



Boswellia serrata

Description

Boswellia serrata (also known as frankincense) is a moderate to large branching tree (growing to a height of about 12 feet) found in India, Northern Africa, and the Middle East. Strips of *Boswellia* bark are peeled away, yielding a gummy oleoresin. Extracts of this gummy

exudate have been traditionally used in the Ayurvedic system of medicine as an anti-arthritis, astringent, stimulant, expectorant, and antiseptic.

Active Constituents

Boswellia contains oils, terpenoids, sugars, and volatile oils. Up to 16 percent of the resin is essential oil, the majority being alpha-thujene and p-cymene. Four pentacyclic triterpene acids are also present, with beta-boswellic acid being the major constituent.

Mechanisms of Action

Animal studies performed in India showed ingestion of a defatted alcoholic extract of *Boswellia* decreased polymorphonuclear leukocyte infiltration and migration, decreased primary antibody synthesis,^{1,2} and caused almost total inhibition of the classical complement pathway.³ In an *in vitro* study of the effects of beta-boswellic acid on the complement system, the extract demonstrated a marked inhibitory effect on both the classical and alternate complement systems.⁴ An investigation of *Boswellia*'s analgesic and psychopharmacologic effects noted that it had marked sedative and analgesic effects in animal models.⁵

In vitro testing revealed *Boswellia* specifically, and in a dose-dependent manner, blocks the synthesis of pro-inflammatory 5-lipoxygenase products, including 5-hydroxyeicosatetraenoic acid (5-HETE) and leukotriene B4 (LTB4),⁶ which cause bronchoconstriction, chemotaxis, and increased vascular permeability.⁷ Other anti-inflammatory plant constituents, such as quercetin, also block this enzyme, but they do so in a more general fashion, as an antioxidant; whereas, *Boswellia* seems to be a specific inhibitor of 5-lipoxygenase.^{8,9}

Boswellia has been observed to inhibit human leukocyte elastase (HLE), which may be involved in the pathogenesis of emphysema. HLE also stimulates mucus secretion and thus may play a role in cystic fibrosis, chronic bronchitis, and acute respiratory distress syndrome.^{10,11} Boswellic acids from *Boswellia serrata* also have an inhibitory effect against the cellular growth of leukemia HL-60 cells.¹²

Non-steroidal anti-inflammatory drugs can cause a disruption of glycosaminoglycan synthesis, accelerating the articular damage in arthritic conditions.¹³⁻¹⁶ A recent *in vivo* study examined Boswellia extract and ketoprofen for their effects on glycosaminoglycan metabolism. Boswellia significantly reduced the degradation of glycosaminoglycans compared to controls; whereas, ketoprofen caused a decrease in total tissue glycosaminoglycan content.¹⁷

Clinical Indications

Human clinical studies are minimal for this substance, and more need to be conducted to better elucidate its effects in humans, as well as to determine optimal dosing. Animal and *in vitro* studies suggest it is useful for a number of inflammatory and bronchoconstrictive conditions.

Ulcerative colitis

Leukotrienes are suggested to play a role in the inflammatory process of ulcerative colitis. Boswellia extract (350 mg three times daily) was compared to sulfasalazine (1 g three times daily) in ulcerative colitis patients. Patients on the Boswellia extract showed better improvements than patients on sulfasalazine; 82 percent of Boswellia patients went into remission, compared with 75 percent on sulfasalazine.¹⁸

A follow-up study of chronic colitis patients on gum resin of Boswellia (900 mg daily divided in three doses for six weeks) and sulfasalazine (3 g daily divided in three doses for six weeks) once again showed similar improvements. Furthermore, 14 of 20 patients (70%) treated with *Boswellia serrata* gum resin went into remission while only 4 of 10 patients (40%) treated with sulfasalazine went into remission.¹⁹

Crohn's Disease

Chemical mediators of inflammation were further addressed in a clinical trial comparing a *Boswellia serrata* extract with mesalazine in the treatment of acute Crohn's disease. The protocol population included 44 patients treated with Boswellia extract and 39 patients treated with mesalazine. Between enrollment and end of therapy, the Crohn's Disease Activity Index (CDAI) decreased significantly with both Boswellia extract and mesalazine. Although the difference between the two treatments was not statistically significant, the Boswellia extract proved to be as effective as the pharmaceutical.²⁰

Asthma

In a 1998 study of *Boswellia*'s effects on bronchial asthma, 40 patients took 300 mg of a *Boswellia* preparation three times daily for six weeks. Seventy percent of the asthma patients taking *Boswellia* had a significant improvement in their disease, measured by symptomatology as well as objective measures of lung and immune function. Only 27 percent of patients taking a placebo improved.²¹

Arthritis

While no studies on *Boswellia* alone have been conducted on osteoarthritis, a study on a combination formula provided positive results. A formula containing *Boswellia*, ashwagandha, turmeric, and zinc was evaluated in a double-blind, placebo-controlled, crossover study.²² Forty-two patients received either the herbal-mineral formulation or placebo for three months; then switched to the other protocol after a 15-day washout period for another three months. The treatment group experienced significant decreases in pain severity ($p < 0.001$) and disability scores ($p < 0.05$). Radiological evaluation found no significant changes in either group.

A placebo ($n=19$) versus *Boswellia* ($n=18$) study in patients with rheumatoid arthritis found no significant differences between the two groups in any measured parameters. NSAID dosage decreased 5.8 percent in the treatment group and 3.1 percent in the placebo group.²³ The researchers concluded that controlled studies including a greater number of subjects are warranted.

Side Effects and Toxicity

Toxicity studies of *Boswellia* in rats and primates showed no pathological changes in hematological, biochemical, or histological parameters at doses of up to 1000 mg/kg. The LD_{50} was established at >2 g/kg.²⁴

Dosage

For inflammatory or asthmatic conditions, 300-400 mg of a standardized extract (containing 60% boswellic acids) three times daily is suggested.

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