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REPORT

Ancient Herb Suppresses Inflammation

By Vicki Brower

With the removal of Vioxx® from the market, and sales of other drugs in this class plummeting, scientists are working overtime to identify natural agents that safely block the underlying factors that give rise to inflammation in the body.

Researchers have focused their microscopes on the herb boswellia, which works to block a lethal pro-inflammatory enzyme called 5-lipoxygenase (5-LOX). Until now, only limited strategies have been available to fight the insidious effects of 5-LOX, a potent contributor to inflammatory processes involved in diseases as diverse as cancer, atherosclerosis, arthritis, inflammatory bowel disease, and asthma.

BOSWELLIA BASICS

For thousands of years, folk medicine practitioners have used the herb boswellia (Boswellia serrata) to treat a wide range of conditions that we now know are caused by inflammation. This herbal extract is derived from gum resin secreted by the boswellia tree, part of a family of medicinal plants grown and used in India, Africa, China, and the Middle East.

FIGHTING INFLAMMATION BY INHIBITING LOX ENZYMES

In the late 1970s, researchers discovered that boswellia produces notable anti-inflammatory effects that are distinct from those produced by nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen and aspirin.

NSAIDs quell inflammation primarily by inhibiting the cyclooxygenase-2 (COX-2) enzyme.[1] Unfortunately, NSAIDs also block the COX-1 enzyme, which is needed to maintain a healthy stomach lining. While NSAIDs are partially effective in treating pain and inflammation, side effects such as stomach irritation and bleeding, kidney toxicity, and peptic ulcers make them less appealing for long-term use. A primary cause of NSAID toxicity is over-inhibition of the COX-1 enzyme.

The stomach-damaging properties of NSAIDs appeared to be solved in 1999, with the approval of selective COX-2 inhibitors that demonstrated less stomach toxicity than NSAIDs. As early as July 2000, however, Life Extension alerted its members to the risks associated with selective COX-2 inhibitors. Since then, reports about the potentially dangerous cardiac side effects of COX-2 inhibitors[2] have led scientists to intensify the search for safer options.

CONTROLLING THE INFLAMMATORY CASCADE

Unlike NSAIDs, boswellia fights inflammation by blocking pro-inflammatory 5-LOX (5-lipoxygenase). 5-LOX is the first enzyme in the metabolic pathway leading to the synthesis of leukotrienes, which are harmful inflammatory substances that scientists believe may have a direct influence on a number of disease processes. Efforts to develop 5-LOX inhibitors that target asthma and cancer[1] suggest that boswellia extract may well have applications in managing these and other disease conditions.

In addition to inhibiting 5-LOX and blocking the biosynthesis of harmful inflammatory leukotrienes,[3] boswellic acids decrease the activity of another pro-inflammatory enzyme, HLE (human leukocyte elastase). HLE is associated with rheumatoid arthritis and respiratory illnesses such as pulmonary emphysema, cystic fibrosis, chronic bronchitis, and acute respiratory distress syndrome[4]—all of which are linked by inflammation. Significantly, both leukotriene levels and HLE release are increased in many inflammatory diseases and allergic reactions. To date, the only anti-inflammatory compounds that have been found to inhibit both HLE and 5-LOX are those derived from boswellia.[4]

Scientists revealed boswellia's mechanism of action in a study in 2005. They found that boswellia works in part by altering the expression of tumor necrosis factor-alpha (TNF-a), which plays an important role in inflammation. While the body needs pro-inflammatory cytokines like TNF-a to fight off acute infections, an excess of such cytokines promotes chronic inflammation. Applying boswellia to cells had the selective effect of decreasing the TNF-a-induced expression of cell adhesion and matrix metalloproteinase proteins, biochemicals that are related to harmful endothelial dysfunction, cancer metastasis, arthritis, and other disease processes.[5]

POTENTIAL USES IN PREVENTING AND MANAGING CANCER

Boswellia shows great promise in the prevention and management of several forms of cancer. Pharmaceutical companies are now testing drugs that inhibit LOX enzymes, for use as potential cancer therapeutics.[1]

German scientists have demonstrated that boswellia extract is a more potent inhibitor of the enzymes that encourage cancer growth in humans than are certain chemotherapy drugs.[6] Based on these positive results with boswellia, the researchers believe that the plant's extracts may help prevent the development and spread of cancer.

