Propolis

Short Description

Propolis is a sticky resinous substance produced by bees from the sap of trees. It is mixed with their saliva and beeswax and then used as a sealant and sterilizer in the hive. It has been found to be anti-viral, anti-bacterial, anti-inflammatory, and anti-fungal[1] with many uses for both the bees and humans. Since it is sourced from nature, its composition and bioactive compounds can vary depending on region, however its use and purpose is consistent within all hives.

Source

Propolis is a resinous mixture that honey bees produce by mixing saliva and beeswax with sap from trees and other botanical sources. Varying sap from different trees can affect the colour and consistency of propolis. The bees seem to prefer certain types of trees as well depending on their region.

Variations

Since propolis is primarily sap from trees, it can vary from one region to another depending on the vegetation. Brazilian propolis has been touted as a superior product than those from other regions due to the unique rainforest foliage in the area. There is evidence to support the fact that Brazilian propolis is unique, however the biological activity of propolis from varying geographical regions seems to be consistent across all types[1,2].

Hive Use

Propolis, or bee glue, as it is commonly named, is used by the bees to seal the hive from the elements and intruders. It is also used in hive construction and repair for its naturally adhesive properties, which is believed to aid in the structural stability of the hive, reduce vibration, and make the hive more defensible by reducing alternative entrances. By sealing the hive with propolis, the bees are using it to prevent diseases and parasites from entering the hive, as well as inhibit fungal and bacterial growth[3].

Human Use

Propolis has been used throughout history, dating back as far as 3000 BC. Egyptians, Incas, Greek and Romans all knew of the benefits of propolis and used as anything from an embalming agent to an antibiotic to a violin varnish. It was listed as an official drug in the London pharmacopoeias of the 17th century and use predominately as a treatment for wounds and illnesses. Propolis can be applied topically or ingested internally, although seldom in its raw form and much more commonly in a capsule or liquid solution.

Forms

Propolis in its raw form is rarely the preferred choice due to its rather unpleasant taste and consistency. Although it is not water soluble, it can be dissolved in a variety of solvents, typically ethanol. An ethanol

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based propolis solution can be heated to evaporate the alcohol whilst adding honey and glycerin to produce a honey based tincture. Propolis can also be dehydrated into a powdered form and then encapsulated with the help of carob powder as a flowing agent. Propolis can be suspended in an oil base, such as olive oil, for use topically on the skin as an emollient and sterilizer as well.

Storage

Propolis is a natural preservative and will last a very long time when stored correctly. It is more likely that propolis will lose its effectiveness before reaching a point of spoilage. The biggest factor in propolis degradation is sunlight and so proper storage in a cool dark place is generally sufficient. Make sure to keep your containers sealed and away from extreme heat. Do not refrigerate the capsules due the amount of moisture in the fridge.

Medicinal Uses

Independent from geographical origin and chemical composition, the biological activity in propolis has always been observed, in particular the antimicrobial activity. Other biological activities include: antibacterial[4,5,6,7], antifungal[5,8,9], antiviral[10,11], antiprotozoan[12,13,14], antitumor[15,16,17,18], anti-

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inflammatory[19,20,21] , local-anesthetic[22], antioxidant[23,24,25], immunostimulating[26,27], cytostatic[28] and hepatoprotective[29,30]. The most widely accepted and studied health claim involving propolis is for the treatment of the herpes simplex virus (Type 1 and 2), both in cold sores (HSV-1) and genital herpes (HSV-2), due to the research required to market two over-the-counter medications made with propolis: *Herstat* and *ColdSore-FX*.

The other claims, although well documented, suffer from one main limiting factor: characterization of the natural health product propolis. Health Canada and similar regulatory boards on drugs in other countries all have strict requirements on the characterization of the product that you are suggesting a health claim for. Unfortunately, due to the vast geographical and vegetative source variances across types of propolis, studies done on one type cannot be generalized to all, even though we have seen many similar biological activities despite different biologically active compounds[1]. This is why the most substantiated claims are for two specifically formulated products involving propolis, and not on propolis in general. It is important that you understand that the following claims on propolis can only be applied, beyond reasonable doubt, to the specific sample of propolis in the study.

Propolis samples from different geographic regions (tropical and temperate zones) were effective against *Staphylococcus aureus*, a Gram-positive bacterium, but not against *Escherichia coli*, a Gram-negative bacterium. Continuing studies on the antibacterial properties of propolis found that it can inhibit growth of Gram-negative bacteria, however higher concentrations are needed than that for Gram-positive bacteria. This however should be no surprise since Gram-negative bacteria have long

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been known for their higher levels of resistance to antibiotics due to their extra outer leaflet of complex lipopolysaccharide (LPS) whose lipid portion acts as an endotoxin.

