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Humulus lupulus in Management of Orodental Pathogens –An Update

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Abstract
Oral diseases are major health problems with dental caries and periodontal diseases among the most important preventable global infectious diseases. Oral health influences the general quality of life and poor oral health is linked to chronic conditions and systemic diseases. More than 750 species of bacteria that inhabit the oral cavity, a number are implicated in oral diseases. Development of dental caries involves gram positive bacteria and gram negative bacteria are associated with periodontal problems. Natural phytochemicals obtained from plants is a good use of traditional medications. The aim of the article is to focus on the therapeutic properties of *Humulus lupulus* in the field of dental practice.

Keywords
Humulus lupulus, caries, dental caries, periodontitis.

INTRODUCTION

Oral diseases are a major health problem worldwide. Dental caries and periodontal diseases are among the most important global oral health problems, although conditions such as oral and pharyngeal cancers and oral tissue lesions are also significant health concerns.[1] There is also evidence linking poor oral health and systemic diseases, such as cardiovascular diseases, rheumatoid arthritis and osteoporosis.[2] In particular, traditional medicinal plant extracts or phytochemicals that have been shown to inhibit the growth of oral pathogens, reduce the development of dental plaque, influence the adhesion of bacteria to surfaces and reduce the symptoms of oral diseases. Studies have also shown that about 80% of the people in developing countries use traditional medicines for oral health care [3]. *Humulus lupulus* is a species of the *Cannabaceae* , the extract is antimicrobial, which makes it useful for making natural deodorant. In general the female flower is used as a stimulative, sedative, general tonic, rheumatism, stress and headaches.

HUMULUS LUPULUS IN DENTISTRY

Humulus lupulus against Dental caries

Dental caries is a localized, progressive demineralization of the hard tissues of the crown and root surfaces of teeth. The demineralization is caused by acids produced by bacteria, particularly *Streptococcus mutans* and lactobacilli that ferment dietary carbohydrates. [4]

Streptococcus mutans are the primary bacteria that causes fermentation of acids in the oral cavity, the bacteria adheres firmly to the tooth surface. Compounds obtained from natural sources are better tolerated and may not have the problem of tolerable resistance. Purified hop derivatives: beta acid, tetra iso-alpha acid, xanthohumol, iso-alpha acid and a cruder form of hop derivative has been formulated for the treatment of dental caries.[5]

In prevention of periodontal disease

Periodontal disease is a group of illnesses in the form of gingivitis and periodontitis, located in the gums and dental support structures (ligament and alveolar bone) and are produced by certain bacteria encountered in sub gingival plaque.[4]

Periodontal disease begins with gum inflammation and leads to pockets of infection, bone loss and eventually loosening of teeth.

Porphyromonas gingivalis, a major periodontal pathogen, triggers a series of cellular inflammatory responses including the production of prostaglandin E_2 (PGE_2), which causes periodontal destruction, hop- and apple-derived polyphenols (HBP and ACT, respectively) inhibit PGE_2 production by human gingival epithelial (HGE) cells stimulated with *P. gingivalis* components [5]

A special extract of the hops, called “hops bract polyphenols,” has shown a bit of promise for preventing or treating periodontal disease.[6]

In management of Halitosis

A plurality of botanical agents and dentifrices can be employed to prevent halitosis commonly referred to as bad breath.

The total amount of the herbal component, i.e., the amount of all botanical agents and extracts thereof in the composition, can vary over a broad range, depending on the potency of individual botanicals or extracts thereof selected, on the oral health benefit targeted, and on other factors. In most cases, for each 100 parts by weight in total of calcium carbonate and red iron oxide, an amount of about 0.5 to about 20 parts by weight of the herbal component will be found effective.[7]