Other researchers have tested boswellia extract against five different types of human leukemia cells and two types of human brain cancer cells. They found that boswellia inhibited the proliferation of these cancerous cells by prompting them to self-destruct. Stronger potencies of boswellia were more effective in promoting cancer cell death, thus demonstrating a dose-dependent effect. The Swiss researchers conducting this trial suggested that boswellia may be able to prevent or treat these cancers.[7]

Scientists from the Cleveland Clinic found that an extract of boswellia was effective against human meningioma cells, which are typically benign tumors of the brain's covering. Boswellia worked by decreasing the cells' ability to spread and by killing the tumor cells.[8]

Boswellia has also attracted the attention of prostate cancer researchers. Prostate cancer cells sampled from men with the disease display an abundance of the 5-LOX enzyme.[9] Other research has found that agents that inhibit the 5-LOX enzyme kill human prostate cancer cells,[10] suggesting that 5-LOX inhibitors such as boswellia may have applications in preventing or arresting the growth of prostate cancer.[9,10]

Boswellia extracts also demonstrate promise in fighting melanoma, the deadliest form of skin cancer. Using advanced microscopy and cell-tracking techniques, scientists were able to observe how boswellia extracts caused melanoma cells to differentiate in a healthy way and to adopt cell-growth patterns resembling those of normal cells, while becoming less able to metastasize. Using these techniques, they also observed that boswellia caused fibrosarcoma (connective tissue cancer) cells to lose their ability to metastasize, and then induced cellular suicide (apoptosis) in these same cells.[11] At this point, there is enough evidence to encourage researchers to continue looking for therapeutic treatment options utilizing boswellia in some of the most serious diseases.

REDUCING INFLAMMATION TO LOWER ATHEROSCLEROSIS RISK

Inflammation is an important contributor to atherosclerosis and the development of heart disease. Using boswellia to inhibit the 5-LOX enzymes and reduce inflammation may prove to be an important element in preventing and treating atherosclerosis.

Genetic research recently revealed an intriguing correlation between 5-LOX and atherosclerosis. Scientists discovered that mice with a genetic defect that resulted in their having only one copy of the 5-LOX gene (rather than the usual two copies) were completely protected from developing atherosclerosis.[12]

Researchers believe that 5-LOX contributes to atherosclerosis in several ways. As noted earlier, increases in the 5-LOX enzyme result in excess leukotriene products that chemically attract white blood cells to adhere to the arterial walls. Furthermore, leukotrienes may promote vascular permeability and low-density lipoprotein (LDL) oxidation. These combined effects may promote the development of atherosclerotic plaques in the arteries, a known risk factor for heart attacks.[12]

Using boswellia extract to inhibit 5-LOX-induced leukotriene production could thus represent an effective strategy to prevent or treat atherosclerosis.[12]

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BOSWELLIA IMPROVES SYMPTOMS OF ARTHRITIS

Osteoarthritis and rheumatoid arthritis can cause disabling pain and immobility in aging adults. Boswellia may offer relief for arthritis suffers because of its well-known analgesic, anti-arthritic, and anti-inflammatory properties.

