
Boswellia serrata, a potential antiinflammatory agent: an overview.
Siddiqui MZ.

Processing and Product Development Division, Indian Institute of Natural Resins and Gums, Namkum, Ranchi-834 010, India.

The resin of Boswellia species has been used as incense in religious and cultural ceremonies and in medicines since time immemorial. Boswellia serrata (Salai/Salai guggul), is a moderate to large sized branching tree of family Burseraceae (Genus Boswellia), grows in dry mountainous regions of India, Northern Africa and Middle East. Oleo gum-resin is tapped from the incision made on the trunk of the tree and is then stored in specially made bamboo basket for removal of oil content and getting the resin solidified. After processing, the gum-resin is then graded according to its flavour, colour, shape and size. In India, the States of Andhra Pradesh, Gujarat, Madhya Pradesh, Jharkhand and Chhattisgarh are the main source of Boswellia serrata. Regionally, it is also known by different names. The oleo gum-resins contain 30-60% resin, 5-10% essential oils, which are soluble in the organic solvents, and the rest is made up of polysaccharides. Gum-resin extracts of Boswellia serrata have been traditionally used in folk medicine for centuries to treat various chronic inflammatory diseases. The resinous part of Boswellia serrata possesses monoterpenes, diterpenes, triterpenes, tetracyclic triterpenic acids and four major pentacyclic triterpenic acids i.e. β-boswellic acid, acetyl-β-boswellic acid, 11-keto-β-boswellic acid and acetyl-11-keto-β-boswellic acid, responsible for inhibition of pro-inflammatory enzymes. Out of these four boswellic acids, acetyl-11-keto-β-boswellic acid is the most potent inhibitor of 5-lipoxygenase, an enzyme responsible for inflammation.

PMID: 22457547 [PubMed - in process]


Effect of Boswellia serrata on Antioxidant Status in an Experimental Model of Colitis Rats Induced by Acetic Acid.
Hartmann RM, Morgan Martins MI, Tieppo J, Fillmann HS, Marroni NP.


AIM OF THE STUDY: To evaluate the antioxidant effect of an extract of the plant Boswellia serrata in an experimental model of acute ulcerative colitis induced by administration of acetic acid (AA) in rats. MATERIALS AND METHODS: The extract of B. serrata (34.2 mg/kg/day) was administered orally by gavage for 2 days before and after induction of colitis with AA diluted to 4 % and in a volume of 4 ml. RESULTS: The anal sphincter pressure in the groups treated with B. serrata showed a significant increase compared to the colitis group (P < 0.001). Histological analysis of treated animals showed less edema with preservation of mucosal crypts. Lipid peroxidation showed a significant decrease in the treated groups compared to the colitis group (P < 0.001). The superoxide dismutase (SOD) enzyme activity showed a significant reduction in the treated groups compared to the colitis group (P < 0.001), the glutathione peroxidase (GPx) significantly increased in the treated groups compared to colitis group (P < 0.05), and the same was the result for enzyme activity glutathione (GSH; P < 0.05). CONCLUSIONS: The extract of B. serrata has active antioxidant substances that exert protective effects in acute experimental colitis.

PMID: 22451119 [PubMed - as supplied by publisher]


Boswellic acids from frankincense inhibit lipopolysaccharide functionality through direct molecular interference.
Henkel A, Kather N, Mónch B, Northoff H, Jauch J, Werz O.

Department for Pharmaceutical Analytics, Pharmaceutical Institute, University of Tuebingen, Germany. ahenkel@gmx.de

Lipophilic extracts of gum resins of Boswellia species (BSE) are used in folk medicine to treat various inflammatory disorders and infections. The molecular background of the beneficial pharmacological effects of such extracts is still unclear. Various boswellic acids (BAs) have been identified as abundant bioactive ingredients of BSE. Here we report the identification of defined BAs as direct inhibitors of lipopolysaccharide (LPS) functionality and LPS-induced cellular responses. In pull-down experiments, LPS could be precipitated using an immobilized BA, implying direct molecular interactions. Binding of BAs to LPS leads to an inhibition of LPS activity which was observed in vitro using a modified limulus amoebocyte lysate assay. Analysis of different BAs revealed clear structure-activity relationships with the classical β-BA as most potent derivative (IC50=1.8 μM). In RAW264.7 cells, LPS-induced expression of inducible nitric oxide synthase (iNOS, EC 1.14.13.39) was selectively inhibited by those BAs that interfered with LPS activity. In contrast, interferon-γ-induced iNOS induction was not affected by BAs. We conclude that structurally defined BAs are LPS inhibiting agents and we suggest that β-BA may contribute to the observed anti-inflammatory effects of BSE during infections by suppressing LPS activity. Copyright © 2011 Elsevier Inc. All rights reserved.

