

Propolis as a natural remedy: An update

Khalid Almas*, BDS, MSc, DDPHRCs, FDSRCS, FRACDS, FICD
Afaf Dahlan†, BDS Ameira Mahmoud*, BDS

هناك ميل كبير لاستعمال المواد الطبيعية لمعالجة الكثير من الأمراض، وقد قدم الطب البديل الكثير من المساهمات للممارسة الطبية الحديثة. البروبوليس كلمة يونانية تعني حماة للدينة. ينتج النحل مادة البروبوليس ويستخدمها ثانية في بناء الخلية، وهذه المادة حلقية تاريخية قوية فقد ورد استعمالها في مختلف الثقافات والحضارات. وللبروبوليس فعالية ضد الجراثيم والفيروسات والفطريات، كما لوحظ وجود فعالية خاصة ضد التسرطن. أما في طب الأسنان فقد استعملت مادة البروبوليس في شفاء الجروح التالية للعمليات الجراحية، ومعالجة آفة الجلود وفي تغطية القلب ومعالجة حساسية الأسنان. تتوفر مادة البروبوليس بأشكال تجارية مختلفة، ويتوقع أن يكون لمادة البروبوليس دوراً في المجال الطبي مستقبلاً، وهناك حاجة لإجراء المزيد من الأبحاث في مجال طب الأسنان السريري.

There is a great trend to use natural materials as a cure for many diseases. Alternative medicine has made a lot of contributions to modern medical practice. Propolis is a Greek word meaning "defender of the city". It is the glue that honey bees use to seal their hives. Propolis has a strong historical background. It has been used in different cultures and civilizations. Propolis has anti-bacterial, anti-viral and anti-fungal effects. Its anti-cancer effect has also been observed. Propolis has also been used in dentistry for surgical wound healing, root canal treatment, pulp capping and tooth hypersensitivity. Different commercial propolis products are available in market. Propolis has a promising role in future medicine. Further research is needed in its application in clinical dentistry.

Introduction

There is a great trend nowadays to use natural materials as cure for many diseases. Alternative medicine has made a lot of contributions to modern medical practice. Propolis is derived from the Greek word "pro" before, polis "city" or defender of the city. Propolis is the glue that honey bees (*Apis mellifera*) use to seal up their hives. Beekeepers were puzzled at why bees were so resistant to infections and disease, despite living in crowded colonies.¹

During the last 10 years, considerable research had been conducted on Propolis in America, Australia, United Kingdom and Europe, and especially in Eastern Europe. Propolis has been known as a natural medicine from ancient times. It has been used for treating different diseases and inflammatory conditions as both local and systemic applications.

Propolis is a sticky filler substance with the aroma of poplar honey and vanilla that is collected by bees from the buds and barks of trees and plants such as horse chest, nuts, poplar and fir trees. The bees take the resin back to their hives and work on it, producing a glue like substance with which they fill cracks, smooth over the interior

of the nest, strengthen comb attachments and cover and embalm intruders and other objectionable objects in the hive that are too large to carry out.

It is composed of resin (55%), essential oils and wax (30%) mixed with bee glue "the salivary secretions of bees" and pollen (5%) and other constituents (10%) which are amino acids, minerals, ethanol (alcohol), vitamins A, B complex, E and the highly active bio-chemical substance known as bioflavenoid.¹ It is a prime source of histamine and serotonin being substances needed to help the body cope with allergies.¹

Propolis is available in the world markets in different forms as capsules, lozenges, tincture and cream in Europe and America. It is already available in Russia as a toothpaste. Further, research is being carried out at Oxford University, on the benefits of Propolis.¹

Propolis was used at the time of Egyptian and Greek civilizations. The Greeks recognized its healing qualities. Hippocrates, the founder of modern medicine, used it for healing sores and ulcers internally and externally. The Roman historian Pliny was quoted as saying "current physicians use propolis as a medicine because it extracts stings and all substances embedded in flesh, reduces swelling, softens indurations, soothes pain of sinews and heals sores when it

Received 28 June 1999, Revised 5 June 2000 Accepted 12 June 2000

*Assistant Professor, Division of Periodontics
Dept. of Preventive Dental Sciences;

†Formerly Intern, College of Dentistry
King Saud University, Riyadh, Saudi Arabia

Address reprint requests to:

Dr. Khalid Almas
PO Box 60169, Riyadh 11545, Saudi Arabia
Email: Kalmas@ksu.edu.sa

appears hopeless for them to mend."¹

The aim of this review was to draw the attention of dental health care workers to Propolis as a natural remedy and its plausible use in dental diseases.