Osteoarthritis, the “wear and tear” arthritis, is caused by deterioration of the cartilage that cushions joints. Research suggests that boswellia helps prevent the deterioration of cartilage and joint tissue. Scientists now theorize that boswellia may work by inhibiting the breakdown of connective tissues that is caused by tumor necrosis factor-alpha (TNF-a)-induced expression of matrix metalloproteinase enzymes.[13]

A pre-clinical animal study demonstrated boswellia’s benefits in managing osteoarthritis. Dogs suffering from osteoarthritis received boswellia extract once daily for six weeks. After only two weeks of therapy, 71% of the animals showed significant improvements in clinical symptoms of arthritis, including reduced pain, stiffness, and lameness.[14]

In a human study, boswellia was similarly shown to be effective in adults with osteoarthritis. Thirty subjects with osteoarthritis of the knee took part in a 16-week, randomized, double-blind, placebo-controlled trial. All of those who took a boswellia supplement reported less pain and swelling, increased knee flexion, and the ability to walk a greater distance.[15]

Rheumatoid arthritis is classified as an autoimmune disorder, in which the body attacks its own tissues as though they were foreign invaders. Boswellia may also offer relief of autoimmune-related rheumatoid arthritis. Boswellia can help reduce immune cells that encourage inflammation while increasing the number of immune cells that inhibit inflammation.[16] Studies indicate that boswellia’s ability to modulate the immune system and inhibit inflammatory activity may help improve the symptoms of rheumatoid arthritis and other autoimmune conditions.[17]

BOSWELLIA: WHAT YOU NEED TO KNOW

- Scientists now know that chronic inflammation underlies many of the diseases that afflict aging adults. Because most anti-inflammatory drugs work by inhibiting the COX enzymes, researchers have sought other means to quell disease-provoking inflammation.
- One of the most promising anti-inflammatory agents today comes from boswellia, a traditional herbal remedy long used to manage conditions such as joint pain and gastrointestinal irritation. Modern research confirms boswellia’s novel inflammation-fighting effects. Boswellia works differently from most conventional anti-inflammatory agents by inhibiting lipoxygenase (LOX) enzymes that are powerful contributors to inflammation and disease.
- Boswellia is particularly effective in inhibiting 5-lipoxygenase (5-LOX), which promotes disease in part by contributing to the formation of damaging leuko-trienes. Leukotrienes promote asthma, cancer, and other disease processes.
- Through its action in blocking 5-LOX, boswellia demonstrates effects that may help combat cancer, atherosclerosis, and asthma. Clinical studies reveal that boswellia also relieves the symptoms and discomfort of arthritis and inflammatory bowel disease.
- An advanced boswellia formulation called 5-LOXIN™ displays particular efficacy in inhibiting 5-LOX’s dangerous inflammatory effects.

CRITICAL SUPPORT AGAINST INFLAMMATORY BOWEL DISEASES

Ulcerative colitis and Crohn’s disease are known as inflammatory bowel diseases. Ulcerative colitis primarily affects the colon, while Crohn’s disease may affect the entire gastrointestinal tract. These autoimmune conditions are marked by symptoms such as severe gastrointestinal pain and cramping, diarrhea, fatigue, weight loss, and malnutrition. Boswellia may offer much-needed support for people facing these challenging conditions.

A recent survey of German patients with inflammatory bowel disease showed that over one third used complementary and alternative medicines—such as herbal therapies, homeopathy, probiotics, or acupuncture—to help manage their condition. Those who used boswellia extract, however, reported better results than those using other approaches.[18]

Rheumatoid arthritis. The knuckles have become inflamed and swollen.

Researchers recently tested boswellia extract in animals with experimentally induced inflammatory bowel disease. The animals demonstrated tissue injury and adherence of white blood cells to the gastrointestinal lining. When the animals received boswellia extract, however, they exhibited less inflammation and destruction of gastrointestinal tissue. These benefits contributed to a reduction in the symptoms of inflammatory bowel disease.[19]

Other researchers tested boswellia extract in an animal model of ulcerative colitis to assess its mechanism of action and compare its efficacy with a steroid commonly used to treat the disease in humans.[20] They found that the boswellia extract protected the colon by significantly reducing disease activity, as measured by decreased recruitment and adherence of white blood cells as well as platelets in the inflamed colon. They also discovered that boswellia decreased the presence of a biochemical known as P-selectin that plays a role in active colitis. Boswellia's impressive protective effects were similar to those seen in patients receiving steroids to reduce their symptoms of colitis.