PMID: 22001311 [PubMed - indexed for MEDLINE]


Acetyl-11-keto-β-boswellic acid (AKBA); targeting oral cavity pathogens.

Raja AF, Ali F, Khan IA, Shawl AS, Arora DS.

Microbiology Unit, Indian Institute of Integrative Medicine (CSIR), Sanatnagar, Srinagar, 190005, India. alsabaraja@gmail.com.

ABSTRACT: BACKGROUND: Boswellic acids mixture of triterpenic acids obtained from the oleo gum resin of Boswellia serrata and known for its effectiveness in the treatment of chronic inflammatory disease including peritumor edema. Boswellic acids have been extensively studied for a number of activities including anti-inflammatory, antitumor, immunomodulatory, and inflammatory bowel diseases. The present study describes the antimicrobial activities of boswellic acid molecules against oral cavity pathogens. Acetyl-11-keto-β-boswellic acid (AKBA), which exhibited the most potent antibacterial activity, was further evaluated in time kill studies, mutation prevention frequency, postantibiotic effect (PAE) and biofilm susceptibility assay against oral cavity pathogens. FINDINGS: AKBA exhibited an inhibitory effect on all the oral cavity pathogens tested (MIC of 2-4 μg/ml). It exhibited concentration dependent killing of Streptococcus mutans ATCC 25175 up to 8 × MIC and also prevented the emergence of mutants of S.mutans ATCC 25175 at 8× MIC. AKBA demonstrated postantibiotic effect (PAE) of 5.7 ± 0.1 h at 2 × MIC. Furthermore, AKBA inhibited the formation of biofilms generated by S.mutans and Actinomyces viscosus and also reduced the preformed biofilms by these bacteria. CONCLUSIONS: AKBA can be useful compound for the development of antibacterial agent against oral pathogens and it has great potential for use in mouthwash for preventing and treating oral infections.

PMCID: PMC3201914
PMID: 21992439 [PubMed]


Gum resin of Boswellia serrata inhibited human monocyctic (THP-1) cell activation and platelet aggregation.

Kokkiri K, Bhakshu LM, Marri S, Padmasree K, Row AT, Rahavendra AS, Tetali SD.

Department of Plant Sciences, University of Hyderabad, Hyderabad 500046, India.
ETHNOPHARMACOLOGICAL RELEVANCE: Stem bark gum resin extract of Boswellia serrata is traditionally used in India for its hemostatic, antiinflammatory and cardiovascular health effects and it is named as Śallakī in Ayurvedic medicine.

AIM OF THE STUDY: This study was conducted to evaluate the antioxidative and antithrombotic properties of stem bark gum resin extracts of Boswellia serrata (BS).

MATERIALS AND METHODS: The inhibitory activity of the BSWE and BSAE on FeCl(3) induced lipid peroxidation (in vitro) in rat liver and heart homogenates was measured spectrophotometrically. Their effect on H(2)O(2) induced reactive oxygen species (ROS) generation in human monocyteic (THP-1) cells was investigated by tracking intensity of a cell permeable fluorescent dye, H(2)DCFDA and subjecting the cell samples to confocal microscopy. Further, the effect of BSAE and BSWE on ADP-induced platelet aggregation was assessed using a multimode detection plate reader, plasma coagulation times using an automated blood coagulation analyzer and on human blood clotting factors Xa and Xla using chromogenic substrate. Phytomarker analysis of the water (BSWE) and hydroalcoholic (BSAE) extracts of BS-gum resin was done through HPLC using a standard compound AKβBA.

RESULTS: BSAE and BSWE inhibited, to varied extents, the lipid peroxidation in liver (80%) and heart (50%) tissue homogenates of male Wistar rats. Further, BSAE (30 µg dwt/mL) and BSWE (300 µg dwt/mL) attenuated ≥ 60% of H(2)O(2) mediated ROS generation in THP-1 cells. In case of standard compounds, ascorbate (20 µg dwt/mL) and butylated hydroxytoluene (BHT) (10 µg dwt/mL) completely scavenged ROS in the cells. BSAE and BSWE at 3 mg dwt/mL completely inhibited ADP induced platelet aggregation and activities were comparable to 20 µg/mL of heparin. The extracts also showed very high activity in prolonging coagulation time periods. Both types of extracts extended prothrombin time (PT) from ~13 to >60s and activated partial thromboplastin time (APTT) from ~32s to >90s. BSAE inhibited clotting factors Xa and Xla remarkably at 6 µg of dwt where as BSWE did not show much effect on FXa and showed 30% inhibition on FXa at 120 µg. 10 µg of heparin was required to inhibit about 30% activity of the above factors. HPLC analyses suggested that BSAE and BSWE had AKβBA of 9% (w/w) and 7.8% (w/w) respectively.

