

ORAL HEALTH FORM HIVE: POTENTIAL USES OF PROPOLIS IN DENTISTRY

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ABSTRACT

Propolis is a resinous yellow brown to dark brown substance that honey bees (*Apis mellifera*) collect from tree buds, sap flows, shrubs or other botanical sources to seal up their hives and uses it as draught-extruder for beehives. The main pharmacologically active constituents present in propolis are flavonoids, phenolics and other various aromatic compounds. Flavonoids are well known plant compounds that have antibacterial, antifungal, antiviral, antioxidant and anti-inflammatory proprieties. Current research involving Propolis in dentistry covers many fields, particularly in cariology, oral surgery, periodontics and endodontics due to its properties, especially its biocompatibility. This paper is an attempt to review various applications of propolis in dentistry.

Key words: Propolis, Dentistry, Oral Health, Safety issue

INTRODUCTION

There is a great trend nowadays to use natural resources as cure for many diseases. Alternative medicine has made a lot of contributions to modern medical practice (K. Almas et al., 2001). Propolis is a resinous mixture collected from trees by the *Apis mellifera* bee, which uses as a building insulating material in the beehive as well as for keeping it in good health. (Greenaway W et al, 1990) Honeybees collect the resin from the cracks in the bark of trees and leaf buds. This resin is masticated, salivary enzymes added and the partially digested material is mixed with beeswax and used in the hive. (Ghisalberti, 1979; Marcucci, 1995)

The word pro-polis is derived from the Greek pro-, for or in defense, and polis-, the city, that is, defense of the city (or the hive). There is a long history of use of propolis, at least to 300 BC (Ghisalberti, 1979) and its use continues today in home remedies and personal products. Propolis was used at the time of Egyptian and Greek civilizations which recognized its healing qualities. Hippocrates, the founder of modern medicine, used it for healing sores and ulcers internally and externally. This non-toxic resinous substance was classified into 12 types according to physicochemical properties and related to geographic locations; however, the botanical origin of only three types was identified. (Wander P, 1995) A new type of propolis,

named Brazilian red Propolis (BRP) because of its color, it has attracted the attention of international business (A. Parolia et al., 2010).

Propolis has been used in general for various purposes and has a promising role in future medicine as well as in dentistry. Current research involving Propolis in dentistry involves many fields, particularly in cariology, oral surgery, periodontics and endodontics due to its properties, especially its biocompatibility (Ghisalberti, 1979; Marcucci, 1995; Nieva Moreno MI et al., 1999; KR et al., 1996). This paper is an attempt to review various applications of this compound in oral health.

Composition of propolis:

The exact composition of raw propolis varies with the source. In nature, or when in room temperature, it is a sticky substance, but becomes hard and brittle at low temperature. It is composed of resin and balsams (50% - 70%), essential oils and wax (30% - 50%), pollen (5% - 10%) and other constituents which are amino acids, minerals, vitamins A, B complex, E and the highly active bio-chemical substance known as bioflavonoid (Vitamin P), phenols and aromatic compounds (A. Parolia et al., 2010). Flavonoids are well known plant compounds that have antibacterial, antifungal, antiviral, antioxidant and anti-inflammatory properties. Flavonoids and caffeic acid present in propolis are known to play an important role in reducing the inflammatory response by inhibiting lipooxygenase pathway of arachidonic acid. Flavonoids and caffeic acid also aid the immune system by promoting phagocytic activities and stimulates cellular immunity (C. Scully, 2006).

POTENTIAL USES OF PROPOLIS IN ORAL HEALTH

Cariology :

Dental caries is one of the most prevalent chronic diseases of people worldwide. It is believed that bacteria of the species *Streptococcus mutans* is the main factor that initiates caries, and the bacteria of the genus *Lactobacillus* are important in further caries development. Caries can also be caused by other

