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File: ■ Tea Tree (*Melaleuca alternifolia*)
■ Dermatology

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RE: Applications of Tea Tree Oil in Dermatology

Pazyar N, Yaghoobi R, Bagherani N, Kazerouni A. A review of applications of tea tree oil in dermatology. *Int J Dermatol*. 2013;52(7):784-790.

Tea tree oil (TTO) is obtained by steam distillation of terminal branch leaves of the native Australian plant, *Melaleuca alternifolia*. TTO (also known as "melaleuca oil") has demonstrated effectiveness for various skin infections and inflammatory immune-related skin disorders. This review is the first to summarize findings of in vivo, in vitro, and clinical studies for applications of TTO in dermatology.

Medical literature searches were performed in two databases (PubMed and ISI Web of Knowledge), limited to articles published in English from 1990 to February 2011 containing the terms "tea tree oil," "dermatology," and equivalent terms. The search produced 47 references total. Results of the search allowed information to be collected on the bioactive constituents of TTO and its chemotypes, as well as any adverse effects and the mechanism of action of TTO. A review of in vitro, in vivo, and clinical studies produced results on studies testing TTO use for regulation of wheal and flare, and use of TTO as an antioxidant, antibacterial, antiviral, antifungal, and antiprotozoal agent. Research on use of TTO in treatment of acne vulgaris, seborrheic dermatitis, and wound healing was also reviewed. Additional research included the antitumor activity of TTO against melanoma and its potential use as a chronic gingivitis treatment.

TTO is at least 30% terpinen-4-ol (a major component of TTO) and no greater than 15% 1,8-cineole. Topical application of TTO can cause adverse reactions at higher concentrations. 1,8-cineole is an undesirable allergen, and adverse reactions to TTO diminish with minimization of 1,8-cineole content.[1] TTO can be potentially toxic if ingested at high doses; however, no human deaths caused by TTO were reported in the literature. In contrast to 1,8-cineole, terpinen-4-ol exhibits strong antimicrobial and anti-inflammatory properties, mediated through reduction of tumor necrosis factor (TNF), interleukin-1 (IL-1), IL-8, IL-10, and prostaglandin E2 production. Commercial TTO products are of a terpinen-4-ol chemotype.[2]

Topical application of TTO has been shown to regulate wheal and flare by reducing histamine-induced edema often associated with type I allergic immediate

hypersensitivities.[3-5] As for the antibacterial activity of TTO, terpinen-4-ol has activity against methicillin-resistant *Staphylococcus aureus* (MRSA) and coagulase-negative staphylococcus. Research has shown TTO treatment to be comparable to topical antibiotics against *S. aureus* with no resistance detected, and washing with TTO effectively removed MRSA from skin. Studies on the antibacterial activity of TTO show that TTO could also be effective against oral bacteria, reducing the amount of plaque that develops. Antiviral research shows that TTO has virucidal activity against herpes simplex virus 1 (HSV-1) and HSV-2, and that TTO could be an effective treatment of recurrent herpes labialis and hand warts caused by human papillomavirus.

Studies on the antifungal activity of TTO demonstrate effectiveness against *Madurella mycetomatis* and *Candida* in vitro. In addition, randomized controlled trials have demonstrated effectiveness for TTO use in treatment of interdigital tinea pedis and distal subungual onychomycosis. Research on antiprotozoal properties of TTO show that TTO is able to reduce growth of *Leishmania major* and *Trypanosoma brucei*, in addition to being effective against *Trichomonas vaginalis*. In vitro research demonstrated that no mites of *Sarcoptes scabiei* var. *hominis* survived three hours of exposure to 5% TTO. The insecticidal characteristic may be attributable to anticholinesterase activity of TTO. TTO has also shown efficacy for treatment of eyelid demodex, improving demodicidosis.

The rationale for TTO as treatment for acne vulgaris is formed on the basis that TTO has demonstrated broad-spectrum antimicrobial and anti-inflammatory properties in vitro. TTO could be used as an alternative to antibiotics as emergence of antibiotic-resistant strains is problematic. TTO treatment for seborrheic dermatitis is based on seborrheic dermatitis being considered a superficial fungal skin disorder caused by an overactive inflammatory response to colonization by the yeast *Malassezia furfur*. TTO exerts antifungal activity against *Malassezia* species, and the review reported one study showing TTO was useful and well tolerated in the treatment of dandruff.

The authors found one study reporting use of TTO hydrogel for cooling burn wounds and increasing the rate of wound healing in immediate and delayed applications. Research on the antitumor activity has shown that TTO can inhibit growth of melanoma cells, specifically, drug-resistant melanoma cells. Research reviewed also mentioned use of the anti-inflammatory properties of TTO for topical treatment of inflamed gingival tissues, and possibly chemotherapeutic periodontal therapy.

This present review highlights dermatological applications for which TTO (and its main component terpinen-4-ol) has shown promise as treatment. The authors suggest that, for conditions where TTO treatment is of benefit, further research should be done to establish guidelines for application.

Adverse side effects may include skin irritation and allergic contact dermatitis.

—Alexis Collins

References

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