CONCLUSION: Present study demonstrated antioxidative and antithrombotic anticoagulant activities of water and hydroalcoholic extracts of Boswellia serrata’s gum resin. We suggest that BS-gum resin as a good source for lead/therapeutic compounds possessing antioxidant, antiplatelet and anticoagulant activities.

Copyright © 2011 Elsevier Ireland Ltd. All rights reserved.

PMID: 21771654  [PubMed - indexed for MEDLINE]


Boswellia serrata: an overall assessment of in vitro, preclinical, pharmacokinetic and clinical data.

Abdel-Tawab M, Werz O, Schubert-Zsilavecz M.

Central Laboratory of German Pharmacists, Eschborn, Germany.
m.tawab@zentrallabor.com

Non-steroidal anti-inflammatory drug (NSAID) intake is associated with high prevalence of gastrointestinal or cardiovascular adverse effects. All efforts to develop NSAIDs that spare the gastrointestinal tract and the cardiovascular system are still far from achieving a breakthrough. In the last two decades, preparations of the gum resin of Boswellia serrata (a traditional ayurvedic medicine) and of other Boswellia species have experienced increasing popularity in Western countries. Animal studies and pilot clinical trials support the potential of B. serrata gum resin extract (BSE) for the treatment of a variety of inflammatory diseases like inflammatory bowel disease, rheumatoid arthritis, osteoarthritis and asthma. Moreover, in 2002 the European Medicines Agency classified BSE as an ‘orphan drug’ for the treatment of peritumoral brain oedema. Compared to NSAIDs, it is expected that the administration of BSE is associated with better tolerability, which needs to be confirmed in further clinical trials. Until recently, the pharmacological effects of BSE were mainly attributed to suppression of leukotriene formation via inhibition of 5-lipoxygenase (5-LO) by two boswellic acids, 11-keto-β-boswellic acid (KBA) and acetyl-11-keto-β-boswellic acid (AKBA). These two boswellic acids have also been chosen in the monograph of Indian frankincense in European Pharmacopoeia 6.0 as markers to ensure the quality of the air-dried gum resin exudate of B. serrata. Furthermore, several dietary supplements advertise the enriched content of KBA and AKBA. However, boswellic acids failed to inhibit leukotriene formation in human whole blood, and pharmacokinetic data revealed very low concentrations of AKBA and KBA in plasma, being far below the effective concentrations for bioactivity in vitro. Moreover, permeability studies suggest poor absorption of AKBA following oral administration. In view of these results, the previously assumed mode of action - that is, 5-LO inhibition - is questionable. On the other hand, 100-fold higher plasma
concentrations have been determined for β-boswellic acid, which inhibits microsomal prostaglandin E synthase-1 and the serine protease cathepsin G. Thus, these two enzymes might be reasonable molecular targets related to the anti-inflammatory properties of BSE. In view of the results of clinical trials and the experimental data from in vitro studies of BSE, and the available pharmacokinetic and metabolic data on boswellic acids, this review presents different perspectives and gives a differentiated insight into the possible mechanisms of action of BSE in humans. It underlines BSE as a promising alternative to NSAIDs, which warrants investigation in further pharmacological studies and clinical trials.

PMID: 21553931 [PubMed - indexed for MEDLINE]


Sengupta K, Kolla JN, Krishnaraju AV, Yalamanchili N, Rao CV, Golakoti T, Raychaudhuri S, Raychaudhuri SP.

Cellular and Molecular Biology Division, Laila Impex R&D Center, Jawahar Autonagar, Vijayawada 520 007, India.

There is significant number of evidences suggesting the anti-inflammatory properties of gum resin extracts of Boswellia serrata containing 3-O-acetyl-11-keto-β-boswellic acid (AKBA) and their promising potential as therapeutic interventions against inflammatory diseases such as osteoarthritis (OA). Unfortunately, the poor bioavailability of AKBA following oral administration might limit the anti-inflammatory efficacy of standardized Boswellia extract(s). To address this issue, we describe a novel composition called Aflapin, which contains B. serrata extract enriched in AKBA and non-volatile oil portion of B. serrata gum resin. Our observations show that the availability of AKBA in systemic circulation of experimental animals is increased by 51.78% in Aflapin-supplemented animals, in comparison with that of 30% AKBA standardized extract or BE-30 (5-Loxin®). Consistently, Aflapin confers better anti-inflammatory efficacy in Freund’s Complete Adjuvant (FCA)-induced inflammation model of Sprague-Dawley rats. Interestingly, in comparison with BE-30, Aflapin(*) also provides significantly better protection from IL-1β-induced death of human primary chondrocytes and improves glycosaminoglycans production in human chondrocytes. In Tumor necrosis factor alpha (TNFα)-induced human synovial cells, the inhibitory potential of Aflapin (IC50 44.736 ng/ml) on matrix metalloproteinase-3 (MMP-3) production is 14.83% better than that of BE-30 (IC50 52.528 ng/ml). In summary, our observations collectively suggest that both the Boswellia products, BE-30 (5-Loxin®) and Aflapin, exhibit powerful anti-inflammatory efficacy and anti-arthritic potential. In particular, in comparison with BE-30, Aflapin provides more potential benefits in recovering articular cartilage damage or protection from proteolytic degradation due to inflammatory insult in arthritis such as osteoarthritis or rheumatoid arthritis.