Actions of Propolis

A. The use of Propolis in medicine

1. Anti-bacterial effect

Steinberg et al² investigated the antibacterial properties of Propolis and honey against oral bacteria *in vitro* and *in vivo*. Propolis demonstrated an *in vitro* antibacterial effect on both isolated oral streptococci and salivary bacterial counts in the clinical study.

Ikeno et al³ studied the effect of Propolis on growth and glucosyltransferase activity of *Streptococcus Sorbinus* 6715, *Streptococcus mutans* PS14 and *Streptococcus circuits* OMZ61 *in vitro*, and on dental caries in rats infected with *S. sorbinus* 6715, *S. mutans* and *S. circuits*. Both water insoluble glycan synthesis and glucosyltransferase activity were inhibited. In rats, dental caries was markedly decreased by the multiple actions of Propolis. Toxic effects of Propolis on the growth of rats were not observed under the experimental conditions of the study. These results suggested that Propolis could control dental caries in the rat model system.

In a study by Grange and Davey,⁴ they used a Propolis dilution of 1:20 in nutrient agar which completely inhibited the growth of *S. aureus*, *S. epidermidis*, *Enterococcus* spp. *Corynebacterium* spp. *B. catarrhalis* and *B. cereus*. This dilution partially inhibited the growth of *P. aeruginosa* and *E. coli* but had no effect on *K. pneumonia*.

Thus it appeared to have an inhibitory effect on cocci and gram positive rods. Tube dilution studies showed that it was bactericidal for *B. cereus* and the gram-negative cocci at dilutions of 1:160 to 1:320, and that growth of the H37RV reference strain of *Mycobacterium tuberculosis* was totally inhibited at 1:320 and partially inhibited at 1:640 dilution.

Koo et al⁵ in Brazil found antibacterial effect of Propolis on *S. mutans*, *S. sanguis* and *A. naeslundii* in addition to the inhibition of glycosyltransferase.

2. Anti-viral effect

Serkedjieva⁶ conducted an *in vitro* study on the antiviral activity of six synthetic substances which were esters of substituted cinnamic acids, identical with or analogous to some of the

constituent fractions of Propolis. One of them, isopentyl ferulate, inhibited significantly the infectious activity of influenza virus A/HongKong *in vitro* and the production of hemagglutinins *in vivo*. In diverse experimental studies, it was found that the maximal inhibition of viral reproduction was observed when test substances were present in the medium during the whole infectious process.

3. Anti-fungal effect

Propolis and nine anti-fungal drugs were tested on four fungi that cause infections in humans. It was as effective as (or more effective than) some of the other preparations against three of the fungi, and in some tests, its activity was enhanced in the presence of propylene glycol.⁷ Propolis and propylene glycol gave better results against *Scopulariopsis breveicaulis* than any of the drugs tested.

4. Anti-oxidant effect

Krol et al⁸ described the remarkable medical property of the ethanolic extract of Propolis (EEP), that is the protection against gamma radiation. They performed their experiment on mice and found that the anti-oxidative effect could be attributed to its radical scavenging ability. They also demonstrated the ability of increasing amounts of EEP to inhibit luminol H₂O₂ chemiluminescence *in vitro*, and suggested that its anti-oxidative capacity was partly due to its high content of flavenoids.

5. Effect on cancer

Scheller⁹ demonstrated the anti-tumoral effect in mature mice bearing Ehrlich carcinoma. Survival rate after EEP treatment was compared to that of bleomycin, given alone or in combination every 2 days for thirty-six days and followed up for fourteen additional days. The survival rate at fifty days was 55% after EEP and 40% after bleomycin, while all the mice treated with EEP plus bleomycin combination demonstrated shorter survival than the controls. It was concluded that while the *in vivo* activity of bleomycin was reduced in the presence of cytochrome - c - reductase inhibitors (as some of the EEP components) are the anti-tumoral property of EEP in the experimental animal model studied was significant and lasting.

B. The use of Propolis in Dentistry

1. Repair of surgical wounds

A study conducted by Magro-Filho and de

Carvalho¹⁰ analyzed the effects of Propolis mouth rinse on the repair of surgical wounds after sulcoplasty by the modified Kazanjian technique. Patients returned 7, 14, 30 and 45 days after surgery for cytological and clinical evaluation. It was concluded that:

- a). 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;
- b). The vehicle employed had a minor irritant effect on infra-buccal surgical wounds;
- c). Exfoliative cytology showed epithelization of infra-buccal surgical wounds.

