



APITHERAPY - A NATURAL ANTIDOTE FOR ORAL DISEASES: AN OVERVIEW

Akkala Satya Gopal¹, Lakshmi Sindhuri Veluru², Sai Sankar A. J.¹, C. H. Ram Sunil³

¹ Department of Pedodontics and Preventive Dentistry, Sibar Institute of Dental Sciences, Guntur, India

² Department of Pedodontics and Preventive Dentistry, Narayana Dental College, India

³ Department of Conservative Dentistry and Endodontics, Sibar Institute of Dental Sciences, India

CORRESPONDING AUTHOR: satyagopal.akkala@gmail.com

ABSTRACT

Natural commodities of honeybees have various ingredients within them, which contribute to their incredible properties. These products have been used in traditional medicine since ancient times, due to its biologically active nature in preventing infections, wound healing and in promoting health. This nature is credited to their antibacterial, antioxidant, immunomodulating, anti-inflammatory and wound healing property. As natural remedies are showing promising results in management of oral diseases in the modern era, this paper attempts to highlight the properties of various products of honeybees and clinical applications in dentistry.

KEYWORDS: apitherapy, antibacterial, honey, oral diseases, propolis

INTRODUCTION

In folk medicine, natural products have been used for several years. Amid these natural products the importance of honey as a therapeutic agent has been well documented in the world's oldest literature.¹ The medicinal use of commodities obtained from honeybees is known as Apitherapy. According to Dr Stefan Stangaciu, 'apitherapy' or 'bee therapy' (from the Latin word 'apis' which means bee) is defined as, 'the art and science of treatment and holistic healing through the honey bee and her products for the benefit of mankind and all the animal kingdom.'²

A diverse commodity of honeybees such as honey, propolis, pollen, royal jelly and bee venom has been used as proxy to the conventional medicines for the treatment of various systemic diseases.³ Honey is a sweet syrupy substance produced by honeybee from the nectar of flowers and used by humans as a sweetener. Recently honey has been reported to have an inhibitory effect on approximately 60 species of bacteria including aerobes and anaerobes.⁴ It was used to treat infected wounds 2000 years ago, prior to the discovery of bacteria as a cause of infection.⁵

Propolis is a resinous material/sap collected from tree bark and bud, by

honeybees which are used to reinforce their hive walls and protect the hives from infection. It has been known to have anti-inflammatory, antibacterial, antioxidant, anticarcinogenic and antiviral activity.⁵⁻⁶ Pollen grains are the reproductive spores of seed-bearing plants. Pollen collected by bees from flowers have benefits such as detection and immunization against allergies.² A thick, milky mix of nutrients produced from a combination of honey and pollen is Royal jelly. It is a concentrated source of essential fatty acids, vitamins A, B, C, D and E and many other nutrients.²

Apitoxin or honey bee venom, is a bitter colourless liquid which consists of a mixture of proteins that causes local

inflammation and acts as an anticoagulant.⁷

LITERATURE REVIEW

Since ancient times honey has been used as a therapeutic agent for variety of systemic diseases such as respiratory diseases, urinary, gastrointestinal and dermatological diseases like ulcers, wounds, eczema, psoriasis, seborrhic dermatitis and dandruff.⁸ These diverse utilities of honey are due to its antimicrobial, anti-inflammatory properties.⁹ It moreover have unique ability to debride and deodorize wound,⁸ stimulate tissue growth from the wound margins and to manage pain and minimize scarring.¹⁰ Even though honey has numerous sanctified properties, medicinal importance of honey can be ascribed to the fact that, it promotes wound healing by maintaining moist environment, offers antibacterial activity and provide protective barrier to prevent infection.¹¹

The antibacterial property of honey was first recognized by Van Ketel (1892). The minimum inhibitory concentration was found to range from 1.8% to 10. 8% (v/v).¹² White et al.¹³ identified the major antibacterial substance in honey as hydrogen peroxide and also demonstrated that it is produced by the enzyme glucose oxidase of honey. Glucose oxidase, catalyses the oxidation of some of the glucose present in honey to form gluconic acid, the resulting low pH inhibits microbial growth and the by-product hydrogen peroxide kills vegetative cells and microbial spores.¹⁴

In addition, honey has an imperative property of healing which may be due to its acidic nature and anti-inflammatory properties. This acidic nature of honey decreases the pH of the

wound bed and makes more oxygen available from haemoglobin in the blood to the regenerating tissue.¹⁴ Honey has been found to significantly stimulate the release of the cytokines, TNF- α , IL-1 β and IL-6 from monocytes, which were known to play an important role in healing and tissue repair.¹⁴