PMID: 21479939 [PubMed - indexed for MEDLINE]


Traditional herbal remedies that influence cell adhesion molecule activity.

Spelman K, Aldag R, Hamman A, Kwasnik EM, Mahendra MA, Obasi TM, Morse J, Williams EJ.

Tai Sophia Institute, Department of Herbal Medicine, Laurel, MD, USA.

phytochems@gmail.com

Many traditional medicines have demonstrated immune activity, however, research has largely neglected their effects on cell adhesion molecules (CAMs). This review reports on extracts from 37 medicinal plant species, similar to or replicating traditional preparations, that up- or downregulate either gene or protein activity of CAMs. The majority of the investigations were in vitro, primarily of the immunoglobulin superfamily of CAMs, specifically intercellular cell adhesion molecule-1 (ICAM-1) and vascular cell adhesion molecule-1 (VCAM-1) and secondarily on the integrin (CD11b or MAC-1) and selectin (E-selectin and P-selectin) families of CAMs. The following plant species have demonstrated modulation of multiple CAMs: Artemisia asiatica, Boswellia serrata, Canasora decussata, Cinnamomum pookum, Dehaasia incrassate, Ganoderma lucidum, Ginkgo biloba, Hypericum perforatum, Juglans regia, Lycopbus lucidus, Panax notoginseng, Rheum undulatum, Salvia miltiorrhiza. Many other species have documented activity on
one CAM. Currently there are limited in vivo/ex vivo investigations, including a clinical trial on Mahonia aquifolium. Although further evidence is needed, the data suggest that the reviewed botanical medicines may have the potential to provide therapeutic potential in disease processes involving CAMs. Additionally, the reported success of many of these plant extracts by traditional cultures and modern phytotherapists may involve the modulation of CAMs.

Copyright © 2010 John Wiley & Sons, Ltd.

PMID: 21105177 [PubMed - indexed for MEDLINE]


Comparative efficacy and tolerability of 5-Loxin and AflapinAgainst osteoarthritis of the knee: a double blind, randomized, placebo controlled clinical study.


Laila Impex R&D Center, Jawahar Autonagar, Vijayawada 520 007, India.

Aflapin(*) is a novel synergic composition derived from Boswellia serrata gum resin (Indian Patent Application No. 2229/CHE/2008). Aflapin is significantly better as an anti-inflammatory agent compared to the Boswellia extracts presently available in the market. A 90-day, double-blind, randomized, placebo-controlled study was conducted to evaluate the comparative efficacy and tolerability of 5-Loxin(*) and Aflapin(*) in the treatment of osteoarthritis (OA) of the knee (Clinical trial registration number: ISRCTN80793440). Sixty OA subjects were included in the study. The subjects received either 100 mg (n=20) of 5-Loxin(*) or 100 mg (n=20) of Aflapin(*) or a placebo (n=20) daily for 90 days. Each patient was evaluated for pain and physical functions by using the standard tools (visual analog scale, Lequesne's Functional Index, and Western Ontario and McMaster Universities Osteoarthritis Index) at the baseline (day 0), and at days 7, 30, 60 and 90. A battery of biochemical parameters in serum, urine and hematological parameters in citrated whole blood were performed to assess the safety of 5-Loxin(*) and Aflapin(*) in OA subjects. Fifty seven subjects completed the study. At the end of the study, both 5-Loxin(*) and Aflapin conferred clinically and statistically significant improvements in pain scores and physical function scores in OA subjects. Interestingly, significant improvements in pain score and functional ability were recorded as early as 7 days after initiation of the study in the treatment group supplemented with 100 mg Aflapin. Corroborating the improvements in pain scores in treatment groups, our in vitro studies provide evidences that Aflapin(*) is capable of inhibiting cartilage degrading enzyme MMP-3 and has the potential to regulate the inflammatory response by inhibiting ICAM-1. Aflapin(*) and 5-Loxin(*) reduce pain and improve physical functions significantly in OA subjects. Aflapin exhibited better efficacy compared to 5-Loxin(*). In comparison with placebo, the safety parameters were almost unchanged in the treatment groups. Hence both 5-Loxin(*) and Aflapin(*) are safe for human consumption.

PMCID: PMC2974165
PMID: 21060724 [PubMed - indexed for MEDLINE]


A review of the efficacy of traditional Iranian medicine for inflammatory bowel disease.