bacteria, including members of the *mitis*, *anginosus* and *salivarius* groups of streptococci, *Enterococcus faecalis*, *Actinomyces naeslundii*, *A. viscosus*, *Rothia dentocariosa*, *Propionibacterium*, *Prevotella*, *Veillonella*, *Bifidobacterium* and *Scardovia*. (Tomasz M et al., 2013). The effect of propolis was observed on growth and glucosyltransferase activity of *Streptococcus sorbinus*, *Streptococcus mutans* and *Streptococcus circuitus* in vitro and in vivo (Ikeno et al., 1991). It was found that the insoluble glycan synthesis and glucosyltransferase activity were inhibited by multidirectional influence of Propolis. Koru et al., 2007 studied the antibacterial action against certain anaerobic oral pathogens and found to be very effective against *Peptostreptococcus anaerobius*, *Lactobacillus acidophilus*, *Actinomyces naeslundii*, *Prevotella oralis*, *Prevotella melaninogenica*, *Porphyromonas gingivalis*, *Fusobacterium nucleatum* and *Veillonella parvula*. Duarte et al., 2006 explained cariostatic effects of propolis by high quantity of fatty acids which slow down the production of acids by *Streptococcus mutans* and decreases the tolerance of microorganisms to acid pH. Arslan et al (2012) concluded that poplar propolis demonstrated antimicrobial activity against *mutans streptococci*, indicating that it may be used in caries prevention.

Periodontics:

Bacterial flora of the mouth can cause not only caries but also periodontal diseases. Periodontitis, or gum disease, affects millions of people each year. Bacterial plaque accumulated over and under gums contributes to inflammation of the tissues adjacent to teeth which leads to clinical attachment loss and a loss of alveolar process (Darveau RP, 2010).

Toker et al. (2008) carried out a study which on the basis of a morphologic and histologic picture showed that systemic administration of propolis prevents the loss of alveolar process in the case of periodontitis in rats. Santos et al (2002) and Koru et al in 2007 confirmed antibacterial properties of propolis in relation to pathogens of periodontitis. Santos et al (2002) indicated that antibacterial effects are conditioned by

flavonoids, phenol acids, and their esters. Research done by Coutinho allowed to conclude that additional subgingival irrigations with a propolis extract during periodontologic treatment allowed to obtain better results than scaling and root planning by themselves, which results from the assessment of both clinical and microbiological parameters. Dodwad V et al (2011) concluded in research that propolis might be used as a natural mouthwash, an alternative to chemical mouthwashes, e.g., chlorhexidine.

Barak S et al (2012) assessed the effect of Breezy candy on halitosis containing zinc gluconate 0.5%, propolis 2%, and a combination of both (zinc 0.25% and propolis 1%). Breezy candy showed reduction of up to 60% in malodor.

Oral Surgery:

It was observed in a study conducted by Magro-Filho and Carvalho in 1994 that the mouth rinse containing propolis in aqueous alcohol solution aided repair of intra-buccal surgical wounds and exerted a small pain killing and anti-inflammatory effect after sulcoplasty by the modified Kazanjian technique. Lopes-Rocha et al in 2012 also noted a beneficial effect of bee glue on healing of surgical wounds within the oral cavity. Propolis decreases inflammation and speeds up creation of granulation tissue and epithelialization.

Avulsion is defined as the total displacement of a tooth from the alveolar socket. Clinical surveys indicate that avulsion occurs in 1 to 16% of all traumatic injuries to permanent dentition (Adil NF et al., 2007). Extra oral time of the avulsed tooth and storage medium are two important factors that prevent damage to the periodontal ligament cells (PDL) (Kenny DJ et al., 2001). Zohreh Ahangari et al (2013) found in their study that propolis 10% was significantly better than egg white, whereas both propolis 10% and 50% were significantly better than milk ($p < 0.05$). They suggested that based on PDL cell viability, propolis could be recommended as a suitable biological storage media for avulsed teeth. In the study done by Özan et al (2007) also propolis turned out to be a better means for

transportation than milk or Hank's Balanced Salt Solution.

Propolis-based extracts were also used in the treatment of viral infections. Schnitzler et al in 2010 found bee glue has high antiviral effectiveness and concluded that propolis extracts can be used locally in viral infections. Propolis-based extracts turned out to be effective in the treatment of recurrent aphthoid stomatitis as it lowers down the frequency of recurrence of the disease and improves the quality of life of patients who suffer from recurrent stomatitis (Samet et al., 2007).

Martins et al. (2002) assessed the inhibitory effect of 20% ethanol propolis extract (EPE) on the growth of *C. albicans* collected from HIV-seropositive. The propolis extract inhibited the in vitro growth of *C. albicans* collected from HIV-seropositive. So it was suggested that commercial EPE could be an alternative medicine in the treatment of candidiasis from HIV-positive patients.

Orthodontics:

Altan et al (2013) in his research on rat confirmed the positive effect of propolis solution on bone forming process during the treatment with the device to expand the palatine suture. They found an increased quantity of osteoblasts and rapid remodeling within the palatine suture.

