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File: ■ Essential Oils
■ Dentistry
■ Therapeutic Properties

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RE: Essential Oils in Oral Health

Dagli N, Dagli R, Mahmoud RS, Baroudi K. Essential oils, their therapeutic properties, and implication in dentistry: a review. *J Int Soc Prev Community Dent*. September-October 2015;5(5):335-340.

Plant essential oils (EOs) are secondary metabolites, complex mixtures of terpenic hydrocarbons, especially mono- and sesquiterpenes, and oxygenated derivatives like aldehydes, ketones, epoxides, alcohols, and esters. Differing greatly in composition from species to species, even EOs from the same species harvested in different regions may vary. Plant maturity at time of extraction also affects composition. About 3000 EOs have been described so far. Many of them have been used medicinally, including in dentistry, since ancient times. EOs are well known to possess antibacterial, antifungal, and antioxidant properties. The mechanisms of antimicrobial effect differ according to chemical composition and the location of functional groups on bioactive molecules; membrane damage to microbes is thought to be the main mechanism of action, due to the solubility of EOs in the phospholipid bilayer of cell membranes. In addition, EOs' terpenoids have the ability to interfere with enzymatic reactions of energy metabolism of microorganisms.

This review focuses on EOs with regard to their potential application in dentistry. Oral health problems, especially dental caries and periodontal disease, persist despite improvements in oral health in some countries, particularly among underprivileged groups. Several antimicrobial agents classically used to treat oral infections may cause adverse effects (AEs) and promote the development of resistance. Therefore, there is a need to identify alternative antimicrobial agents. The authors searched the PubMed database for clinical trials and reviews of specific EOs, published up to February 2015. A total of 70 articles were found; 52 were included in this review. Inclusion criteria are not specified.

Lavender (*Lavandula* spp., Lamiaceae) oil includes linalool, linalyl acetate, lavandulol, 1,8-cineole, and other constituents varying by species and extraction method. The activity of whole EOs is reflected by the activity of linalool, indicating that it is likely the active compound. EOs from various lavenders are active against bacteria, filamentous fungi, and yeasts. Interestingly, one species has been reported to be active against antibiotic-resistant bacteria. Lavender EOs are anxiolytic, reducing stress and improving mood. Given this property, lavender oil may be used to reduce anxiety before dental procedures and lessen the pain of needle insertion.

Eucalyptus (*Eucalyptus* spp., Myrtaceae) oil contains as major constituents 1,8-cineole, cryptone, α-pinene, *p*-cymene, and α-terpineol. Its antimicrobial effects are likely to involve

several components acting in synergy rather than a single molecule component. Several species of *Eucalyptus* have antibacterial effects towards both Gram+ and Gram− bacteria, including oral pathogens, thus supporting their use as an anticariogenic agent. Moreover, eucalyptus EO possesses anti-inflammatory effects and can stimulate the innate cell-mediated immune response.

The widely used peppermint (*Mentha* × *piperita*, Lamiaceae) oil has menthol as its major compound, along with menthyl acetate and menthofuran. It inhibits the proliferation of *Staphylococcus* spp., as well as both azole-resistant and azole-susceptible *Candida* spp. strains. Peppermint EO possesses a fungal anti-biofilm effect and dose-dependently inhibits *Candida albicans* biofilm formation.

Tea tree (*Melaleuca alternifolia*, Myrtaceae) oil (TTO) contains terpinen-4-ol, γ-terpinene, *p*-cymene, α-terpinene, 1,8-cineole, α-terpineol, and α-pinene. It is active against dental biofilm and was found to be strongly antibacterial against oral pathogens. It is also antimycotic, with terpinen-4-ol being mostly responsible for this effect. TTO can be used to treat oral candidiasis, although one study found terpinen-4-ol safer and more effective.

Lemon (*Citrus* × *limon*, Rutaceae) oil is made up almost entirely of terpenes and oxygenated terpenes. It has been found effective against three *Candida* spp. and has been suggested for the treatment of *Candida albicans* infections.

Constituents of clove (*Syzygium aromaticum*, Myrtaceae) bud oil include the phenylpropanoids eugenol, eugenyl acetate, carvacrol, thymol, cinnamaldehyde, β-caryophyllene, and 2-heptanone. It possesses antioxidant, antifungal, and antibacterial properties, and is even active against multi-resistant strains of *Staphylococcus* spp. Eugenol is well known for its therapeutic properties, being effective against pathogens associated with tooth decay and gum disease, and is thus widely used in dentistry.

Oils from the bark, leaf, and root of various cinnamons (*Cinnamomum* spp., Lauraceae) differ widely in composition. In Ceylon cinnamon (*C. verum* syn. *C. zeylanicum*) bark oil, *trans*-cinnamaldehyde, eugenol, and linalool make up 82.5% of the total compounds. Cinnamaldehyde is the most active constituent. Cinnamon EO inhibits both Gram+ and Gram− bacteria, as well as many fungi. It is known to possess antimutagenic properties in vitro and in vivo and has been found to have significant anti-melanoma activity. Ceylon cinnamon EO is also known to have antiparasitic and antioxidant effects, with free radical scavenging activity. A phase I clinical study found cinnamon EO safe and effective for treating patients with denture-associated oral candidiasis.

Combining EOs with other antibacterial agents can lower resistance in multidrug-resistant bacteria. In this regard, peppermint, cinnamon bark, and lavender EOs can potentiate the effect of piperacillin against antibiotic-resistant bacterial strains.

Not all the studies reviewed support the use of EOs. A study comparing an EO mouthwash with 0.2% chlorhexidine found EOs effective for two to three hours only, thus suggesting that the use of chlorhexidine may be preferable. Another study found no benefit over water in using EOs as a coolant in ultrasonic root debridement. Some AEs have been reported in regard to the use of EOs, ranging from dermatitis to tonic-clonic seizures. Nonetheless, although additional clinical trials are required, there is considerable evidence that EOs may be useful in dental therapy to improve the quality of dental treatments.

—Mariann Garner-Wizard

Referenced article can be accessed at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4606594/.