Hop polyphenols in food for prevention of Dental caries

Polyphenols derived from hop (*Humulus lupulus* L.) bract region (HBP) can be used as food materials, thereby preventing dental caries. The polyphenols from hop bract (HBP) region were purified by counter

current chromatography (CCC). The fractions were analyzed by high-performance size-exclusion chromatography (HPSEC) and reversed phase high-performance liquid chromatography (RP-HPLC). From HBP fractions by HPSEC, some low-molecular-weight polyphenols (glycosides of flavonoids, catechins, and proanthocyanidins) were identified .However, a hydrophilic fraction was found to have the most potent cavity-preventive activity, but it showed no peak in its RP-HPLC chromatogram (absence of small polyphenols). HPSEC analysis showed that the major components of this fraction were high-molecular weight substances, which were supposed to be proanthocyanidins, consisting of approximately 22 catechin units in its structure.[8]

Leopold Jirovetz *et al* conducted a study on antimicrobial testing, gas chromatographic analysis, olfactory evaluation of the essential oil of hop cones from Bavaria. The tree main components of the oil were found to be isobutyl isobutryrate, geraniol, beta-pinene. These were tested against gram positive and gram negative bacteria as well as *candida albicans* by agar diffusion and agar dilution methods, the results showed positive anti-microbial activity.[9]

Sanchita Bhattacharya *et al* conducted a research determining inhibition of *Streptococcus Mutans* and other oral streptococci like *S.sanguis, S.salivarius* by Hop (*Humulus Lupulus* L.) constituents The hop constituents studied were purified beta acid, xanthohumol, iso-alpha acid and tetra iso-alpha acid. The antimicrobial activity of these hop constituents was tested against four strains of *Streptococcus mutans* as well as one strain each of *Streptococcus sanguis* and *Streptococcus salivarius* and compared to antimicrobial essential oils used in mouthwashes in two independent assay systems. It was found that all tested hop constituents inhibited the Streptococci. The minimum inhibitory concentration at pH 7.5 ranged from 2 to 50 µg/ml depending on the microorganism and hop phytochemical tested. Antimicrobial activity of hop constituents was found to be greater than other plant products such as thymol, nerol, cinnamon oil, oil of clove, menthol and eucalyptol. [10]

Inaba.*H et al* conducted a study determining if apple- and hop-polyphenols protect periodontal ligament cells stimulated with enamel matrix derivative from Porphyromonas gingivalis. These results suggest that AP (Apple and Hop-polyphenols), ACT(apple condensed tannin), HBP(hop bract polyphenol), and HMW-HBP protect Enamel Matrix Derivative-stimulated PDL cells from P. gingivalis and may be therapeutically useful supplements for EMD therapy .[11]

The yellow lupulin glands within the hop cones contain resins and essential oils which have a distinct bitter taste and aroma. The bittering compounds are classified into alpha and beta acids. Alpha acids are represented by humulone and its congers, the beta acids are represented by lupulone and its congers.[12] Hop extracts are known to have anti bacterial and anti microbial activity. The beta acids have greater activity than the iso alpha acids against *streptococcus mutans.* The constituents of hop are purified beta acid, xanthohumol, isoalpha acid and tetra isoalpha acid. Anti microbial activity of the hop constituents were found to be greater than that of thymol, nerol, cinnamon oil, oil of clove, menthol and eucalyptol.[13] The hop bitter acids inhibit gram positive bacteria however certain species of lactobacillus are not affected. A special extract of the hop plant called “hop bract polyphenols” has shown promise for preventing caries and treating or preventing periodontal diseases

Dosage: The standard dosage of hops is 0.5 g taken 1 to 3 times daily until required.[14]

Leaves of hop plant

It should be noted that both male and female flowers are present; the males do not have aromatic properties. Lupulin glands are present predominantly on the perianth of the female flower

General uses of hop

Sedation, anxiety reliever, reduce symptoms of rheumatic arthritis and osteoarthritis, menopausal symptoms, appetite stimulant, antispasmodic, irritable bowel syndrome etc.[15] The major use of hop in the present day is conversion of ale into beer. It acts as a presative to prevent beer from spoiling and widely used in breweries.

CONCLUSION

Apart from its uses in orodental infections such as dental caries and periodontitis, humulus lupulus is employed for many other primitive uses. Since it is naturally obtained and had less side effects when compared to conventional drugs it should be sought out as a preferred method of treatment in orodental infections not withstanding its anti microbial properties. In dental application it can be used in caries, periodontal problems, loose teeth, sensitive teeth and frequent cavities.

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