Influence of essential and fatty oils on ciliary beat frequency of human nasal epithelial cells

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ABSTRACT

Background: *In alternative and complementary medicine, the use of essential and fatty oils has become more and more popular. In addition to conventional medical therapies, self-medication is showing increasing popularity, using agents with unclear compounds and poorly controlled dosages. Among other disorders, these alternative treatments are used in bronchitis and rhinitis, including some topical applications. Thus, the influence on ciliated epithelia should be evaluated, because a disturbance of the ciliary function can lead to recurrent sinusitis and chronic rhinosinusitis. The aim of this study was to test the influence of fatty and essential oils on the ciliary beat frequency (CBF) of nasal mucosa* in vivo.

Methods: *The influence of sesame oil, soy oil, peanut oil, Miglyol 840, thyme oil, lavender oil, eucalyptus oil, and menthol on the ciliary activity of nasal brushings was evaluated by digital high-speed imaging.*

Results: *The presence of most fatty oils resulted in an increase in CBF, the effect being highest for peanut oil. Miglyol 840 had no significant influence on CBF. The essential oils were tested at a concentration of 0.2 and 2%. Thyme oil did not affect CBF, whereas the presence of all other essentials oils resulted in an increase in CBF; the effect was higher at 0.2% than at 2%.*

Conclusion: *Except thyme oil and Miglyol 840, all tested oils caused an increase in CBF. Interestingly, the 0.2% concentrations of essential oils resulted in stronger effects when compared with the 2% concentrations.*

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Key words: Alternative medicine, ciliary activity, ciliary beat frequency, essential oils, fatty oils, high speed camera, *in vivo*, nasal brushings, nasal drugs, nasal mucosa

Alternative and complementary medicine has become more and more popular worldwide. Fifty percent of the population in Australia[1], 33% in the United States,[2] and 25% in the United Kingdom[3] have already tried complementary treatment.[4] Herbalism and aromatherapy, as well as homeopathy, acupuncture, and osteopathy are among the most common methods.[5] Successful therapy with different herbal pharmaceuticals is reported.[6–8] Herbal drugs are either inhaled, intranasally applied, or administered orally, as drops, syrups, or tablets. Most of the treatments are based on empiric methods and the lack of evidence-based data is obvious. Results have to be objectified and the mechanism of action should be analyzed.

Essential oils are heterogenic liquid mixtures of volatile and lipophilic compounds that display characteristic aromatic smells.[9] In medicine, they are used among others as expectorants, antiseptic agents, and spasmolytics in bronchitis and rhinitis, as well as in aromatherapy.[4,10] A mixture of menthol, camphene, and essential oils, *e.g.*, is used as broncholytics and secretolytics.[11]

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In contrast to essential oils, fatty oils are esters of fatty acids with glycerol. They are liquid at room temperature and not volatile. Medical products with fatty oils, such as sesame oil, almond oil, and Miglyol 840, are used as ingredients in sprays and drops for nasal mucosa care (*e.g.*, Coldises; Sigmapharm GmbH & Co. KG, Vienna, Austria and Sasol Germany GmbH, Witten, Germany).

Besides the conventional medical therapies, additional self-medication with different agents shows increasing popularity in the western community; for these agents, the amount of compounds and dosages often is not controlled. The goal of this study was to investigate the influence of different essential and fatty oils on ciliary beat activity in human nasal epithelial cells. In addition, we tested whether higher concentrations of essential oils are harmless or if they cause an undesired disturbance of the ciliary beat activity influencing the mucociliary clearance. A disturbance of the mucociliary clearance can lead to recurrent sinusitis and in succession to chronic rhinosinusitis.[12] However, data on the consequences of herbal extracts, *e.g.*, essential and fatty oils, on ciliary beat frequency (CBF) of human nasal epithelial cells are missing in the literature.

MATERIALS AND METHODS

Oils

The following oils were used in our experiments:

1. Fatty Oils. Sesame oil, soy oil, and peanut oil were purchased from Herba Chemosan (Rum, Austria). Miglyol 840 was a gift of Sasol Germany GmbH (Witten, Germany).