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# Non-combustible air fresheners: exposure and health risk assessment

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## SUMMARY

As part of the French National Plan on Indoor Air Quality, an exposure and health risk assessment was performed for several types of widely used non-combustible air fresheners, including sprays, gels, oils and liquids. The assessment was based on the volatile organic compounds (VOCs) emissions of 25 air fresheners, characterized in a 1 m<sup>3</sup> test chamber, combined with a national online survey about household uses. Results obtained showed that chronic limonene exposures could exceed the French health based Lowest Concentration of Interest, for a reasonable-worst-case type scenario, mainly for active diffusers. Substances of concern also included, to a lesser extent, linalool and eucalyptol. No exceedance was identified for short term exposures (1 hour). These results suggest that good practice – use reasonably, ventilate the room after use, avoid direct inhalation, etc. – and reducing the emissions of high-emissivity products could be necessary to insure a safe use.

## KEYWORDS

Indoor Air Quality; Sprays; Passive diffusers; Active diffusers; Limonene.

## 1 INTRODUCTION

Air fresheners are one of the specific indoor emission sources of air pollutants. Potential associated exposures and health risks need to be further understood. As part of the French National Plan on Indoor Air Quality, an exposure and health risk assessment was performed for several types of widely used non-combustible air fresheners, including sprays, gels, oils and liquids, in active or passive forms, with instant, intermittent, or continuous release, in order to evaluate whether household uses could be of concern.

## 2 METHODS

The emissions of 25 non-combustible air fresheners were characterized in a 1 m<sup>3</sup> test chamber, using off-line chemical analysis for volatile organic compounds (VOCs), including gas chromatography with mass spectrometry and high-performance liquid chromatography with a UV detector.

Based on the available knowledge and on results from a national online survey performed in 2017 (approximately 1 500 people) about the French household uses, standard exposure scenarios were elaborated. They included a mean exposure scenario (mean usage in France) and a reasonable-worst-case scenario (reasonable increase of the mean exposure).

For each mainly emitted substance, existing toxicity reference values (TRVs) were collected among international databases (e.g. US-EPA, WHO, ATSDR), with and without a threshold dose, for both short-term and long-term inhalation exposures. Other reference values, elaborated by French toxicologists under indoor air regulatory test protocols, were also collected.

The exposure assessment was discussed for each scenario, tested product and substance. The obtained exposures were compared to the chosen long-term reference values, in order to highlight potential chronic risks. The maximum 1h-exposures were also compared to the chosen short-term TRVs.

### 3 RESULTS

For each substance under the mean exposure scenario, no exposure exceeded the selected health reference values. Furthermore, multi-substances exposures did not exceed reference values either. Consequently, our results suggest that no situation of concern is expected.

For the reasonable-worst-case scenario, exposures could exceed health reference values, mainly for active diffusers (i.e. using a source of energy). However, the frequency and the magnitude of exceedances were lower than those previously identified for combustible air fresheners, e.g. incenses and scented candles (Karr et al. 2016).

Substances of concern included limonene and, to a lesser extent, linalool and eucalyptol.

No exceedance was identified for short term exposures (1 hour).

### 4 DISCUSSION

These results give a complementary perspective to the results of the European project EPHECT (Trantallidi et al., 2015) that studied different types of consumer products, known to be potential sources of hazardous air pollutants in dwellings. Here, this study was focused on non-combustible air fresheners, specific to French uses, for a large set of substances and for health reference values selected under national standards.

Terpenes released by other indoor air emission sources (e.g. cleaning products, furniture, paints) could lead to higher cumulative exposures, including for limonene, linalool and eucalyptol.

These results suggest that good practice – use reasonably, ventilate the room after use, avoid direct inhalation, etc. – and reducing the emissions of high-emissivity products could be necessary to insure a safe use. Consequently, these results could help to establish health risk management actions, e.g. public information campaign, regulatory restriction on composition or on emissions, labelling of emission levels, labelling of user safety information.

The main limitation of this study was a lack of available TRVs for the VOCs emitted by non-combustible air fresheners. Results include the identification of the main needs for new toxicological data.

### 5 CONCLUSIONS

Substances of concern were identified for non-combustible air fresheners. These substances include limonene. Further tests are planned for 2018-2019, combining the elaborated exposure scenarios with experiments under real conditions, in an experimental house, in order to better understand exposures and health risks for consumers.

The strategy used in this study, i.e. combining experiments in an emission test chamber and an online survey, could be implemented to assess the health risks of any other usual consumer product.

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