014): 29.
23. Azadmehr, A., et al. "A randomized clinical trial study: Anti-oxidant, anti-hyperglycemic and anti-hyperlipidemic effects of olibanum gum in type 2 diabetic patients." *Iran Journal of Pharmaceutical Research.* Vol. 13, No. 3 (2014): 1003–1009.
24. Siddiqui, M. Z. "*Boswellia serrata*, a potential antiinflammatory agent: An overview." *Indian Journal of Pharmaceutical Sciences.* Vol. 73, No. 3 (2011): 255–261.

© NFH Nutritional Fundamentals for Health 2017

For healthcare professional use only.