

ABSTRACT

Fragrances are ubiquitous in our environment. Not only cosmetics and toiletries contain fragrance materials but most household and occupational products are scented. Because of their widespread use fragrances are next to nickel the most common cause of contact allergy in the population and among eczema patients and thus constitute a significant clinical problem. Terpenes are because of their odorous properties frequently used in fragrances. Due to air oxidation (autoxidation) terpenes may form oxidation products with allergenic properties on air exposure.

In this thesis, the autoxidation at room temperature of the commonly used fragrance terpenes linalool, β -caryophyllene, β -myrcene, and linalyl acetate was investigated. The main focus was on the formation of hydroperoxides since they are known to be strong contact allergens. The effect of autoxidation on the contact allergenic activity of the compounds was investigated by testing the sensitizing capacity before and after air exposure. The oxidized terpenes were also used for screening in consecutive dermatitis patients.

All terpenes studied autoxidized on air exposure. The autoxidation of linalool and β -caryophyllene was carefully examined. Many oxidation products were identified in oxidized linalool, including two hydroperoxides, which were shown to be strong contact allergens. In oxidized β -caryophyllene no hydroperoxides could be detected. The only oxidation product identified was the moderately sensitizing caryophyllene oxide. Accordingly, oxidized linalool showed a relatively strong allergenic activity, while oxidized β -caryophyllene was only weakly sensitizing. Autoxidation of linalyl acetate gave a similar pattern of oxidation products as linalool and the allergenic activity was affected to the same extent. β -Myrcene polymerized rapidly when air exposed and no oxidation products were identified but an increased sensitizing capacity was observed after air exposure compared to the pure compound.

The importance of formation of stable hydroperoxides was also evident in the patch test study on consecutive dermatitis patients. A high frequency of positive reactions (1.7%) was seen to oxidized linalool and/or the hydroperoxide fraction of linalool while fewer reactions were observed to oxidized β -caryophyllene and β -myrcene. However, it is important to consider also the more frequent exposure to linalool in the population.

Essential oils are often claimed to be protected from autoxidation by occurrence of natural antioxidants. Lavender oil, an essential oil containing linalool, linalyl acetate, and β -caryophyllene, was included in these studies. The compounds were found to oxidize also in the oil, and the same oxidation products could be identified as in the oxidation mixtures of the pure compounds, including the hydroperoxides of linalool and linalyl acetate.

The results show the importance of investigating the effect of autoxidation on the allergenic activity for each compound of interest. The formation of stable hydroperoxides seems to be essential for a significant increase in sensitizing capacity which means that not only the degradation of a compound needs to be investigated but also the composition of the obtained oxidation mixture. In order to develop effective preventive strategies it is necessary to know the true allergens with which people come in contact. To be able to reduce the frequency of contact allergy to fragrances, compounds with low allergenic potential and low content of oxidation/degradation products should preferentially be used.

Keywords: autoxidation, contact allergy, essential oil, FCAT, fragrance, hydroperoxide, LLNA, patch testing, radical reaction, sensitization, structural elucidation, terpene
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