Exposure Assessment

Investigating what, where, and how pollutants affect humans and the environment, and developing ways to reduce exposures, reduce costs, and improve health.

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Answers to Frequently Asked Questions

1. Why didn't you disclose brand names?

We chose not to disclose brand names for two main reasons. First, the identification of brands was not central to the objectives of this research. Second, we wanted to avert any implication that brands other than those tested would contain greater or fewer compounds of possible concern. We found similar chemicals among the 25 fragranced products tested in this study, and all products emitted at least one chemical classified as toxic or hazardous.

2. Are fragranced products safe to use?

This study did not specifically analyze health effects, and thus provides no statement on whether the products are safe to use.

3. Is exposure to fragranced products associated with adverse health effects?

Previous work by Professor Steinemann and a colleague found that nearly 38% of Americans report adverse effects when exposed to some kind of fragranced product. For instance, approximately 20% of Americans report breathing difficulties, headaches, or other health problems when exposed to air fresheners and deodorizers, and more than 10% report adverse effects when exposed to laundry products vented outdoors. Percentages are nearly twice as high for asthmatics. (See Caress and Steinemann, 2004, 2005, 2009.)

Exposure to fragranced products has also been associated with asthma and asthmatic exacerbations, migraine headaches, mucosal symptoms, and contact allergy (e.g., Millqvist and LÃ¶whagen, 1996; Kumar et al., 1995; Kelman, 2004; Elberling et al., 2005; Johansen, 2003; Rastogi et al., 2007).

Fragrance-free policies have been implemented that restrict the use of scented products in workplaces and other environments (e.g., CDCP, 2009; USAB 2000; CCOHS, 2010).

On the other hand, studies conducted by the Research Institute for Fragrance Materials maintain that fragrance ingredients are safe (e.g., Bickers et al., 2003;

The study did not test whether the fragrances were natural or synthetic.

However, a review of aroma chemicals indicated that "synthetic organic chemicals currently constitute more than 80-90% (by weight and value) of the raw materials used in fragrance and flavor formulations" (Somogyi, et al., 1998). Another study found that "natural" fragrances typically contain synthetic compounds (Rastogi et al., 1996). A single "fragrance" in a product may contain up to several hundred substances, both natural and synthetic, among more than 2,600 substances documented as fragrance ingredients.

5. Are "natural" or "organic" fragranced products any different?

Emissions from products with "natural fragrance" or "organic fragrance" were not significantly different from the other products. All products with "natural" or "organic" fragrance emitted at least one chemical classified as toxic or hazardous under federal laws. The terms "natural" and "organic" are not regulated or defined in fragranced products.

6. What about essential oils?

Emissions from products with "essential oils" were not significantly different from the other products. Each product with essential oils emitted at least one chemical classified as toxic or hazardous under federal laws. Prior work has identified potentially hazardous chemicals, such as benzene and toluene, emitted from essential oils (e.g., Chiu et al., 2009).

7. What about products with "perfume" or "parfum" - is that a fragrance?

Yes. Fragrance mixtures can also be called "perfume" or "parfum" (the French word for perfume).

8. Nearly half of the products emitted chemicals that have "no safe exposure level." What does that mean?

These chemicals are classified as carcinogenic Hazardous Air Pollutants by the U.S. Environmental Protection Agency. The EPA's position on these carcinogens is that not even one molecule of exposure is safe or risk-free. Eleven of the products emitted one or more probable carcinogens (acetaldehyde, 1,4-dioxane, methylene chloride, and formaldehyde).

9. How did you detect the chemicals?

We used headspace analysis with gas chromatography/mass spectrometry (GC/MS). Samples were prepared by placing approximately 2 grams of each product in individual, clean 0.5 liter glass flasks that initially contained only ambient laboratory air, followed by equilibration for at least 24 hours at room temperature. Samples were then analyzed for VOCs using a GC/MS system interfaced to a cryogenic preconcentrator.

We detected chemicals that were emitted directly from the products, and did not evaluate the "secondary pollutants" that could also be generated, due to reactions among product chemicals and ambient air.

10. What were the minimum and maximum concentrations you found, and what does that mean?

Headspace concentrations ranged from our minimum reporting value of 100 Âµg/m^3 to a maximum value of over 1,600,000 Âµg/m^3.

highest concentrations emitted, and more could have been identified and reported.

We note that headspace concentrations are not the same as ambient concentrations, and are typically higher.

11. Can the products emit more than volatile organic compounds?

Yes. While this study looked only at VOCs, other classes of chemicals, such as semi-volatile organic compounds (e.g., phthalates and musks), are often emitted from fragranced products. (See., e.g., Reiner and Kannan, 2006; Reiner et al., 2007; Peters, 2005.)

Secondary pollutants can also be generated. For instance, limonene (the most common chemical in these products) reacts readily with ozone (both indoors and outdoors) to generate a range of secondary pollutants, such as formaldehyde, acetaldehyde, and ultrafine particles. (See, e.g., Nazaroff and Weschler, 2004.)

12. What can we do to minimize potential exposures?

Choose products without any fragrance or scent.

Instead of air fresheners or deodorizers, use ventilation. Scented air fresheners and deodorizers do not "clean" the air, but they can add potentially hazardous chemicals to an existing air quality problem.

Use simple products to clean, such as vinegar and baking soda. (These simple products can be mixed with each other, but should not be mixed with conventional cleaners, just as conventional cleaners should not be mixed with each other.)

Note: Products called "fragrance-free" and "unscented" are not necessarily non-toxic. The chemicals identified in this study could have been part of the added fragrance, the product base, or both. Also, even if a product does not contain a fragrance, it could still contain chemicals that are classified as toxic or hazardous. Further, a "fragrance-free" or "unscented" product can nonetheless be a fragranced product with the addition of a "masking fragrance" to cover the scent.

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