Propolis or 'bee glue' is a generic name for the resinous substance collected by bees from plants and used within the bees’ nest. It is a heterogeneous mixture of many substances collected, transformed and used by bees to seal holes, to line the internal walls of their nest cavity (tree or hive), and to protect the entrance against intruders.

The word propolis means ‘defence of the city’ – derived from the Greek words ‘pro’ (meaning in front of) and ‘polis’, (meaning the city). It has an accepted role in direct defence against parasites and pathogens in a bee colony. Bees make use of both the mechanical properties of propolis and of its anti-bacterial and anti-fungal properties.

 Typically, propolis is coloured dark brown, although it can be yellow, green, grey or red. The chemical composition varies depending on the region and floral sources.

Propolis collected by different bee species in the same region also vary. The three top-producer countries of propolis in world trade are China, Brazil and Russia. The market size of propolis products in Japan was recorded at about US$ 3 billion in 2009.

**How do bees collect propolis?**

Resin is collected from the sticky protective layer around tree-buds and from plant exudates following a wound to the plant. The bee bites off scraps of plant resin with her mandibles and packs them into the corbiculae (pollen baskets) on her hind legs. Each corbicula can carry about 10 mg of propolis. Because of its stickiness, propolis gathering is a slow business: it can take an hour to fill both baskets. Back at the nest, unloading can take another hour. Propolis is only collected when the temperature is above 18°C. Sometimes bees collect man-made materials and use these in the same way as ‘real’ propolis. For example, bees will collect drying paints, road tar or varnish. Presumably to bees, these substances have a consistency and strong odour similar to plant resins.

**Do all honey bees collect propolis?**

No: Apis cerana, the Asian hive bee, does not use propolis. Different races of Apis mellifera use propolis to different extents: Apis mellifera caucasica is known for its high collection of propolis. Many stingless bee species also collect propolis.

**How do you harvest propolis?**

To encourage bees to produce conveniently-sized propolis, place a perforated, plastic grid in the hive. This is a piece of plastic with small holes - not more than 6 mm. The bees will seal up the slots with propolis. Take out the grid and put it in a freezer. When cold enough, flexing the sheet will cause the propolis pieces to drop out. It might be possible to harvest 50 g per hive per season this way.

**What do bees use propolis for?**

- *Apis mellifera* honey bees use propolis to keep their homes dry, cosy and hygienic. The propolis coating makes the walls of their nesting place waterproof and draught-proof. Propolis is used to seal up any cracks or gaps where micro-organisms could flourish. The volatile oils in propolis must serve as a kind of antiseptic air-freshener.
- As a building material to decrease the size of nest entrances, and to make them smooth for passing bee traffic.
- A thin layer is used to varnish the rim of brood cells before the queen lays eggs into them.
- To embalm bodies of mice or other predators too large for them to eject from the nest: these would otherwise decay and be a source of infection.
• *Apis florea*, one of the Asian honey bee species deters enemies by using rings of propolis (like grease bands) to coat the branch from which its single-comb nest is suspended.

**Propolis for bee health**

Studies have investigated the chemical components of propolis that could be used to treat human diseases, yet there is a surprising lack of information on the importance of propolis in regards to bee health.

Studies on the effect of propolis on the reproductive success of *Varroa destructor* in field colonies suggest that propolis treatments may reduce the number of mature females produced in a single cell, and propolis extracts have been shown to cause larval mortality of wax moth. Cape honey bees have been observed encapsulating the parasitic small hive beetle, *Aethina tumida*, in ‘propolis prisons’ which prevent the beetles from reproducing. The majority of studies relating to the effectiveness of propolis have investigated propolis versus the bee pathogen *Paenibacillus larvae*, the causative agent of American foulbrood. Results suggest treated colonies show a reduction in number of diseased bee larvae.

**Medicine for humans**

Propolis is used by many societies for its therapeutic properties. Considerable research has been done on the biological properties of propolis including

- antibiotic
- antitumour (used in the treatment of cancer)
- antioxidative (inhibits oxidation of molecules that can lead to cell damage)
- anti-inflammatory

Propolis is used as an ingredient in mouthwash products and toothpastes and also in cough syrups, oral pills, lozenges, ointments, lotions and vitamins. Propolis products are often sold as health-giving products but in many countries it is not permitted to sell propolis as a medicine nor make medicinal claims.

Propolis cannot be used as a crude material. It must be purified by extraction with adequate solvents, to remove unwanted material, whilst preserving the active components.

There is great interest in trying to standardise the product, and develop internationally-accepted quality control techniques. Yet the heterogeneity of the product makes this difficult. Progress has been made with standardising the propolis derived from poplar trees from Europe, Asia and Americas. Another area of research work is to connect a particular chemical propolis type to a specific type of biological activity for formulating recommendations for practitioners.

**References**


Stingless bees collect a lot of propolis for nest building. One way to harvest propolis from stingless bees is to build a door at the side of the hive and gradually open it – leaving just a small crack each time. The bees will quickly fill the gap with propolis which can then be harvested. These stingless bees are *Meliponula nebulata*. The picture shows the hive with door fully open.