2. Treatment of root canal and periodontitis

Kosenko and Kosrish¹¹ suggested the addition of 4% alcohol solution of bee glue as filler for root-canal filling, besides the traditional treatment of the root-canal with bee glue solution. Clinical and radiographic examinations have demonstrated a high efficacy of such technique in acute, exacerbated and chronic forms of periodontitis. This filler is characterized by its anesthetizing effect. It is preserved in the root canal and does not stain the tooth crown, promotes regeneration of the bone structure and prolongs the effect of 0.4% water-alcohol bee glue emulsion.

3. Application of Propolis to dental sockets and skin wounds

Magro-Filho and de-Carvalho¹² examined cutaneous wound healing and socket wound after tooth extraction in rats with topical application of either a 10% hydro alcohol solution of Propolis or 10% hydro-alcohol solution alone. The animals were sacrificed at 3, 6, 9, 15 and 21 days after the

operation. It was concluded that topical application of Propolis hydro-alcoholic solution accelerated oral epithelial repair after root extraction but had no effect on socket wound healing.

4. Direct and indirect dental pulp capping

With a view to extending the range of biologically active preparations for direct and indirect capping of the dental pulp, Lonita et al¹³ used a paste made from an alcoholic solution of Propolis and zinc oxide. The study included 150 teeth with indirect pulp capping of deep cavities and 50 teeth with direct pulp capping. The evolution of the capping was followed clinically, radiologically and morphologically. The results obtained showed that the paste with Propolis exerted effects similar to those of zinc eugenol. The morphologic study of the indirect capping showed that secondary dentin developed shortly after the application of the paste, and that it was followed by the development of pulpitis and sclerotic transformation of the pulp. In teeth with direct capping a protective film developed at the opening of the pulp chamber. In time, the pulpal wound underwent cicatrization by fibrosis with a trend to remineralization. No areas of pulpal degeneration were found in the rest of the pulpal tissue and this suggested that the paste was more histophilic than the pastes based on calcium hydroxide, with which an area of necrosis occurred at the opening of the chamber, and calcium and fibrous degeneration occurred in the coronal pulp.

5. Effect on dentinal hypersensitivity

Recently, the authors have conducted a pioneer study on the effect of Propolis on dentinal hypersensitivity *in vivo*.^{14,15} The clinical trial of propolis on female subjects for four weeks was conducted at King Saud University, College of



Fig. 1. Crude/raw Propolis from Pakistan



Fig. 2. Propolis spray from the USA and Ethanolic extract from Syria



Fig. 3. Propolis solution and gum from Bee Health, UK.

Dentistry, Riyadh. Twenty-six female subjects with age range 16-40 years (mean 28 years) were included in the study. Propolis was applied twice daily on teeth with hypersensitivity. The hypersensitivity was assessed on a visual scale 0-10 and by slight, moderate and severe classification at baseline, after 1 and 4 weeks. Seventy percent of the subjects had severe hypersensitivity at the baseline. At first recall, 50% reported moderate hypersensitivity, fifty percent reported slight hypersensitivity at second recall and 30% had no hypersensitivity while only 19% had moderate hypersensitivity. It was concluded that Propolis had a positive effect in the control of dentinal hypersensitivity.

In another *in vitro* study using Scanning Electron Microscopic (SEM), it was found that Propolis occluded the dentinal tubules in both 60 and 120 seconds application on dentin in sound, periodontally involved and recession teeth specimens. Propolis was also compared with saline and it was found that Propolis and saline both occluded the dentinal tubules in both etched and unetched dentin. Propolis occluded more dentinal tubules than saline.¹⁶

The results from the above-mentioned studies are very encouraging. Further research on clinical trials to evaluate the long term effects of Propolis on dentinal hypersensitivity is necessary.

C. Global appraisal of Propolis

Bee Health (UK) has collected the largest research information (data) on Propolis in the world, published by the Independent Propolis Information Bureau (UK) confirming that Propolis has medical and dental uses especially anaesthetic, anti-bacterial, antibiotic, anti-inflammatory, anti-fungal, anti-viral and anti-

oxidant properties. Other diseases and conditions like arthritis, blood pressure, bone regeneration, bone cancer, haemorrhoids, hay fever, rheumatic fever and tuberculosis are said to be responsive to treatment with Propolis as a traditional treatment although the efficacy is not scientifically proven yet.

