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# Non-combustible air fresheners tested in an experimental house: exposure and health risk assessment

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## 1 Introduction

Air fresheners constitute one of the specific indoor emission sources of air pollutants. Potential associated health risks need to be further understood. As part of the PRESSENS research project, and in order to contribute to the French National Plan on Indoor Air Quality, an exposure and health risk assessment was performed for two types of widely used non-combustible air fresheners – sprays and (passive or active) diffusers; including liquids, gels and oils – in order to evaluate whether household uses could be a matter of concern.

## 2 Materials/Methods

Fifteen different products were tested in 2017, under real conditions, in an experimental house (CSTB, Champs-sur-Marne, France). The measurements were focused on physicochemical characterization of the particulate (PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>0.1</sub>) and gaseous (VOCs, aldehydes, terpenes) air emissions.

The exposure assessment was based on the above measured concentrations and on the results from a national phone survey (around 1 500 people) about French household uses, conducted in 2017. Generic exposure scenarii were elaborated, including a mean exposure scenario (mean usage in France) and a reasonable-worst-case scenario (reasonable

increase of the mean exposure). These generic scenarii aimed at characterising long-term (chronic) and short term (acute – 1h) inhalation exposures.

For each tested substance, toxicity reference values (TRV) were collected among international databases, for both short-term and long-term inhalation exposures, and selected as per French national standards.

Chronic and acute exposures were calculated for each scenario, tested product and substance. The obtained exposures were compared to the chosen long-term and short-term TRV, in order to characterise health risks associated with household uses.

## 3 Results and Discussion

Three types of generic scenarii were elaborated, for sprays, passive and active diffusers, respectively.

For the mean exposure scenario, uses included the following characteristics:

- For sprays, a product is used in each room of the house, with a frequency varying between twice every three days, in the toilets, and once every three months, in a bedroom. Each use corresponds to two hand-presses of one second;

- For passive diffusers, a product is used continuously in the toilet, during 10 months a year;
- For active diffusers, a product is used three times a week in the living room, during 40 minutes;
- Each room is manually ventilated, on a daily basis.

For the reasonable-worst-case scenario, uses included the following characteristics:

- For sprays, a product is used in each room of the house, at a frequency varying between six times a day, in the toilets, and once a day, in a bedroom. Each use corresponds to four hand-presses of two seconds;
- For passive diffusers, a product is used continuously in each room, during 11 months per year;
- For active diffusers, a product is used continuously in each room, during 11 months per year.
- Each room is not manually ventilated and is associated with a ventilation rate ( $0,35 \text{ h}^{-1}$ ).

Results of the exposure and risk assessments were not fully available at the time of writing. First assessments, to be confirmed, showed:

- No exposure exceeded the selected health reference values, for mean and reasonable-worst-case scenarios;
- Substances associated with the highest risks included acrolein, formaldehyde, and, to a lesser extent, benzene, limonene and benzaldehyde.

Furthermore, PM could be of concern.

Once the assessments are finished, the obtained exposures and risks will be compared to the existing results in the scientific literature (Delmas et al. 2016; BEUC, 2005; Nørgaard, 2014; Carrer, 2013; etc.) and to the results of a previous project (EBENE) on combustible air fresheners (Karr, 2016). These results will give a complementary perspective to the results of the European project EPHECT (Trantallidi et al. 2015): here, the PRESSENS project is focused on sprays and diffusers, specific to French uses, based on actual indoor air concentrations (experimental values instead of modelled concentrations), for a large set of substances (around 80 substances, including PM, instead of six substances).

## 4 Conclusions

Obtained results are expected to provide a better understanding of the levels of exposure and risk associated with French household uses of non-combustible air fresheners, complementing the results of the European EPHECT project with concentrations tested in real conditions.

Obtained results could also show what kind of good practice – e.g. use reasonably, ventilate the room after use, avoid direct inhalation, etc. – should be recommended. Furthermore, if needed to insure safe uses, obtained 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 – by identifying the substances of highest concern.

The same strategy, combining experiments in real conditions and a phone survey, could be implemented in order to assess the health risks associated with other usual consumer products.

## 5 Acknowledgement

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