Its direct nutrient effect on regenerating tissue is due to wide range of vitamins, trace elements and amino acids in addition to the large quantities of readily assailable sugars. Vitamin C content in honey is three times higher than that of in serum which plays vital role in collagen synthesis that aids in wound healing.¹⁴

CLINICAL APPLICATIONS IN DENTISTRY:

1. *Anti halitosis:* Microorganisms present in the oral cavity causes putrefaction of debris. This results in production of hydrogen sulphide and methyl mercaptan, which have been related directly to oral malodour.¹⁵ However it has been stated that when candy's containing honey were used, glucose in honey was used by bacteria in preference to amino acids. This would produce lactic acid instead of bad-smelling amines and sulfur compounds.⁵

2. *Inhibition of plaque formation:* Dental plaque control is a key factor in the prevention of dental caries and periodontal disease. The enzyme glucose oxidase of honey produces hydrogen peroxide due to its natural catalysis reaction. This prevents plaque bacteria organization and formation of biofilms resulting in plaque disorganization. This has been proved when propolis has been used as a chewing gum or mouth rinse¹⁶⁻¹⁷.

3. *Periodontal therapy:* The harm caused by persisting state of inflammation in periodontal disease can be stopped by restraining the pathogenic organisms. Honey has been reported to have an inhibitory effect on approximately 60 species of bacteria including aerobes and anaerobes, gram-positives and gram-negative microorganisms.⁵ As honey contains a significant level of antioxidants, they protect the periodontal tissues from the free radicals formed during inflammatory process.² The connective tissue erosion and bone healing is also augmented by stimulating the growth of granulation tissue and epithelial cells.⁵

4. *Cariostatic agent:* *S. mutans* is the most frequently associated microorganism, owing its ability to adhere to teeth and survive in acid environment. Glucosyltransferase (GTFs) within dental plaque provide distinct binding sites for oral microorganisms, by facilitating the formation of glucan in situ.¹⁸ Several reports has shown that propolis inhibits the GTFs activity of *S. mutans* thus preventing caries.¹⁸⁻²⁰ Simone et al. in his *in vitro* study proposed two possible pathways of cariostatic effect by propolis. First is the reduction of acid production of *S. mutans* and secondly by inhibiting the proton translocating F-ATPase activity which is one of the means by which *S. mutans* alleviate their influence of acidification.¹⁹

5. *Pulp therapy:* Propolis when used as a pulp capping agent contributes to the hard tissue bridge formation by stimulating the circulation, cell metabolism, various enzymes and collagen formation.²¹ This property can be attributed presence of provitamin A, B, vitamin C, arginine and trace minerals

such as copper, iron, zinc as well as bioflavonoids in propolis.²²

6. *Intracanal irrigant and medicament:* Propolis was as effective as NaOCl when used as an irrigant on extracted human teeth in a study by Al-Qathmi and Al-Madi owing to its antimicrobial nature²²⁻²³. Rezende et al.²⁴ found propolis was to be effectual against *Enterococcus faecalis* as intracanal medicaments. Oily nature of propolis promotes low-speed dissociation and dispersal of endodontic paste. Hence its blend with calcium hydroxide could aggregate the benefits of each material.

7. *New storage media:* As long-term prognosis of avulsed tooth depend on type of storage media and its effect on the periodontal cell viability. Several studies have proven propolis to be effective in maintaining periodontal cell viability. This success can be credited to the antioxidant, antibacterial and anti-inflammatory properties.²⁵⁻²⁶

8. *Dentinal hypersensitivity:* Propolis as a therapeutic agent for dentinal hypersensitivity has been studied by Mahmoud et al. and was proven successful. In vitro studies done by Almas et al. and Sales-Peres et al. propolis was found to occlude the dentinal tubules, thus reducing dentin permeability which could be reason for its success.²

9. *Surgical remedial:* The analgesic, anti-inflammatory and ability to promote tissue regeneration through stimulation of angiogenesis, growth of fibroblasts and epithelial cells has proven commodities of honeybees to be effective in reducing postoperative complications in various conditions like socket healing in impacted third molars, infrabuccal surgical wounds, dental abscess,

sulculoplasty, alveolar osteitis and osteomyelitis.²²

10. *Soft tissue lesions:* Numerous studies reported that propolis a bee hive extract has showed a lesion regression on various conditions like oral candidiasis, oral lichen planus, recurrent aphthous stomatitis, radiation mucositis and denture stomatitis when compared with conventional medicines. The anti-inflammatory action and stimulating effect on tissue repair of honey could possibly be beneficial for the relief of these oral conditions.²⁻³

CONCLUSIONS

Natural commodities of honeybees have various ingredients in them, which contribute to their implausible properties. Its antimicrobial and wound healing bustle have attracted researchers towards the range of clinical applications in dentistry. However the ingredients of these commodities vary widely because of climate, season, location and chemical formulation. Hence extensive research is necessary to determine a standard formulation for therapeutic use and to consider its success rates as well as its potential adverse effects.