Rahimi R, Shams-Ardekani MR, Abdollahi M.

The etiology of inflammatory bowel disease (IBD) is not yet known, but many factors such as defects in the immune system, oxidative stress, microbial content in the gastrointestinal tract, nuclear factor (NF)-κB, nitric oxide (NO), cyclooxygenase-2 (COX-2), and leukotriene B4 (LTB4) are thought to play a role in its pathogenesis. In traditional Iranian medicine (TIM), several medicinal plants are thought to be effective for the treatment of IBD. In this study, information on all of these remedies were derived from all available old sources such as documents or notes and books and were added to the information derived from modern medical databases covering all in vitro, in vivo and clinical trials. For some of these plants, only one or two mechanisms of action have been found such as in Cassia fistula, Lepidium sativum, and Bunium persicum. However, for some plants various mechanisms of action are known. For example, Commiphora mukul is effective in IBD due to its immunomodulatory, antioxidant, and antibacterial
properties and it decreases NF-κB, NO and Cox-2. Another herb, Plantago ovata, has immunomodulatory, antioxidant, anti-inflammatory and wound healing activities and decreases NO and LB4. Considering the mechanisms of action of these plants, the combination of some of them may be useful because of their many mechanisms of action such as Pistacia lentiscus, Bunium persicum, Solanum nigrum, Plantago ovata, Boswellia, Solanum nigrum, Plantago ovata and Commiphora mukul. For some of the herbal products used in TIM such as oleogum resin from Commiphora myrrha, seeds of Ocimum basilicum, seeds of Linum usitissimum, gum resin of Dracaena cinnabari, seeds of Plantago major, seeds of Lallemandia royleana, and seeds of Allium porrum, there is no or not enough studies to confirm their benefits in IBD. It is suggested that an evaluation of the effects of these plants on different aspects of IBD should be performed.

PMCID: PMC2945480
PMID: 20857519  [PubMed - indexed for MEDLINE]


Inhibition of microsomal prostaglandin E2 synthase-1 as a molecular basis for the anti-inflammatory actions of boswellic acids from frankincense.


Pharmaceutical Institute, University of Tuebingen, Tuebingen, Germany.

BACKGROUND AND PURPOSE: Frankincense, the gum resin derived from Boswellia species, showed anti-inflammatory efficacy in animal models and in pilot clinical studies. Boswellic acids (BAs) are assumed to be responsible for these effects but their anti-inflammatory efficacy in vivo and their molecular modes of action are incompletely understood.

EXPERIMENTAL APPROACH: A protein fishing approach using immobilized BA and surface plasmon resonance (SPR) spectroscopy were used to reveal microsomal prostaglandin E(2) synthase-1 (mPGES1) as a BA-interacting protein. Cell-free and cell-based assays were applied to confirm the functional interference of BAs with mPGES1. Carrageenan-induced mouse paw oedema and rat pleurisy models were utilized to demonstrate the efficacy of defined BAs in vivo.

KEY RESULTS: Human mPGES1 from A549 cells or in vitro-translated human enzyme selectively bound to BA affinity matrices and SPR spectroscopy confirmed these interactions. BAs reversibly suppressed the transformation of prostaglandin (PG)H(2) to PGE(2) mediated by mPGES1 (IC(50) = 3-10 μM). Also, in intact A549 cells, BAs selectively inhibited PGE(2) generation and, in human whole blood, β-BA reduced lipopolysaccharide-induced PGE(2) biosynthesis without affecting formation of the COX-derived metabolites 6-keto PGF(1α) and thromboxane B(2). Intraperitoneal or oral administration of β-BA (1 mg·kg(-1) ) suppressed rat pleurisy, accompanied by impaired levels of PGE(2) and β-BA (1 mg·kg(-1) , given i.p.) also reduced mouse paw oedema, both induced by carrageenan. CONCLUSIONS AND IMPLICATIONS: Suppression of PGE(2) formation by BAs via interference with mPGES1 contribute to the anti-inflammatory effectiveness of BAs and of frankincense, and may constitute a biochemical basis for their anti-inflammatory properties.


PMCID: PMC3012413
PMID: 20840544  [PubMed - indexed for MEDLINE]


Modulation of the immune system by Boswellia serrata extracts and boswellic acids.

Ammon HP.

