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Antioxidant and ex vivo immune system regulatory properties of Boswellia serrata extracts

Beghelli D, Isani G, Roncada P, Andreani G, Bistoni O, Bertocchi M, Lupidi G and Alunno A Oxi Med Cel Longev. 2017;2017:7468064

Different samples of Boswellia serrata were examined for their phenolic content, DPPH assay, ferric oxide reducing power and ABTS assay. Results showed that the sample containing higher quantity of AKBBA was most efficient as anti-oxidant, and had maximum phenolic content. Boswellia was also effective in influencing effector and regulatory T-cell compartments. Study concluded that Boswellia serrata can be efficient immuno-modulatory agent which can be useful in immune deregulations.

Biological activities of frankincense essential oil in human dermal fibroblasts

Han X, Rodriguez D, Parker TL Biochimie Open. 2017;4:31-5

In this study frankincense essential oil (FREO) was evaluated on pre-inflamed human dermal fibroblasts for their biological activities. Microarray analysis of genome-wide gene expression was done after the RNA isolation. It was found that, FREO up-regulated 42 genes and down-regulated 41 genes. It significantly inhibited collagen-III, IP-10 and ICAM-1. It showed the anti-proliferative effect on human dermal fibroblasts. Overlapped multiple pathways were also activated by FREO and many of them are closely related to biological processes of inflammation, immune response and remodelling of tissues.

Defined Structure-Activity Relationships of Boswellic Acids Determine Modulation of Ca2+ Mobilization and Aggregation of Human Platelets by Boswellia serrata Extracts

Siemoneit U , Tausch L , Poeckel D, Paul M, Northoff H, Koeberle A, Jauch J, Werz O Planta Med. 2017;83(12-13):1020-7

This study evaluated the effect of AKBBA and other boswellic acids on intracellular [Ca2+]i concentrations and platelet aggregation. Platelets were activated by collagen or a thromboxane A2 receptor agonist U-46619. It was found that AKBBA potently suppressed the Ca2+ mobilization and aggregation at inhibitory concentrations of IC50 = 6 μM and IC50 = 1 μM, respectively. In contrast boswellic acids lacking '11-keto moiety' were weak inhibitors of agonist-induced platelet responses, but instead they elicited elevation of [Ca2+]i and aggregation of platelets. Study concluded by discussing the complex agonizing and antagonizing properties of boswellic acids on human platelets, which alerts us to take up careful safety studies with respect to cardiovascular disease risks and use of such herbal extracts.

Boswellia serrata resin extract alleviates azoxymethane (AOM)/dextran sodium sulfate (DSS) -induced colon tumorigenesis

Chou YC, Suh JH, Wang Y, Pahwa M, Badmaev V, Ho CT, Pan MH Mol Nutr Food Res. 2017; 61(9)

The mice were fed with 0.25 or 5% Boswellic serrata extract and the colon tissues were collected after 15 weeks by sacrificing the animals. The Boswellic serrata group showed significant decrease in the tumor formation. It was also found that Boswellic serrata supplementation reduced the inflammation-associated proteins. Histopathological study supported the observation by showing diminished tumor formation. Boswellia inhibited the proliferative indicators protein kinase B, glycogen synthase kinase 3β and cyclin D1. Boswellia-supplemented group also sowed the alteration in gut microbiota composition by increasing clostridiales and decreasing bacteroidales. Thus, it concluded that Boswellia serrata can be a potential agent to alleviate colon tumorigenesis.