A good deal of research data on the effect of Propolis has come from Eastern Europe where Propolis has always been used as a natural medicine and where it is still being used routinely in medical practice. These literature data are being published mostly in Russian, Polish and Roman, Slovak, German, Bulgarian and Chinese languages.

There is a need for further human and animal trials of this natural remedy in oral diseases.

In conclusion, Propolis is a natural medication with a promising future but further studies should be conducted to investigate its merit and demerits in clinical dentistry.

Recommendations

1. Studies should be conducted on the effects of Propolis and these studies should meet the requirements of basic principles of clinical research and trial.
2. Both clinical trials and demonstration studies should be carried out to determine the efficacy and effectiveness of Propolis in human subjects.
3. The primary health care notion of appropriate technology should be encouraged through controlled trials of native natural herbal products as alternative medicine for good general and dental health of the community. In Saudi Arabia, the dental profession should consider low cost local products in dealing with the moderately high prevalence of dental and oral diseases among the population.

Acknowledgment

The authors would like to extend their appreciation to the Bee Health Company, UK, which provided us with useful information regarding Propolis, and to Ms. Elizabeth Posadas for typing the manuscript.

References

1. Wander P. Taking the sting out of dentistry. *Dental Practice* 1995; 25:3.
2. Steinberg D, Kaine G and Gedalia I. Anti-bacterial

- effects of Propolis and honey on oral bacteria. *Am J Dent* 1986; 9: 236-339.
3. Ikeno K, Ikeno T and Miyazawa C. Effect of Propolis on dental caries in rats. *Caries Res* 1991 ;25:347-51.
 4. Grange JM and Davey RW. Anti-bacterial properties of Propolis. *Journal of the Royal Society of Medicine* 1990;83:159-160.
 5. Koo H, Cury JA, Rosaleu PL and Park YK. Effects of Propolis from two different regions of Brazil on oral microorganisms. *J Dent Res* 1998; 77:1157 (Abstr # 115).
 6. Serkedjieva J. Anti-influenza virus effect of some Propolis constituents and their analogues (esters of substituted cinnamic acids). *J Nat Prod* 1992;55:294-302.
 7. Miller-Clere J, Michel D, Simeray J and Chaumon JP. Preliminary study of the anti-fungal properties of Propolis compared with some commercial products. *Fac Medicine & Pharmacy, Besancon Monograph Cedex, France* 1987.
 8. Krol W, Czuba Z, Scheller S, Gabrys J, Grabiec S and Shani J. Anti-oxidant property of ethanolic extract of Propolis (EEP) as evaluated by inhibiting the chemiluminescence oxidation of luminol. *Biochemistry International* 1990; 21:593-597.
 9. SchellerS, KrolW, Swiacik J, Owcare kS, Gabrys J and Shani J. Antitumocal property of ethanolic extract of Propolis in mice-bearing ehrlich carcinoma, as compared to bleomycin. Department of Microbiology, Silesian School of Medicine, Zabrze-Rokitnica, Monograph Poland 1989.
 10. Margo-Filho O and de Carvalho AC. Topical effect of Propolis in the repair of sulcoplasties by the modified Kazanjian techniques. Cytological and clinical evaluation. *J Nihon Univ Sch Dent* 1994; 36:102-11.
 11. Kosenco SV and Kosovich Tiu. The treatment of periodontitis with prolonged action Propolis preparations (clinical x-ray research). *Stomatologia -MOSk* 1990; 69:27-9.
 12. Margo-Filho O and de Carvaho AC. Application of Propolis to dental sockets and skin wounds. *J Nihon Univ Sch Dent* 1990; 36:4-13.
 13. Lonita R et al. Experimentation of apiarian preparations for the direct and the indirect capping of the dental pulp. *Stomatologie* 1990; 37:19-30.
 14. Mahmoud A, Almas K and Dahlan A The effect of Propolis on female subjects with dentinal hypersensitivity *J Dent Res* 2000,79:406 (Abst # 2097).
 15. Mahmoud AS, Almas K and Dahlan AA. The effect of Propolis on dentinal hypersensitivity and level of satisfaction among patients from a university hospital, Riyadh, Saudi Arabia. *Indian J Dent Res* 1999;10:130-137.
 16. Almas K, Mahmoud A and Dahlan A. A comparative study of Propolis and saline application on human dentin: An SEM Study. *J Dent Res* 2000; 79; 1281 (Abstr #40).