



Review Article

“Propolis” And Its Potential in Dentistry: A Review

Ashish Handa¹, Nikhilanand Hegde¹, Mahendra S¹, Mahesh .C.M.¹, Ramesh Kumar PC¹,
Soumya K M¹

¹Department of Orthodontics and Dentofacial Orthopaedics, Krishnadevaraya College of Dental Sciences, Bangalore.

*Correspondence Email: dr_ashish38@yahoo.com

Received: 17/11/2011

Revised: 28/11/2011

Accepted: 1/12/2011

ABSTRACT

The health fraternity has always used natural products as an alternative, to the conventional allopathic formulations available for the treatment of several afflictions. ‘Propolis’ or the ‘purple gold of beehive’, a natural antibiotic is a resinous substance that honey bees *collect* from trees and plants to seal their hives. It has appreciable anti-inflammatory, antibacterial, antifungal and antiviral actions, as well as cytostatic and antitumor activity. Propolis has been used in dentistry for various purposes and has a promising role in future medicine as well as in dentistry. Of late there has been a renewed interest in this herbal medicine, with considerable research work being conducted in America, Australia, U.K. and in eastern part of Europe. This paper is an attempt to review and highlight various applications of this compound in dentistry.

Keywords: propolis, honey bees, antimicrobial, anti-inflammatory.

INTRODUCTION

Natural products have been used for many years in folk medicine. Apitherapy, or therapy with bee products (e.g. honey, pollen, propolis, fortified honey, etc) is an old tradition that has been revitalized in recent research. [1] Their beneficial effects allied to the prevailing worldwide "back to nature" trend have led to much greater attention being paid to these products. [2]

Propolis is a yellowish brown, sticky, glue-like resinous substance that honeybees (*Apis mellifera* L.) collect from various plant

species. [3] Bees have been producing propolis almost since time began. They do it by collecting resin from trees and plants, taking it back to the hive where they work upon it, transforming it into the highly complex chemical mix (Figure1). Propolis is sticky at and above room temperature. At lower temperatures, it becomes hard and brittle.



Figure1

History:

The term 'propolis' is derived from 'pro' (Greek = before), and 'polis' (city) or "defender of the city". [4] It is believed to have been coined by Aristotle who identified how propolis was used to protect and defend the hive. Bees often built a wall of propolis at the front entrance of their colony (i.e., "before the city").

The Egyptians used propolis, honey and other resins to mummify their pharaohs and its use was continued by the Greeks and Romans. Hippocrates, the founder of modern medicine, used it for healing sores and ulcers internally and externally.

The primary function of propolis in the hive is to act as a biocide, being active against invasive bacteria, fungi, invading larvae [5] and weather. [6] Bees use propolis as a sealant in the colony nest, to strengthen comb attachments, embalm intruders and smoothen over the interior of the nest. It creates internal as well as external defense system, making the beehive one of the most sterile environments known to mankind.

Composition:

There are said to be more than 180 different chemicals in propolis which vary according to the kind of bees collecting it, the climatic zone, the local trees and plants

and even the time of the day it is collected. It is composed of resin (55%), essential oils and wax (30%), pollen (5%), other constituents (10%) such as amino acids, minerals, ethanol (alcohol), vitamins A, B complex, E and the highly active biochemical substance known as bioflavonoid. [7] Mixed with bee's salivary secretions, it becomes a sticky filler substance termed as 'bee glue'. Many attempts have been made to isolate those particular chemicals in propolis thought to be the 'actives'. Amino acids, vitamins, bioflavonoid and antioxidants account for its miraculous curative properties. Flavinoids (quercetin, pinocembrin, galangin, pinobanksin) are known to be antibacterial and anti-inflammatory. They are a prime source of histamine and serotonin that are essential to help the body cope with allergies. A very active and important ingredient is CAPE: caffeic acid phenethyl ester, with anti-inflammatory, antimutagenic, antioxidant, cystostatic and anti-cancer activities. [5]

It is available in the world markets in different forms as capsules, lozenges, tincture, anti-acne lotions, face creams and toothpastes (Figure2).



Figure 2

Uses of Propolis in medicine:

Propolis is a good antimicrobial agent. It breaks down bacterial cell wall, cytoplasm and prevents bacterial cell division. Its antibacterial effect [8,9] on both isolated oral streptococci (e.g. S.sobinus 6715,S.mutansPS14,etc.) and salivary bacterial counts(e.g. A.naeslundaii [10]) have been demonstrated. It has significant antiviral, antifungal and anticancerous property that has been proved. [7] The Flavinoids in propolis are powerful antioxidants, and have been shown to be capable of scavenging free radicals.Kro et al described the medical property of ethanolic extract of Propolis(EEP) in the protection against gamma radiation. [11]

It also exhibits anti-inflammatory effects. The exact mechanism of action is unclear, but in vivo suppression of the lipoxygenase pathway of arachidonic acid metabolism resulting in suppression of prostaglandin and leukotrienes has been advocated. [12] It also enhances the immune system by promoting phagocytic activities, stimulating cellular immunity and augmenting healing effects.