Boswellia shows important treatment activity against ulcerative colitis. In a clinical trial of 30 ulcerative colitis patients, 20 patients took a conventional boswellia extract three times daily for six weeks, while 10 patients in the control group took sulfasalazine (a NSAID used to treat inflammatory bowel disease) three times daily for six weeks. A remarkable 90% of those treated with boswellia showed improvement in one or more disease indicators, compared to only 60% in the sulfasalazine group who showed similar improvement. Even more impressive was that 70% of the boswellia-treated patients went into disease remission, compared to 40% of those taking sulfasalazine.[21]

AN ADVANCED BOSWELLIA FORMULATION: 5-LOXIN™

While the anti-inflammatory effects of boswellia are well documented, different preparations of the herb vary greatly in their potency and biochemical makeup.

Scientists avidly studied boswellia to determine how it fights the inflammation-provoking 5-lipoxygenase (5-LOX) enzyme. They discovered a compound known as AKBA (3-O-acetyl-11-keto-B-boswellic acid), which binds directly to 5-LOX and inhibits its activity.[23] Other boswellia-derived compounds only partially and incompletely inhibit 5-LOX.[23,24]

Researchers have long sought an AKBA-rich boswellia extract for the treatment of chronic inflammatory disorders. Even in standardized boswellia extracts, however, biologically active AKBA makes up only a small fraction of the total composition.

Several years ago, researchers discovered how to produce a standardized boswellia formulation that contains a concentration of AKBA greater than 30%. This product was patented and trademarked under the name 5-LOXIN™. Testing found that 5-LOXIN™ inhibits 5-LOX even more effectively than the highest-quality boswellia formulation.

In an animal study comparing the efficacy of 5-LOXIN™ to that of the popular anti-inflammatory drug ibuprofen, 5-LOXIN™ produced a 27% reduction in inflammation, compared to 35% for ibuprofen.[5] Another study comparing

5-LOXIN™ to the anti-inflammatory steroid drug prednisone found that 5-LOXIN™ produced a 55% reduction in inflammation, similar to the effects of prednisone.[13,25] 5-LOXIN™ is not only a powerful anti-inflammatory agent, but is also considered safe and well tolerated.

BLOCKING LEUKOTRIENES IMPROVES ASTHMA SYMPTOMS

Cases of asthma are dramatically increasing. An inflammatory disorder of the airways, asthma causes shortness of breath, wheezing, chest tightness, and coughing. By blocking 5-LOX-induced leukotriene production, boswellia may offer relief from the breathing difficulties that characterize asthma.

In a double-blind, placebo-controlled study of 80 asthma patients, 40 patients took an extract of boswellia three times daily for six weeks, and 40 patients took a placebo.[22] Of patients taking boswellia, 70% showed an improvement in their symptoms, including the ability to inhale and exhale normally. Additionally, the boswellia-treated subjects demonstrated a decrease in eosinophils, which are white blood cells associated with allergy and asthma. By contrast, only 27% of the placebo-treated group demonstrated improved symptoms.

CONCLUSION

Every year, scientists are learning more about how inflammation promotes various disease processes. Recent studies have shed light on the interplay between pro-inflammatory lipoxygenase (LOX) enzymes and conditions such as cancer, heart disease, and asthma.

Long used as a traditional herbal medicine, boswellia blocks 5-lipoxygenase (5-LOX), one of the most damaging of the LOX enzymes. Laboratory and clinical studies alike demonstrate that boswellia holds promise in averting the numerous diseases associated with excessive levels of inflammation in the body. Boswellia may benefit adults seeking to manage or prevent conditions caused by the debilitating effects of chronic inflammation.

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