

## LITERATURE REVIEW ON CORRELATION OF THE COMPONENTS OF TEA TREE OIL WITH ITS ANTIBACTERIAL EFFECTS AND SKIN IRRITATION

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**Introduction:** Tea tree oil (TTO), is a natural essential oil derived from the leaves of *Melaleuca alternifolia*, thus also known as melaleuca oil. It has a fresh camphoraceous odor and is native to Australia. It has been traditionally used for its medicinal properties, including antibacterial, antifungal, anti-inflammatory, and wound-healing effects. However, the oil comprises many constituent chemicals hence, its use has been associated with skin irritation, allergic reactions, and other adverse effects. This literature review aims to explore the correlation between the components of TTO and its antibacterial effects and skin irritation.

**Components of TTO:** TTO is a complex mixture of over 100 components, mainly consisting of terpenes, terpinen-4-ol (35.0-48.0%), and  $\gamma$ -terpinene (14-28%),  $\alpha$ -terpinene (6.0-12.0%). Terpinen-4-ol is considered the most important component of TTO, as it is responsible for most of its antibacterial effects. Other important components of TTO include 1,8-cineole (traces-10.0%), terpinolene,  $\alpha$ -terpineol,  $\alpha$ -pinene, p-Cymene, Sabinene, limonene, aromadendrene, ledene and globulol.

**Antibacterial effects of TTO:** Studies have investigated the antibacterial effects of TTO and its components. The essential oil of *Melaleuca alternifolia* consists largely of cyclic monoterpenes of which about 50% are oxygenated and about 50% are hydrocarbons. It has been shown to exhibit broad-spectrum antibacterial activity against various Gram-positive and Gram-negative bacteria, including *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*. The antibacterial activity of TTO is attributed to its components, especially terpinen-4-ol, has shown a strong antibacterial effect against several bacterial strains. Other components of TTO, such as  $\alpha$ -terpineol and  $\gamma$ -terpinene, also have significant antibacterial activity.

**Skin irritation caused by TTO:** *Melaleuca* oil has been reported to cause skin irritation, especially when used undiluted or at high concentrations. The skin irritation caused by TTO is attributed to its components, especially terpinen-4-ol, which is a potent skin irritant. Other components of TTO, such as 1,8-cineole, can also contribute to skin irritation.

**Correlation between components and antibacterial effects:** Several studies have investigated the correlation between the components of TTO and its antibacterial effects. A study by Carson et al. (2006) found that the antibacterial activity of TTO against *S. aureus* and *E. coli* was strongly correlated with the concentration of terpinen-4-ol. Another study by Hammer et al. (2003) found that the antibacterial activity of TTO against *P. aeruginosa* was strongly correlated with the concentration of  $\gamma$ -terpinene.

**Correlation between components and skin irritation:** The correlation between the components of TTO and skin irritation has also been investigated. A study by de Groot et al. (1998) found that terpinen-4-ol was the main component responsible for the skin irritation caused by TTO. Another study by Reichling et al. (2006) found that the concentration of 1,8-cineole was correlated with the degree of skin irritation caused by TTO.

**Conclusion:** TTO has been used traditionally for its medicinal properties, growing in popularity, the melaleuca oil has been in use in most of the cosmetics nowadays as it is promoted for its anti-inflammatory and healing properties. The antibacterial activity of TTO is credited to its components, especially terpinen-4-ol, which is considered the most important component. However, the use of TTO has been associated with skin irritation, which is also connected to its components, especially terpinen-4-ol and 1,8-cineole. Hence, further studies are needed to investigate the safety and efficacy of TTO and its components for use in various medical and cosmetic applications.