Applications of propolis in dentistry:

It has numerous applications in dentistry and has the potential to be inculcated in its various sectors. Propolis mouthwash has been found as an aid in the repair of buccal surgical wounds and exerts an analgesic and anti-inflammatory effect. [13,14]

4% alcohol solution of propolis as filler for root canal filling has demonstrated high success rate in acute, exacerbated and chronic forms of periodontitis. [15] It has anaesthetizing effect, promotes regeneration of bone structure and does not stain the tooth crown.

Wound healing:

Topical application of 10% hydro-alcoholic solution of propolis accelerates the

oral epithelial repair after tooth extraction. [12]

Direct and indirect pulp capping:

Mechanical exposure of human pulp tissue to Propolis has led to the stimulation of various enzyme systems, cell metabolism, circulation and collagen formation, thus contributing to the hard tissue bridge formation by propolis. [16]

A histologic study [17] has shown that secondary dentin develops shortly after the application of the paste made from an alcoholic solution of propolis and zinc oxide for indirect pulp capping of deep cavities and for direct pulp capping. In teeth with direct pulp capping, a protective film develops at the opening of pulp chamber. Later the pulp wound undergoes cicatrisation by fibrosis followed by remineralisation.

Dentinal tube disinfection:

Propolis has been found to be effective against E.faecalis in dentin. [18,19] Propolis tincture is stupendous in treatment of oral aphthous ulcers, denture trauma and herpetic and non-specific painful oral ulcerations. It has an anaesthetic effect and can be applied over areas where other preparations are not so effective in terms of retention. It is useful in treating lichen planus lesions and has also been used successfully in treatment of pericoronal inflammation and dry socket.

Effect on Dentinal hypersensitivity: [19,20]

Propolis has been said to control dentinal hypersensitivity by occluding the dentinal tubules, though further research to evaluate its long term effects is required.

As storage media for avulsed teeth:

Various storage media have been proposed in the literature for tooth replants or transplants during the time in which the socket is being prepared. The storage medium is expected to maintain or improve the vitality of the cells of the periodontal membrane and cementum, since it is

generally accepted that a vital periodontal ligament is essential for the long-term survival of a transplant or replant. [21-26]

Martin and Pileggi [27] advocated that Propolis appeared to be a viable alternative to HBSS, milk or saline in terms of maintaining periodontal ligament cell viability after avulsion and storage. In similar studies, it was concluded that 75% of periodontal ligament cells were kept viable after 20 hour maintenance in propolis solution [28] and 10% propolis solution preserved the periodontal ligament cells viability for upto 24hours. [29] Incorporation of 'actives' of propolis, which are responsible for healing as well as antimicrobial and anti-inflammatory actions, is at peak when the tooth has been kept in propolis for upto 6hours. [30]

Propolis has also been found to inhibit osteoclastogenesis and osteoclast activation in tissue culture, thus showing its direct actions on osteoclasts. [31] Hence, it is advised that further studies be undertaken to investigate if it can be used to prevent root resorption following auto transplantation.

CONCLUSION

Propolis is a natural medication with a promising future. With its range of clinical applications in dentistry, it will surely be a valuable addition to every clinician's armamentarium in coming times.

The constituents of Propolis vary widely because of climate, season, location and year, and its chemical formula is not stable. Further long term research is needed to determine a standard formulation for therapeutic use, to assess its success rates as well as its possible adverse effects.

REFERENCES

1. Banskota AH, Tezuka Y, Kadota S. Recent progress in pharmacological research of propolis. *Phytotherapy Res* 2001; 15:561-571.

2. Dobrowolski JW, Vohora SB, Sharma K et al. Antibacterial, antifungal, antimoebic, anti-inflammatory and antipyretic studies on propolis bee products. *J Ethnopharmacol* 1991; 35:77-82.

3. Hu F, Hepburn HR, Li Yet al. Effects of ethanol and water extracts of propolis (bee glue) on acute inflammatory animal models. *J Ethnopharmacol* 2005; 100:276-83.

4. Wander P. Taking the sting out of dentistry. *Dental Practice* 1995; 25:3-4.

5. Na HK, Wilson MR, Kang KS et al. Restoration of gap junctional intercellular communication by caffeic acid phenethyl ester (CAPE) in a ras-transformed rat liver epithelial cell line. *Cancer Lett.* 2000; 157: 31-8.

6. Thomson WM. Propolis. *Med J Aust.* 1990; 153: 654.

7. Almas K, Dahlan A, Mahmoud A. Propolis as a natural remedy: An update. *Saudi Dental J* 2001; 13: 45-49.

8. Steinberg D, Kaine G, Gedalia I. Antibacterial effect of propolis and honey on oral bacteria. *Am J Dent.* 1996; 9: 236-9.