Although antibacterial activity is more relevant than the antifungal properties of propolis, many studies have reported the susceptibility of clinically important yeasts belonging to *Candida* genera, as well as the sensitivity of some filamentous fungi, manly dermatophytes[5]. The fungicidal effect was associated with the presence of flavonoids[31] and other phenolic components such as for antibacterial properties. Differences in antifungal activity of propolis extracts can again be attributed to the differences in chemical composition and concentration of propolis compounds. As for antibiotics, a synergistic effect with conventional antimycotic drugs was observed.

Another important biological property already ascribed to propolis is the antiprotozoan activity. This property is evaluated by an *in vitro* growth inhibitory effect on a culture of parasites after incubation in the presence of different concentrations of propolis. Several publications reported the effect of European propolis on protozoa that cause diseases in humans and animals such as trichomoniasis, toxoplasmosis, giardiasis, Chagas disease, leishmaniosis and malaria[32].

There are few data available concerning antiviral effects of propolis but the studies performed have shown that propolis from various geographic regions displays significant antiviral activity, acting at different levels and interfering with the replication of some viruses[33]. The results provided evidence that propolis is very active *in vitro* against poliovirus and herpes viruses, whereas vesicular stomatitis virus (same family as rabies) and adenovirus are less susceptible. Besides this effect on virus multiplication, a virucidal action on the enveloped viruses herpes simplex and vesicular stomatitis virus was also detected. Flavonoids and aromatic acids are responsible for the antiviral activity of propolis extracts[34]. Some flavonoids (baicalin) have inhibitory effect on HIV infection and replication as showed by *in vitro* studies.

Free radicals are highly reactive species that can damage cellular components, such as proteins, nucleic acids and lipids, and are implicated in a variety of diseases. Their reactivity is usually neutralized in the body by antioxidant enzymes and nutrient-derived antioxidant molecules, which protect humans from deleterious oxidative processes. Propolis is noted for its antioxidant properties, only surpassed by those of green tea, and is more active than the rest of the beehive products in which make this claim. The antioxidants present in propolis[35] play a great role in its immunomodulatory properties[36]. It was

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reported that propolis increases the cellular immune response through the increase of mRNA for interferon-γ and activates the production of cytokines[35]. The relatively strong antioxidant effects exhibited by propolis extracts from different geographic origins were correlated with high polyphenol and flavonoid contents, particularly kaempferol and phenethyl caffeate[37].

Antitumor activity, including cytotoxicity, was reported for propolis extracts in numerous studies[38,39,40,41]. Different methods allow determination of cytotoxic effects *in vitro* but, normally, cells are maintained in appropriate medium and then cultured in the presence of different concentrations of propolis extracts. Some new compounds responsible for these properties such as diterpenic acids were isolated from propolis. Coniferyl aldehyde, betuletol, kaempferide and ermanin isolated from Brazilian propolis showed potent cytotoxicity towards human HT-1080 fibrosarcoma and murine colon 26-L5 carcinoma cells. The new prenylflavanones propolin A and propolin B from Taiwanese propolis exhibit cytotoxic properties towards human melanoma, C6 glioma, and HL-60 cell lines, inducing apoptosis with DNA fragmentation. CAPE (caffeic acid phenethyl ester) propolis extract has been identified as one of the major active compounds in propolis with chemopreventive and antitumor properties[38] without being cytotoxic to normal cells[42]. In regards to the flavonoids, the assessment concluded the following susceptibility order: quercetin has the strongest antitumor activity, followed by rhamentin and galangin[43]. Natural resistance to tumour development has been associated with the cytotoxic activity of natural killer (NK) cells[42]. Sforcin *et al.*[44] found an increase of NK activity in spleen cells of propolis-treated animals.

Many other biological and pharmacological properties of propolis have been studied, including tissue regenerative properties, anti-inflammatory effects, immunogenic properties, liver detoxifying action, hepatoprotective activity, choleretic and antiulcer action *in vitro.* The hepatoprotective effect appears to be due to the presence of dicaffeoylquinic acid and flavonoids. Propolis seems to lower cholesterol levels and blood pressure making possible its use in the prevention and treatment of atherosclerosis[45].

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Propolis has anesthetic activity similar to cocaine[46]. It also kills the ectoparasitic mites *Varroa destructor*, which attack honey bees causing the varroatosis disease.

Precautions

Asthma: Some experts believe certain chemicals in propolis may make asthma worse. Asthmatics should use extra caution and start with less than the recommended dose.

Pregnancy and breast-feeding: There is not enough reliable information about the safety of taking propolis if you are pregnant or breast-feeding. Stay on the safe side and avoid use.

Bleeding conditions: A certain chemical in propolis might slow blood clotting. Taking propolis might increase the risk of bleeding in people with bleeding disorders.

Allergies: Do not use propolis if you are allergic to bee by-products including honey, conifers, poplars, Peru balsam, and salicylates.

Surgery: A certain chemical in propolis might slow blood clotting. Taking propolis might increase the risk of bleeding during and after surgery. Stop taking propolis 2 weeks before surgery.

References

See footnotes.

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