REFERENCES

1. Molan PC. The antibacterial activity of honey. The nature of antibacterial activity. *Bee World* 1992;73:5-28.
2. Ara SA, Ashraf S, Arora V, et al. Use of apitherapy as a novel practice in the management of oral diseases: a review of literature. *J Contemp Dent* 2013;3:25-31.
3. Haddad S, Maysara D. Effect of honey for treatment of some common oral lesions: Follow-up of 50 cases. *J Dent Oral Hyg* 2013;5:55-61.

4. Richa W, Gaurav S, Aditi P, et al. A review: does honey have role in dentistry? *Acta Biomedica Scientia* 2014;1:69-73.
5. Ahuja V, Ahuja A. Apitherapy: a sweet approach to dental diseases. Part II: propolis. *J Acad Adv Dent Res* 2011;2:1-7.
6. Scully C. Propolis: a background. *Br Dent J* 2006;200:359-60.
7. Shashi Kiran MR, Namitha J, N Pallavi, et al. The therapeutic benefits of bee venom. *Int J Curr Microbiol App Sci* 2014;3:377-81.
8. Haddad S, Maysara D. Effect of honey for treatment of some common oral lesions: Follow-up of 50 cases. *J Dent Oral Hyg* 2013;5:55-61.
9. Cooper RA, Molan PC, Harding KG. Antibacterial activity of honey against strains of *Staphylococcus aureus* from infected wounds. *J R Soc Med* 1999;92:283-5.
10. Haynes HS, Callaghan R. Properties of honey: its mode of action and clinical outcomes. *Wounds UK* 2011;7:51-7.
11. Mandal MD, Mandal S. Honey: its medicinal property and antibacterial activity. *Asian Pac J Trop Biomed* 2011;1:154-60.
12. Dustmann JH. Antibacterial effect of honey. *Apiacta* 1979;14: 7-11.
13. White JW, Doner L. Honey composition and properties. *Beekeeping in the United States Agriculture*. Philadelphia: Eastern Regional Research Center; 1980.
14. Molan PC. The evidence and the rationale for the use of honey as a wound dressing. *Int J Low Extrem Wounds* 2006;5:40-54.
15. Veerasha KL, Bansal M, Bansal V. Halitosis: a frequently ignored social condition. *J Int Soc Prev Community Dent* 2011;1:9-13.
16. Ercan N, Erdemir EO, Ozkan SY, et al. The comparative effect of propolis in two different vehicles, mouthwash and chewing-gum on plaque accumulation and gingival inflammation. *Eur J Dent* 2015;9:272-6.

17. Koo H, Cury JA, Rosalen PL, et al. Effect of a mouthrinse containing selected propolis on 3-day dental plaque accumulation and polysaccharide formation. *Caries Res* 2002;36:445-8.
18. Yadav NR, Garla BK, Reddy VK, et al. Antimicrobial effect of honey on *Streptococcus mutans* of dental plaque. *J Oral Health Comm Dent* 2014;8:72-5.
19. El-Din NSG, Abbas HM, El-Dokky NA, et al. Comparative clinical trial on the effect of propolis extract and sodium fluoride mouthrinse on salivary *Streptococcus mutans* count. *Nature and Science* 2012;10:89.
20. Nassar HM, Li M, Gregory RL. Effect of honey on *Streptococcus mutans* growth and biofilm formation. *Appl Environ Microbiol* 2012;78:536-40.
21. Parolia A, Kundabala M, Rao NN, et al. A comparative histological analysis of human pulp following direct pulp capping with Propolis, mineral trioxide aggregate and Dycal. *Aust Dent J* 2010;55:59-64.
22. Parolia A, Thomas MS, Kundabala M, et al. Propolis and its potential uses in oral health. *Int J Med Sci* 2010;2:210-15.
23. Rathod S, Brahmankar R, Kolte A. Propolis: a natural remedy. *Ind J Dent Res Rev* 2011;1:50-2.
24. Rezende GP, Costa LR, Pimenta FC, et al. In vitro antimicrobial activity of endodontic pastes with propolis extracts and calcium hydroxide: a preliminary study. *Braz Dent J* 2008;19:301-5.
25. Gopikrishna V, Baweja PS, Venkateshbabu N, et al. Comparison of coconut water, propolis, HBSS, and milk on PDL cell survival. *J Endod* 2008;34:587-9.
26. Casaroto AR, Hidalgo MM, Sell AM, et al. Study of the effectiveness of propolis extract as a storage medium for avulsed teeth. *Dent Traumatol* 2010;26:323-31.