Restorative Dentistry:

In restorative dentistry, propolis can be utilized to decrease permeability of the dentin and to direct pulp capping in order to create restorative dentin.

Direct pulp capping is defined as a wound dressing of the exposed clinically normal pulp with the absence of signs and symptoms of severe pulpal disease. This procedure is a noninvasive, comparatively simple, and in expensive treatment. There have been many attempts to find a substance that will predictably induce a hard tissue barrier after pulp exposure (Brita Willershausen et al 2011). Zohreh Ahangari, et al (2012) evaluated the effect of Propolis as a bioactive material on quality of

dentin and presence of dental pulp stem cells. This study documented that propolis provides stimulation of stem cells. In addition to producing no pulpal inflammation, infection or necrosis this material induces the production of high quality tubular dentin. According to Sabir et al (2005) direct pulp capping with propolis flavonoids in rats may delay dental pulp inflammation and stimulate reparative dentin.

Sales-Peres et al (2011) found that propolis can reduce dentin permeability by partially obliterating the dentin tubules. On this basis, it can be concluded that it can be a good option in the treatment of patients with dentin sensitivity.

Endodontics:

The objective of endodontic therapy is not just simple cleaning and filling of root canals, but successful treatment requires the establishment of a sufficient level of disinfection. Al-Qathami and Al-Madi (2003) compared the antimicrobial efficacy of propolis, sodium hypochlorite and saline as an intracanal irrigants and found that the propolis has antimicrobial activity equal to that of sodium hypochlorite. Verma MK et al (2014) confirmed Antimicrobial effectiveness of 25% water-soluble extract of propolis in the root canals of primary teeth. Maekawa LE et al (2013) evaluated the effectiveness of glycolic propolis (PRO) and ginger (GIN) extracts, calcium hydroxide (CH), chlorhexidine (CLX) gel and their combinations as ICMs (ICMs) against *Candida albicans*, *Enterococcus faecalis*, *Escherichia coli* and endotoxins in root canals. It was concluded that all ICMs were able to eliminate the microorganisms in the root canals and reduce their amount of endotoxins. Mattigatti S et al (2012) concluded that Propolis showed antimicrobial activity against *E. faecalis*, *S. aureus*, *C. albicans*. It could be used as an alternative intracanal medicament. Ramos IF et al (2012) and Al-Shaher A (2004) inferred that because of inconsiderable inflammation of periapical tissue and protective effect on the cells of periodontium, propolis can be effectively used as a product to disinfect the root canals.

Prosthetics:

Denture stomatitis is a common inflammatory lesion in the palatal mucosa of denture wearers who presenting a erythema of variable intensity and extension (E. Budtz-Jørgensen, et al 1975). An association between denture stomatitis and *Candida* spp., specially *Candida albicans*, has been reported (R. Könsberg et al 1994). Despite the existence of a great number of antifungal agents, treatment failure is observed frequently. Santos VR et al (2008) described in their pilot study assessed the clinical efficacy of a new Brazilian propolis gel formulation in patients diagnosed with denture stomatitis. It was found that this new Brazilian propolis gel formulation had efficacy comparable to Daktarin. Capistrano HM et al (2013) observed that Brazilian green propolis has a similar effect as miconazole in the treatment of *Candida*-associated denture stomatitis. could be an alternative topical choice for the treatment of denture stomatitis.

Safety issues with propolis:

In general, propolis is safe. However, like other honey bee products, there are people who are allergic to propolis. It is believed that a substance called caffeic acids to be one of the causes of allergies to propolis. Therefore caution should be taken by people who are allergic to pollen; Asthma patients; Allergic to bee stings; Pregnant women (Eshwar Shruthi et al., 2012). If allergic to propolis, it may cause redness of skin, develop rashes, swelling, itching, fluid collection, fever and may even lead skin to crack (including a severe allergic reaction called anaphylaxis). Apart from that, it may also irritate the skin area where it is applied on, cause eczema, lesions, psoriasis or mouth sores. (Wander, 1995)

Conclusion

Propolis is a natural medication with a promising future. Propolis can be used in the various fields of dentistry as it has antibacterial, antiviral, antifungal, anti-inflammatory, analgesic, and many other applications. Though propolis has shown very promising results but clinician should be cautious while using this substance due to its allergic reactions shown in some patients. Further studies should be conducted to investigate its merit and demerits in dentistry

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