A standardised frankincense extract reduces disease activity in relapsing-remitting multiple sclerosis (the SABA phase IIa trial)

Stürner KH, Stellmann JP, Dörr J, Paul F, Friede T, Schammler S, Reinhardt S, Gellissen S, Weissflog G, Faizy TD, Werz O, Fleischer S, Vaas LAI, Herrmann F, Pless O, Martin R, Heesen C J Neurol Neurosurg Psychiatry. 2018 Apr;89(4):330-8

In this study the efficacy and safety of standardised frankincense extract (SFE) was evaluated on relapsing-remitting multiple sclerosis (RRMS). Patients with RRMS were given oral dose of SFE. The baseline characteristics were obtained from a 4-month observation period of the patients and were intervened successively for 8 months. A significant difference was noted in monthly contrast enhancing lesions (CELs) in SFE-treated group ($P < 0.0001$) and parenchymal brain volume change showed the significantly lesser brain atrophy. Mechanistic evaluation revealed significantly increased immunomodulatory effects of SFE. The adverse events noted in this study were from mild to moderate and they were mainly gastrointestinal and minor infections. Finally, the study concluded that SFE is safe for oral administration in patients of RRMS with its beneficial effects.

Preliminary phytochemical screening and antibacterial activity of resins of Boswellia serrata Roxb

Bhutada SA, Farhan MM and Dahikar SB J Pharmacog Phytochem. 2017;6(4):182-5

The present study was done to evaluate the chemical composition and anti-bacterial activity of gum resin of Boswellia serrata. Methanol, n-Hexane and petroleum extracts of Boswellia were prepared and phyto-chemical analysis was done. Boswellia revealed to contain flavonoids, steroids and tannins. The methanol extract had better and wide-spectrum antibacterial effect on enteric bacterial pathogens than petroleum extract. N-hexane extract also had higher antibacterial activity than petroleum extract. This study concluded that Boswellia can be an effective agent in fighting againt bacterial infections.

Boswellia serrata has promising impact on glutamate and quinolinic acid induced toxicity on oligodendroglia cells: In vitro study

Rahimi VB, Askari VR, Mehrdad A and Sadeghnia HR
Acta Poloniae Pharmaceutica – Drug Research. 2017;74(6):1803-11

In this study, Boswellia serrata was evaluated for its effect on glutamate and quinolinic acid (QA)-induced toxicity on oligodendroglia cells (OLN-93). Boswellia significantly decreased the toxic effects of glutamate and the generation of ROS ($P<0.05$ and $P<0.001$, respectively), in a dose-dependent manner. It also increased the viability of the OLN-93 cells, which confirms its protective effect. This study concluded that Boswellia can be effectively used in the neuro-inflammatory diseases like multiple sclerosis.

