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Review Article

Essential Oils in Acne Treatment

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Abstract

An overview is provided of the use of essential oils in dermatology together with a brief review of the pathogens most commonly associated with acne vulgaris and the current standard treatment regimens for the conditions.

The essential oils identified for the treatment of acne vulgaris and, where relevant, the disadvantages that are associated with their use are discussed. The growing interest in the use of manuka oil, specifically oil distilled from plants grown in New Zealand's East Cape region, is a significant development in the topical treatment of acne with essential oils. The current consensus is that the anti-acne properties together with the anti-inflammatory and wound healing benefits of manuka oil are due to its high β-triketone content, particularly of oils from plants derived from that particular region of New Zealand.

Keywords: *Essential Oils; Acne Treatment; Acne Vulgaris; Manuka Oil; β-Triketone Content*

Introduction

Essential oils are popularly used in dermatology because they are readily available and gainsay the development of antimicrobial resistance found with antibiotics. Further, at least 90 essential oils with in at least 1500 combinations are recommended for dermatological use based on their antimicrobial activity [1], In fact, it is now well-established that, based on over 500 reports in the literature over the period 1987-2001, a large number of essential oils, including manuka and tea tree oils, and their constituents exhibit antimicrobial properties against bacteria and fungi [2].

Interestingly, whereas dermatological skin pathogens such as *Staphylococcus aureus* have been studied in depth, other skin-colonizing pathogens such as *Streptococcus pyogenes, Propionibacterium acnes*, *Haemophilus influenzae* and *Brevibacterium spp*. have received far less scientific study [1].

Acne vulgaris or more simply "acne" is a chronic inflammatory follicular disorder of the skin. Two bacterial species, *Propionibacterium acnes* (*P. acnes*) and *Staphylococcus epidermidis* (*S. Epidermis)*, play critical roles in the outbreak of acne by inducing inflammation and forming comedones[1].

[1]Comedones are small, flesh-colored, white, or dark bumps giving skin a rough texture that are caused by acne and usually contain a plug of sebum in a skin pore.

Currently, the main methods of treatment for acne vulgaris include topical medication, retinoids, antibiotics and anti-inflammatory drugs [3]. However, prolonged use of these drugs may cause various side effects, notably skin irritation, dryness, flushing, itching and, frequently, resistance to the applied drug. Consequently, there has developed a growing demand for effective but natural alternatives, the underlying concept being that the use of natural products exhibiting anti-bacterial activity to treat acne may elicit significantly fewer side effects than existing medications.

Essential oils used to treat acne

Various books, scientific papers and internet blogs advocate the use of essential oils to treat acne [1,2,4-7] and the ones most frequently cited for this purpose are noted in table 1. Based on the findings of a variety of studies and from an overall review of their anti-bacterial, anti-inflammatory, antioxidant and sebum reduction properties, the essential oils that appear to be optimal for acne treatment are provided with an asterisk in table 1.

Bitter orange (*Citrus aurantium*)
Chamomile (*Anthemis aciphylla var. discoidea*)
Cinnamon (*Cinnamomum zeylanicum*)
Clary sage (*Salvia sclarea*)
Clove (*Syzygium aromaticum*)
Eucalyptus (*Eucalyptus globulus*)*
Ginger (*Zingiber officinale*)
Juniper (*Juniperus communis*)
Kānuka (*Kunzea ericoides*)
Korean fir (*Abies koreana*)
Lavender (*Lavandula angustifolia*)*
Lemon (*Citrus medica limonum*)*
Lemongrass (*Cymbopogon citratus* and *C*. flexuosus)#
Manuka (*Leptospermum scoparium*)
Oregano (*Origanum vulgare*)*
Peppermint (*Mentha piperita*)*
Rose (*Rosa centifolia*)
Rosemary (*Rosmarinus officinalis*)*
Spearmint (*Mentha spicata*)
Tea tree (*Melaleuca alternifolia*)
Thyme (*Thymus vulgaris*)*

Table 1: *Essential oils with antimicrobial activity suggested for acne treatment.*

#: Note that Cymbopogon flexuosus is primarily used in aromatherapy. The lemongrass of most EO companies comprises the East Indian C. flexuosus whereas C. citratus is West Indian in origin and contains myrcene. In contrast, C. flexuosus contains very little mycene, a medication often used to treat the symptoms of too much stomach acid, typically stomach upset, heartburn, and acid indigestion.

It must be mentioned, however, that not all the essential oils listed in this table are without risk of causing skin irritation or other adverse effects. Tea tree oil gel, for example, is recognized as being an effective treatment for mild to moderate acne [1,4-6], but nearly 5% of tea tree oil (TTO) users are reported to develop allergic skin reactions [5]. These side reactions may include skin dryness, redness, stinging, itching, scaling and a burning sensation at the application site although these side effects may be less severe than those caused by the standard benzoyl peroxide medication.

In this context of skin sensitization, authentic TTOs (especially oxidized ones) have been identified as potential skin sensitizers whereas there are fewer reports of adverse allergic reactions to the other tea trees essential oils [8]. It should be mentioned here that it is common to refer to all trees in the myrtle (myrtaceae) family as "tea trees", which can cause confusion. Thus, the well-known tea tree oil (TTO) comes from the tea tree (*Melaleuca alternifolia*) whereas manuka oil and manuka honey derive from Leptospermum scoparium, which is native to New Zealand and south-east Australia and commonly called mānuka, mānuka myrtle, New Zealand tea tree, broom tea-tree, or just tea tree. TTO and manuka oil differ quite significantly in their compositions and properties.