Department of Pharmacology, Institute of Pharmaceutical Sciences, University of Tuebingen, Tuebingen, Germany.

sekretariat.ammon@uni-tuebingen.de

Extracts from the gum resin of Boswellia serrata and some of its constituents including boswellic acids affect the immune system in different ways. Among the various boswellic acids 11-keto-beta-boswellic acid (KBA) and acetyl-11-keto-beta-boswellic acid have been observed to be active. However, also other boswellic acids may exhibit actions in the immune system. In the humoral defence system a mixture of boswellic acids at higher doses reduced primary antibody titres; on the other hand lower doses enhanced secondary antibody titres following treatment with sheep erythrocytes. In the cellular defence boswellic acids appear to increase lymphocyte proliferation whereas higher concentrations are even inhibitory. Moreover, BAs increase phagocytosis of macrophages. BAs affect the cellular defence system by interaction with production/release of cytokines. Thus, BAs inhibit activation of NFkappaB which is a product of neutrophile granulocytes. Consequently a down regulation of TNF-alpha and decrease of IL-1, IL-2, IL-4, IL-6 and IFN-gamma, which are proinflammatory cytokines by BAs and BAs has been reported. Suppressions of the classic way of the complement system was found to be due to inhibition of the conversion of C3 into C3a and C3b. However, which of these pharmacological actions contribute to the therapeutic effects and which is finally the best dosage of a standardized extract needs further examination. And it is also a question whether or not a single BA will have the same therapeutic effect as a standardized extract. Among the mediators of inflammatory reaction, mast cell stabilisation has been described by a BE. Inhibition of prostaglandin synthesis appears to play only a minor role as far as the anti-inflammatory effect is concerned. On the other hand the inhibitory action of BAs on 5-LO leading to a decreased production of leukotrienes has received high attention by the scientific community since a variety of chronic inflammatory diseases is associated with increased leukotriene activity. At the end of the cascade of events in the cellular immune system as far as it directs to various tissues of the body - i.e. autoimmune diseases - formation of oxygen radicals and proteases (for example elastase) play an important destructive role. Here, BAs as well as BAs have been found to be inhibitory. From the pharmacological properties of BEs and BAs it is not surprising that positive effects of BEs in some chronic inflammatory diseases including rheumatoid arthritis, bronchial asthma, osteoarthritis, ulcerative colitis and Crohn's disease have been reported.

Copyright 2010. Published by Elsevier GmbH.

PMID: 20696559 [PubMed - indexed for MEDLINE]


Natural anti-inflammatory products and leukotriene inhibitors as complementary therapy for bronchial asthma.

Houssen ME, Ragab A, Mesbah A, El-Samanoudy AZ, Othman G, Moustafa AF, Badria FA.

Department of Biochemistry, Faculty of Pharmacy, University of Beni Suef, Beni Suef 62514, Egypt.
mahahoussen@yahoo.com

OBJECTIVE: To assess the efficacy of a combination of Boswellia serrata, licorice root (Glycyrrhiza glabra) and Tumeric root (Curcuma longa) as natural leukotriene inhibitor, antiinflammatory and antioxidant products respectively in controlling bronchial asthma. SUBJECTS AND METHODS: The study comprised 63 patients with bronchial asthma that are further subdivided into two groups. Group 1 receiving oral capsule (combined herb) in a soft-gelatin capsule 3 times daily for 4weeks and group 2 receiving placebo. Plasma leukotriene C(4) (LTC(4)), nitric oxide (NO) and malondialdehyde (MDA) levels were measured and pulmonary function was also assessed in all patients enrolled in the study. RESULTS: There was a statistically significant decrease in the plasma levels of LTC(4), (MDA), and NO in target therapy group when compared with placebo group. CONCLUSION: The used extract contained Boswellia serrata, Curcuma longa and Glycyrrhiza has a pronounced effect in the management of bronchial asthma.

Copyright 2010 The Canadian Society of Clinical Chemists. Published by Elsevier Inc. All rights reserved.

PMID: 20430018 [PubMed - indexed for MEDLINE]


Topical Boswellic acids for treatment of photoaged skin.

Calzavara-Pinton P, Zane C, Facchinetti E, Capezzera R, Pedretti A.
Dermatology Department, University of Brescia, Brescia, Italy.

Boswellic acids (BAs) are pentacyclic triterpenes extracted from the gum resins of the tropical tree Boswellia serrata. They are orally administered in traditional Indian medicine for the treatment of several inflammatory disease and cancer because of their anti-inflammatory and immunomodulatory activities as well as stimulatory effects on fibroblasts. The present authors have investigated efficacy, tolerability, and safety of a base cream containing 0.5% BAs in the treatment of clinical manifestations of photoaging of facial skin with a randomized, double-blind, placebo-controlled, split-face study. Fifteen female volunteers applied the creams with or without BAs on the half sides of the face once daily for 30 days. Significant improvements of the Dover’s global score for photoaging, tactile roughness, and fine lines, as well as, with noninvasive diagnostic techniques, an increase of elasticity, a decrease of sebum excretion, and a change of echographic parameters were observed with topical BAs in comparison with placebo. The treatment was always well tolerated without adverse effects. The present findings seem to indicate that topical application of BAs may represent a suitable treatment option for selected features of skin photoaging.