Alleviative effects from boswellic acid on acetaminophen-induced hepatic injury

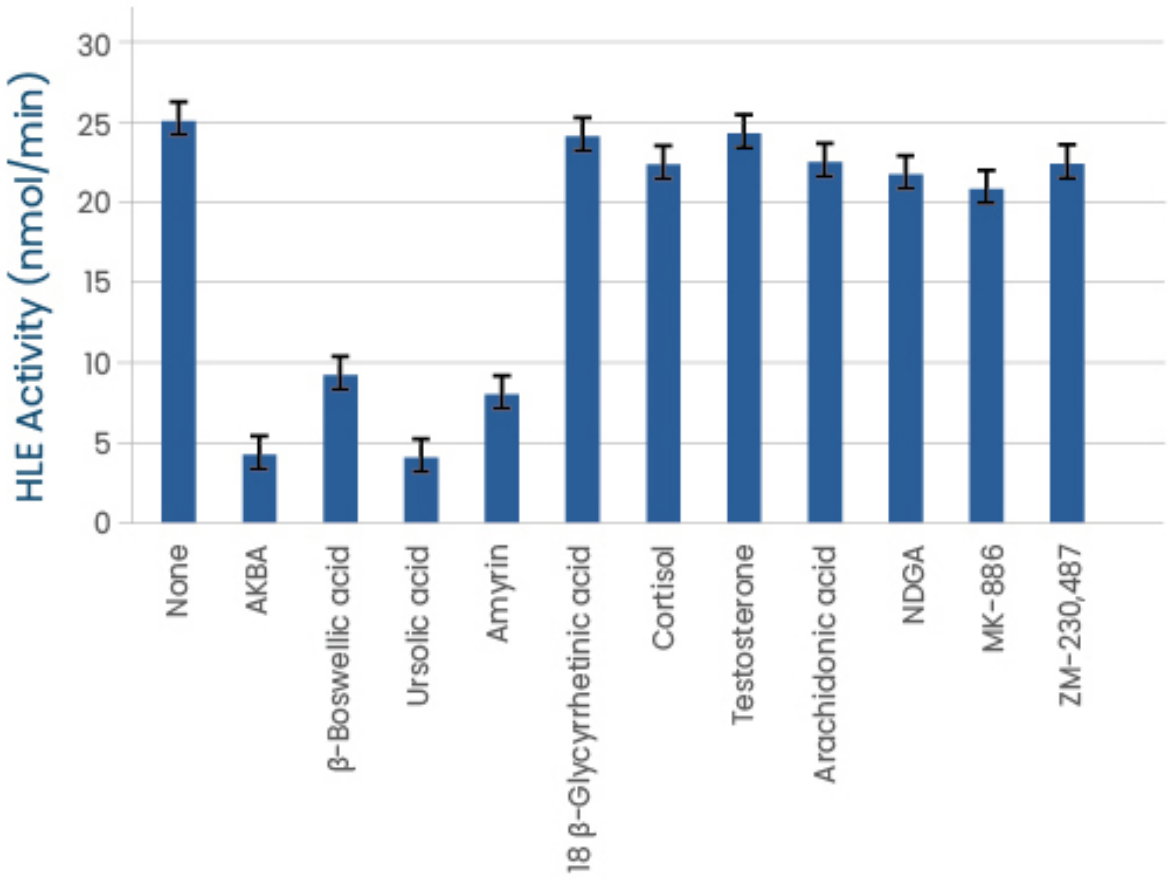
Chen LC, Hu LH and Yin MC Biomedicine (Taipei). 2016 Jun;6(2):9

This study evaluated the effect of Boswellic acid (BA) on acetaminophen (APAP)-induced hepatic injury using Balb C/A mice. Mice were divided into 5 groups viz group 1 – normal diet group, group 2 – BA group (0.1% BA and APAP), group 3 – APAP group (normal diet and APAP), group 4 – BA low dose (0.05% BA and APAP) and group 5 – BA high dose (0.1% BA and APAP). After 4 weeks of pre-treatment with low and high doses of BA in group 4 and 5, all mice were induced acute hepatic injuries with APAP. Results revealed that pre-treatment with BA suppressed the expression of inflammatory mediators like NF-κB and p-JNK. The high dose BA-treated group (0.1% BA) showed the decreased expression of TLR-3, TLR-4 and MYD88, which could produce oxidants and inflammatory cytokines, and significantly increased the antioxidants such as hepatic glutathione (GSH), glutathione reductase (GR) and heme oxygenase ((HO) -1). This study concluded that BA could be an effective agent for hepatoprotective action.

Dual inhibition of 5-LO and HLE enzymes is unique to the Boswellic acids

Boswellic acids have been studied for their ability to interact with 5-lipoxygenase (5-LO) and human leukocyte elastase (HLE), enzymes involved in the body's natural inflammatory response. These enzymes, produced by polymorphonuclear leukocytes (PMNLs), play a role in the body's defense mechanisms. Research suggests that Boswellic acids may support the body's maintenance of normal enzyme activity, contributing to overall health and well-being.

This dual inhibitory action of two pathophysiologically important enzyme activities (HLE and 5-LO) is unique to the pentacyclic triterpenes from the boswellic acid series. Several leukotriene biosynthesis inhibitors furnished no HLE inhibitory activity (as shown below). The β-boswellic acid, acetyl-11-keto-β-boswellic acid (AKBBA), ursolic acid, and amyrin significantly inhibited HLE. The HLE inhibition activity of AKBBA and ursolic acid were comparable; however, ursolic acid's mode of inhibition is competitive (Safayhi et al., 1997).



HLE activity in the presence of leukotriene synthesis inhibitors and cyclic as well as noncyclic hydrophobic compounds