In general, chemical sensitizers are usually electrophilic compounds, and *in chemico* methods have been developed to identify skin allergens in terms of their ability to bind to biological nucleophiles. However, little information is available on the assessment of sensitization potential of mixtures, such as essential oils, due to their complexity [8].

Peppermint oil, for example, is known to possess antibacterial and anti-inflammatory properties [4,9] but it can cause skin irritation depending upon its content of pulegone [10], the safe concentration limit of which should be ≤ 1%. This concentration of pulegone in peppermint oil is achieved both by controlling the time of harvest and the processing technique.

Another example where caution over its use should be exercised is lemon oil which has a relatively high content of furocoumarins, and these can increase skin sensitivity to UV light, especially for light-skinned people. Likewise, pregnant or nursing women should avoid oregano and rosemary oils.

Further, as a basic rule of thumb, very few essential oils should be used undiluted on the face or other sensitive areas and even when admixed with a suitable diluent or carrier oil, skin tests on less vulnerable areas should be performed before facial application. The number of drops of essential oil for different volumes of carrier oil required for different dilutions are indicated in table 2.

Carrier oil volume	1%	2%	5%	10%
1 Teaspoon (5 ml)	1d	2d	5d	10d
1 Tablespoon (15 ml)	3d	6d	15d	30d
1 Fluid ounce (30 ml)	6d	12d	30d (1.5 ml)	60d (3 ml)

Table 2: *Volume of essential oil drops(d) required for dilution with carrier oils.*

Whereas a variety of carrier oils are available for diluting essential oils [4], many carry some risk of causing skin irritation and certain carrier oils such as coconut oil can be comedogenic[2]. There are indications that jojoba, coconut, olive and almond oils, all of which have higher contents of oleic acid than linoleic acid, may cause skin irritation with people with sensitive skins. In contrast, rosehip, sunflower and evening primrose oils are thought to be very satisfactory essential oil diluents, not the least because they can be very effective skin moisturizers.

[2]Having a tendency to cause blackheads by blocking skin pores.

In contrast, rosehip, sunflower, medium chain triglycerides (aka fractionated coconut oil), and evening primrose oils are thought to be very satisfactory essential oil diluents, not the least because they can be very effective skin moisturizers.

There is increasing evidence [1,4] that combinations of essential oils as well as mixtures of EOs with conventional antimicrobials can achieve greater efficacy due to synergistic effects. Although there is a growing literature on the antimicrobial dermatological activity of essential oils, studies of antiviral effects involving dermatology appear to be very limited. Likewise, there is limited availability of data on the interactions between EOs and carrier oils with regard to antimicrobial activity.

Manuka oil vs. acne

As previously stated, over the past 20 - 30 years the literature has reported a large number of studies of the antimicrobial properties of essential oils and their constituents, with a growing interest in their use for treating acne. In recent years, there has been a significant increase in the attention being paid to manuka oil [1,11-14].

Despite this interest, manuka essential oil is still underutilized and there is limited research data on how manuka oil works. The present consensus is that the anti-acne properties, together with the anti-inflammatory and wound healing benefits, of manuka oil are due to its high β-triketone content, particularly of oils from plants derived from New Zealand's East Cape region [1].

Although few clinical studies of manuka being used to treat acne have been reported, at least one clinical study [13] reported significant improvement in the acne after treatment with mānuka oil compared with a control group. Significant improvements were found in both objective and subjective parameters, including total microbial number in face, sebum content, erythema index, melanin index and pore index, compared with the control group. It was concluded that the anti-acne effects of manuka oil were through its antibacterial properties alleviating the red spots on the face and reducing the melanin index. Further, manuka oil would be an useful ingredient for the development of anti-acne cosmetics. Other workers [12,14] reached similar conclusions but without the clinical data of Kim., *et al* [13].

The relative efficacies of manuka and tea tree oils against acne-related bacteria are indicated in table 3 [12].

Pathogen	Mānuka Oil	Tea Tree Oil
S. epidermidis	0.14	0.4
P. acnes	0.055	0.2

Table 3: *Minimum inhibitory concentrations (%v/v) of manuka and tea tree oils.*

The data clearly indicate that manuka oil is 2.5 - 3.5 X more effective against *S. epidermidis* and *P. acnes* than its related TTO and that a minor addition, ca. 0.2% of manuka oil, may improve anti-acne formulations.

The other major advantage of manuka oil as an anti-acne treatment is that it does not appear to be irritant to the skin [8,15,16]. This is an important consideration since, as noted above, many potentially effective anti-acne essential oils can be irritant to the skin.

Conclusion

The emerging resistance to drug-based antimicrobial and anti-parasitic treatments, together with the extensive *in vitro* data supporting the medicinal properties, notably antibacterial activity [17], of essential oils has stimulated growing interest in alternative therapies for dermatological problems. The research work review here clearly indicates that many essential oils, most notably manuka and tea tree oils but also those indicated in table 1, hold promise to innovative and natural treatments for that age-old scourge for teenagers and adults, namely acne vulgaris.

Despite the promise indicated in *in vitro* and rather limited *in vivo* studies, there is a need to characterize the antimicrobial activity of essential oils, both individually and when used in combination with other oils and antimicrobial agents, to maximize their potential to become clinically useful products. Understanding the mechanism of action is obviously important for its implications with regard to the selectivity and safety of antimicrobial agents. In addition, more valid and statistically verifiable clinical studies should be performed on different age group sufferers and also, hopefully, with patients possessing a variety of skin types and textures.

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