PMID: 20136919  [PubMed - indexed for MEDLINE]


Effect of exclusion diet with nutraceutical therapy in juvenile Crohn's disease.

Slonim AE, Grovit M, Bulone L.

Division of Clinical Genetics, Department of Pediatrics, Columbia University College of Physicians & Surgeons, New York, New York 10032, USA. as2718@columbia.edu

BACKGROUND: Most moderate-severe juvenile Crohn's disease (CD) patients are in a constant catabolic state resulting in poor weight gain and growth failure. Anti-inflammatory, immunomodulatory, and monoclonal antibody drugs, as well as growth hormone (GH), frequently fail to achieve sustained remission or reverse growth failure. OBJECTIVE: To test whether an exclusion diet with nutraceutical therapy (DNT) could induce sustained clinical remission and weight gain, and if so does this enhance the ability for GH to reverse growth failure. METHODS: An uncontrolled prospective case study was undertaken in six moderate-severe CD patients, two of whom had completed growth. All were treated with DNT. Adequate caloric and protein (>or= 3g/kg/d) intake for catch up weight was prescribed. Dairy products, certain grains and carrageenan containing foods were eliminated. Nutraceuticals, consisting of fish peptides, bovine colostrum, boswellia serrata, curcumin and a multivitamin were administered daily. Lactobacillus GG, a probiotic, was administered twice weekly. Recombinant human GH (rhGH) was administered daily. RESULTS: Within 2 months of starting DNT all six patients went into remission, with discontinuation of all pharmacological drugs. Three patients have remained in sustained remission for 4 to 8 years. One patient with very severe CD had recurrence of CD symptoms after being in complete remission for 18 months, one patient was in remission for 3 years but symptoms recurred when she became less compliant to DNT and one recently treated patient remains in remission after 6 months. With the addition of rhGH, the 4 growing patients had good-excellent growth response CONCLUSION: DNT engendered prolonged remission and restoration of normal weight in moderate-severe juvenile CD patients, providing conditions that enabled rhGH to stimulate growth. These findings justify larger controlled trials to evaluate the long-term benefit of compliance to DNT in both juvenile and adult CD patients.

PMID: 20150601  [PubMed - indexed for MEDLINE]


Boswellia frereana (frankincense) suppresses cytokine-induced matrix metalloproteinase expression and production of pro-inflammatory molecules in articular cartilage.

Blain EJ, Ali AY, Duance VC.

Connective Tissue Biology Laboratories, School of Biosciences, Cardiff University, Cardiff, UK. blain@cardiff.ac.uk
The aim of this study was to assess the anti-inflammatory efficacy of Boswellia frereana extracts in an in vitro model of cartilage degeneration and determine its potential as a therapy for treating osteoarthritis. Cartilage degradation was induced in vitro by treating explants with 5 ng/ml interleukin1alpha (IL-1alpha) and 10 ng/ml oncostatin M (OSM) over a 28-day period, in the presence of absence of 100 microg/ml B. frereana. Treatment of IL-1alpha/OSM stimulated cartilage explants with B. frereana inhibited the breakdown of the collagenous matrix. B. frereana reduced MMP9 and MMP13 mRNA levels, inhibited MMP9 expression and activation, and significantly reduced the production of nitrite (stable end product of nitric oxide), prostaglandin E2 and cyclooxygenase-2. Epi-lupeol was identified as the principal constituent of B. frereana. This is the first report on the novel anti-inflammatory properties of Boswellia frereana in an in vitro model of cartilage degradation. We have demonstrated that B. frereana prevents collagen degradation, and inhibits the production of pro-inflammatory mediators and MMPs. Due to its efficacy we propose that B. frereana should be examined further as a potential therapeutic agent for treating inflammatory symptoms associated with arthritis.

(c) 2009 John Wiley & Sons, Ltd.

PMID: 19943332 [PubMed - indexed for MEDLINE]


Effects of topical boswellic acid on photo and age-damaged skin: clinical, biophysical, and echographic evaluations in a double-blind, randomized, split-face study.

Pedretti A, Capezzera R, Zane C, Facchinetti E, Calzavara-Pinton P.

Dermatology Department, University of Brescia, Brescia, Italy.

ale.pedretti@alice.it

Boswellic acids (BAs) are pentacyclic triterpenes with strong anti-inflammatory activity; their most important source is the extract of the gum resin of Boswellia serrata, a tropical tree that grows in India and Africa. In the present randomized, double-blind, split-face, comparative study we have assessed efficacy, tolerability, and safety of a base cream containing 0.5% BAs as compared to the same cream without these active ingredients in the treatment of clinical manifestations of photoaging of facial skin. Fifteen female volunteers were enrolled; they applied creams once daily for 30 days. At baseline, at the end of the treatment, and after a 2-month follow-up, clinical findings were assessed according to the Dover classification scale for photoaging and by biophysical and echographic measurements. We registered a significant improvement of tactile roughness and fine lines in the half side of the face treated with BAs; noninvasive instrumental diagnostic investigations showed an improvement of elasticity, a decrease of sebum excretion, and a change of echographic parameters suggesting a reshaping of dermal tissue. The treatment was always well tolerated without adverse effects. The present findings seem to indicate that the topical application of BAs may represent a suitable treatment option for selected features of skin photoaging.

