

## The Systemic and Brain Health Benefits of Frankincense

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Received: April 14, 2020; Published: April 30, 2020

Frankincense may be one of the most familiar essential oils known to man, possibly through its various religious connotations [1]. Although possibly most well-known as one of the 3 gifts of the three wise men to the baby Jesus, frankincense is mentioned in the biblical books of Exodus, Leviticus, Numbers, 1 Chronicles, Nehemiah, Song of Solomon, Matthew and Revelation. The English word *frankincense* is thought to derive from *franc encens*, an antique French expression meaning “high-quality incense” with the word *franc* denoting “noble” or “pure”. Unsurprisingly then, crushed frankincense is a principal constituent in the incense used in religious ceremonies throughout the world, including Buddhism, Christianity, Hinduism, Islam, Judaism, Shinto and Taoism. Further, the first recorded use of incense dates back to the Ancient Egyptian 5<sup>th</sup> Dynasty (2345-2494 BC).

However, before addressing the health-benefiting properties of frankincense, it might be useful to briefly discuss the *Boswellia Tree*, commonly known as the *Frankincense Tree* but also as the *Olibanum Tree*. Further, the frankincense oleo-gum resin is often referred to *olibanum* in the literature.

### The frankincense tree

Frankincense is the resinous extract from the trees of the genus *Boswellia* (*Boswellia spp.*) which comprise some 16 known species in the family Burseraceae. The *Boswellia* tree originated in Somalia and is widespread in the northern part of the country but it is also native to the Arabian Peninsula and grows in the Indian subcontinent. Of these varieties of tree, the most widely used in herbal medicine and as sources of frankincense resin and essential oil are *Boswellia carterii*, *Boswellia sacra*, *Boswellia serrata* and *Boswellia papyrifera*. Unfortunately, frankincense tree populations in Somalia and elsewhere are declining, partly due to over-exploitation [2] but also from beetle infestation and agricultural land clearing.

Basically, frankincense resin is harvested from cuts made in the trunk of the *Boswellia* tree in a renewable process known as tapping, which involves slashing the bark to let the exuded resin bleed out and then harden in place. Each of the different species and varieties of frankincense tree yields a slightly different type of resin with small variations in composition. As with other resin-based materials such as myrrh, frankincense essential oil is extracted from the partially crushed/fragmented resin by steam distillation. The hardened and usually slightly crushed resin is also burned as incense.

### Chemical composition

Over 200 compounds have been identified in resins obtained from *Boswellia spp.* [1], the primary ingredient (30 - 60%) of frankincense resin being a solidified gum very similar to *gum Arabic*. The resins contain a series of pentacyclic triterpene molecules known as the boswellic acids, the diterpene alcohol incensole acetate and several monoterpenes called the *phellandrenes*. The triterpenoid boswellic acids probably comprise up to 30% of frankincense resin. Frankincense essential oil has a high oil content, at about 60%, and contains

mono- and diterpenes (at 13% and 40% respectively) as well as ethyl acetate (21.4%), octyl acetate (13.4%) and methylanisole at 7.6% [3]. The terpenes in frankincense oil include  $\alpha$ -pinene, actanol, linalool, bornyl acetate, incensol and incensol acetate. Although there are small differences in their compositions, it appears that the extracts from *Boswellia carterii* and *Boswellia serrata* have the highest levels of reported therapeutic properties [1,3].

### Medicinal properties

Frankincense has been used in traditional medicine (CAM) for over 5000 years to treat a wide variety of ailments [1,3,4-6], a few of which are indicated in table 1. Interestingly, a very recent study [7] has shown that essential oil derived from frankincense is a natural anti-microbial agent and both diffused oil and incense are effective air purifiers. This finding indicates an additional reason for the widespread use of incense in religious institutions of worship other than the tranquilizing effects of the vapor, as discussed below.

Analgesic
Anti-bacterial activity
Anticancer activity
Anti-emetic
Anti-fungal properties
Anti-inflammatory properties
Anti-microbial
Anti-neurotic
Antirheumatic
Antiseptic
Immunomodulation
Improvement of memory and learning
Stimulation of the gastrointestinal tract
Viricidal activity

**Table 1:** Reported health benefits of frankincense.

Numerous published studies report anti-inflammatory, anti-bacterial and viricidal properties. Many of these curative properties of frankincense are ascribed to the boswellic acids content [1,4,5,7-9].

Interestingly, it has been suggested that frankincense, due to its content of physiologically active compounds such as Ak $\beta$ BBA, can improve learning and enhance the memory in humans and animals [4]. Further, it has been intimated that frankincense might not only be an alternative natural medicine for chronic and inflammatory diseases but also effective in treating patients with brain and memory disorders.

### Psychoactivity and neuroprotection

There is, however, another school of thought that considers incensole acetate to be an important constituent of frankincense and at least 5 scientific studies [10-14] ascribe the anti-inflammatory and neuroprotective properties to its incensole acetate content. In particu-

lar, *in vitro* and *in vivo* studies indicate that incensole acetate is psychoactive, reducing depressive-like behavior [1,11], as well as being a neuroprotective agent, notably against cerebral ischemic injury as well as traumatic injuries [10,13,14]. It has also been used to treat dementia [15].

There also have been reports that aromatherapy using frankincense and other essential oils can alleviate anxiety symptoms [16] particularly in the first stage of labor [17]. Nevertheless, the literature indications are that lavender essential oil may be a more effective anxiolytic than frankincense.

The neuroprotective (and anti-inflammatory) properties of frankincense have been ascribed to its incensole acetate content [10-14] and attributed to activation of the TRPV3 receptor [1] in the brain as well as specific activation of the amygdala, septum and the motor cortex. However, it has also been suggested in a very recent paper [8] that incensole acetate (and its nonacetylated form incensole) inhibits the nuclear factor-kappaB (NF-κB). This effect may have great significance since NF-κB is a ubiquitous transcription factor which, by regulating the expression of multiple inflammatory and immune genes, is crucial in defense of the body against pathogens and in chronic inflammatory diseases [18]. At this time, frankincense appears to be psychoactive but the mechanism involved in its effects is somewhat unclear but there is obviously considerable scope for further studies of this potentially highly effective therapeutic approach to neurological problems.

It follows from this brief overview of the therapeutic properties and health benefits of frankincense that this natural product is an unusual, if not unique, and very complex mixture of components. Its centuries-old applications in complementary and alternative medicines, especially Ayurvedic medicine, are now supported by increasing numbers of scientific papers which suggest that it may enable modern medicine to make significant advances in many different fields, especially neurology and psychology/psychiatry. No longer can frankincense simply be considered as a source of incense for a multiplicity of religions and religious practices.

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<sup>1</sup>Not only is the transient receptor potential cation channel (TRPV3) found in the brain but it also is present in the skin where its activation, e.g. by capsaicin, induces a warm or heating sensation.

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**Volume 9 Issue 5 May 2020**

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