9. Ikeno K, Ikeno T, Miyazawa C. Effect of Propolis on dental caries in rats. *Caries Res* 1991; 25: 347-351.

10. Koo H, Cury JA, Rosaleu PL et al. Effects of Propolis from two different regions of Brazil on oral microorganisms. *J Dent Res* 1998; 77:1157.

11. Krol W, Czuba Z, Scheller S et al. Antioxidant property of ethanolic extract of Propolis (EEP) as evaluated by inhibiting the chemiluminescence oxidation of luminol. *Biochem. Int* 1990, 21: 593-597.

12. A. Parolia et al. A comparative histological analysis of human pulp following direct pulp capping with propolis, mineral trioxide aggregate and Dycal. *Aust Dent J* 2010 Mar; 55(1):59-64.

13. Magro-Filho O, de Carvalho AC. Topical effect of Propolis in the repair of sulcoplasties by the modified Kazanjian

- techniques. Cytological and clinical evaluation. *J. Nihon Univ. School Dentistry* 1994;36: 102-111.
14. Kosenco SV and Kosovich Tiu. The treatment of periodontitis with prolonged action Propolis preparation (clinical X-ray research).*Stomatologia MOSk* 1990; 69:27-9.
 15. Magro Filho O, de Carvalho AC. Application of propolis to dental sockets and skin wounds. *J. Nihon Univ. School Dentistry* 1990; 32(1): 4-13.
 16. Lonita R et al. Experimentation of apiarian preparation for the direct and the indirect capping of the dental pulp. *Stomatologie* 1990; 37:19-30.
 17. Kandaswamy D, Venkateshbabu N, Gogulnath D et al. Dentinal tubule disinfection with 2% chlorhexidine gel, propolis, morinda citrifolia juice, 2% povidone iodine and calcium hydroxide. *Int Endod J.* 2010 May;43(5):419-23.
 18. Awawdeh L, Al-Beitawi M, Hammad M. Effectiveness of propolis and calcium hydroxide as a short-term intracanal medicament against *Enterococcus faecalis*: a laboratory study. *Aust. Endod. J* 1990, 35: 52-58.
 19. Almas K, Mahmoud A, Dahlan A. A comparative study of Propolis and saline application on human dentin: A SEM Study. *Indian J. Dental Res* 2001; 12: 21-27.
 20. Martin MP, Pileggi R. A quantitative analysis of Propolis: a promising new storage media following avulsion. *Dental traumatol* 2004; 20 (2): 85-89.
 21. Andreasen JO, Hjorting, Hansen E. Replantation of teeth I. Radiographic and clinical study of 110 human teeth replanted after accidental loss *Acta Odontol. Scandinavia* 1996; 24: 263-86.
 22. Andreasen JO. The effect of extra-alveolar period and storage media upon periodontal and pulpal healing after replantation of mature permanent in monkeys. *Int. J. Oral Surg* 1981; 10: 43-53.
 23. Loe H, Waerhaug J. Experimental replantation of teeth in dogs and monkeys *Arch. Oral Biol.* 1961; 3: 176-184.
 24. Blomlof L., Andersson L., Lindskog S. et al. Periodontal healing of replanted monkey teeth prevented from drying *Acta Odontol. Scandinavia* 1983; 4(2):117-123.
 25. Fagade O.O., Gillbe G.V, Wastell D.G. Radiographic pattern of root resorption in auto transplanted maxillary canines. *J. Dent* 1988; 16:80-84.
 26. Fagade O.O. Effect of surgical details on the incidence of root resorption on auto-transported maxillary canines: A retrospective study. *Nig. Dent. J* 1997; 11(2): 8-12.
 27. Al-Shaher A, Wallace J, Agarwal S et al. Effect of propolis on human fibroblasts from the pulp and periodontal ligament. *J. Endodontics* 2004; 30(5): 359-361.
 28. Ozan F, Polat ZA, Er K, Ozan U et al. Effect of propolis on survival of periodontal ligament cells: new storage media for avulsed teeth. *J. Endod* 2004; 33(5): 570-73.
 29. Graziela Garrido Mori, Daniele Clapes Nunes. Propolis as storage media for avulsed teeth: microscopic and morphometric analysis in rats. *Dental Traumatol* 2010 Feb; 26(1):80-5.
 30. F.Ozan, Z.Sumer et al. Effect of mouth rinse containing Propolis on oral micro-organisms and human gingival fibroblasts. *Eur J Dent* 2007; 1:195-201.
 31. R.Pileggi, K.Antony et al. Propolis inhibits osteoclast maturation. *Dent Traumatology* 2009; 25:584-88.