Georg Thieme Verlag KG Stuttgart New York.

PMID: 19918712 [PubMed - indexed for MEDLINE]


Boswellia resin: from religious ceremonies to medical uses; a review of in-vitro, in-vivo and clinical trials.

Moussaieff A, Mechoulam R.

Department of Plant Sciences, The Weizmann Institute of Science, Rehovot, 76100, Israel. arieh@weizmann.ac.il

OBJECTIVES: Despite its historical-religious, cultural and medical importance, Boswellia has not been thoroughly studied, and gaps still exist between our knowledge of the traditional uses of the resin and the scientific data available. Here we review the pharmacology of Boswellia resin and of the small molecules identified as the active ingredients of the resin.
KEY FINDINGS: The resin of Boswellia species ('frankincense', 'olibanum') has been used as incense in religious and cultural ceremonies since the beginning of written history. Its medicinal properties are also widely recognized, mainly in the treatment of inflammatory conditions, as well as in some cancerous diseases, wound healing and for its antimicrobial activity. Until recently, work on Boswellia focused on the immunomodulatory properties of the resin and boswellic acids were considered to be the main, if not the only, active ingredients of the resin. Hence, this family of triterpenoids was investigated by numerous groups, both in vitro and in vivo. These compounds were shown to exert significant anti-inflammatory and pro-apoptotic activity in many assays: in vitro, in vivo and in clinical trials. We recently found incensol acetate and its derivatives, which are major components of Boswellia resin, to be nuclear factor-kappaB inhibitors, thus suggesting that they are, at least in part, responsible for its anti-inflammatory effects. Incensol acetate also exerts a robust neuroprotective effect after brain trauma in mice. Furthermore, it causes behaviour as well as anti-depressive and anxiolytic effects in mice. It is also a potent agonist of the transient receptor potential (TRP)V3 channel. It thus seems that incensol acetate and its derivatives play a significant role in the effects that Boswellia resin exerts on biological systems.

CONCLUSIONS: Altogether, studies on Boswellia resin have provided an arsenal of bio-active small molecules with a considerable therapeutic potential that is far from being utilized.

PMID: 19814859 [PubMed - indexed for MEDLINE]


On the interference of boswellic acids with 5-lipoxygenase: mechanistic studies in vitro and pharmacological relevance.

Siemoneit U, Pergola C, Jazzar B, Northoff H, Skarke C, Jauch J, Werz O.

Department for Pharmaceutical Analytics, Pharmaceutical Institute, University of Tuebingen, Tuebingen, Germany.

Boswellic acids are pharmacologically active ingredients of frankincense with anti-inflammatory properties. It was shown that in vitro 11-keto-boswellic acids inhibit 5-lipoxygenase (5-LO, EC 1.13.11.34), the key enzyme in leukotriene biosynthesis, which may account for their anti-inflammatory effectiveness. However, whether 11-keto-boswellic acids interfere with 5-LO under physiologically relevant conditions (i.e., in whole blood assays) and whether they inhibit 5-LO in vivo is unknown. Inhibition of human 5-LO by the major naturally occurring boswellic acids was analyzed in cell-free and cell-based activity assays. Moreover, interference of boswellic acids with 5-LO in neutrophil incubations in the presence of albumin and in human whole blood was assessed, and plasma leukotriene B(4) of frankincense-treated healthy volunteers was determined. Factors influencing 5-LO activity (i.e., Ca(2+), phospholipids, substrate concentration) significantly modulate the potency of 11-keto-boswellic acids to inhibit 5-LO. Moreover, 11-keto-boswellic acids efficiently suppressed 5-LO product formation in isolated neutrophils (IC(50)=2.8 to 8.8 muM) but failed to inhibit 5-LO product formation in human whole blood. In the presence of albumin (10 mg/ml), 5-LO inhibition by 11-keto-boswellic acids (up to 30 muM) in neutrophils was abolished, apparently due to strong albumin-binding (>95%) of 11-keto-boswellic acids. Finally, single dose (800 mg) oral administration of frankincense extracts to human healthy volunteers failed to suppress leukotriene B(4) plasma levels. Our data show that boswellic acids are direct 5-LO inhibitors that efficiently suppress 5-LO product synthesis in common in vitro test models, however, the pharmacological relevance of such interference in vivo seems questionable.

PMID: 19374837 [PubMed - indexed for MEDLINE]