



Fact Sheet

California Environmental Protection Agency
Air Resources Board

October 2008

CLEANING PRODUCTS and INDOOR AIR QUALITY

Actions you can take to reduce exposures

Keeping your home clean is one of the most important activities you can do to assure healthy indoor air quality. However, the indoor use of certain common cleaning products and air fresheners when ozone (the primary component of smog outdoors) is present may cause an increase in indoor concentrations of some pollutants. Fortunately, people who use these products can take simple steps to reduce the production of air pollutants and their exposure to these pollutants.

In a recent study funded by the California Air Resources Board (ARB), investigators from the University of California at Berkeley and Lawrence Berkeley National Laboratory measured pollutant concentrations during and after simulated cleaning activities, including mopping and general cleaning, and during use of a plug-in air freshener. The investigators found that chemicals directly emitted from the products, such as terpenes and glycol ethers, generally were below levels of concern, but that indoor chemical reactions of the substances emitted produced some other pollutants at levels of health concern. Specifically, using products that contained terpenes – which are components of pine and citrus oils – in rooms where elevated levels of ozone were present, resulted in the production of formaldehyde and ultrafine particles, both of which can potentially harm human health.

Formaldehyde is a known human carcinogen with no level of exposure that poses zero risk, and is a strong eye, nose, throat and lung irritant. Because there are many indoor sources of formaldehyde, it is found in nearly all homes and buildings. Ultrafine particles and the potential health effects associated with them are not well understood, but exposure to particle pollutants from the outdoor environment is associated with a variety of health effects, including serious heart and lung disease and even premature death. Increased exposure to these pollutants indoors could be a concern for professional house cleaners, individuals cleaning in small enclosed areas, and individuals with pre-existing lung or heart disease.

Actions You Can Take

Fortunately, there are measures one can take to reduce exposure to these pollutants during and immediately following cleaning activities. Users of cleaning products should:

- Limit the use of cleaning products or air fresheners advertised as pine- or lemon-scented, or that contain pine or citrus oils, especially during high outdoor pollution days. For ozone forecasts, visit <http://airnow.gov> and click on “Local forecasts and conditions.”
- When using cleaning products, avoid the use of indoor air cleaning devices such as electrostatic precipitators and ionizers that can emit some ozone. Air cleaners or air “purifiers” that intentionally produce ozone should never be used; they produce high levels of ozone, a reactive gas that may harm human health.
- Do not use more of the cleaning agent than is necessary to complete the job. Read and carefully follow all label instructions for use.
- Rinse surfaces liberally with water after cleaning (where appropriate); residual cleaning agents that remain on surfaces will continue to react with any ozone present in the air.

- Remove the paper towels, sponges, and mops used in cleaning from the indoor living space; rinse sponges and mops well before storing.
- Always use adequate ventilation during cleaning.
- Keep the ventilation rate high for several hours after cleaning.

Cleaning Product Composition

Currently the amount of reactive volatile organic compounds (VOCs) found in cleaning products is regulated by ARB due to their potential to contribute to the photochemical formation of ground level ozone. Because terpenes and glycol ethers are reactive VOCs, the amount used in cleaning products is limited by these regulations. The total amount of VOCs allowed varies by product category, but is generally set as low as feasible. Since the initiation of this study, most cleaning products have been reformulated to meet even lower VOC limits.

Additional Results of the Study

In addition to observing the generation of formaldehyde and ultrafine particles, the investigators also noted the following results:

- Twelve of the 21 products examined contained terpenes or other VOCs that can react with ozone. The terpenes constituted from 0.2% to 26% of the product.
- Glycol ethers, compounds classified by ARB as Toxic Air Contaminants, generally were not released at levels that pose a risk to building occupants during cleaning. However, calculations showed that high exposure situations could potentially lead to exposure to one of the compounds, 2-butoxyethanol, above health guideline values. Examples of high exposure situations include cleaning multiple interior windows with limited ventilation, or cleaning a large surface area such as a shower stall in a small bathroom.

For More Information

The full research report on this study can be downloaded from ARB's website at <http://www.arb.ca.gov/research/abstracts/01-336.htm>. The current restrictions on VOC content of cleaning products, as well as recently approved changes that take effect in the future, can be obtained from <http://www.arb.ca.gov/consprod/regs/regs.htm> or by calling the phone numbers provided below. For additional information on ozone-generating air cleaners, please visit <http://www.arb.ca.gov/research/indoor/ozone.htm>. Further information on formaldehyde is available at <http://www.arb.ca.gov/research/indoor/formaldGL08-04.pdf>. General information on indoor air quality is available at <http://www.arb.ca.gov/research/indoor/indoor.htm>.

For additional information, please contact ARB's Public Information Office at (916) 322-2990, or leave a voice mail message on ARB's Indoor Air Quality Information line at (916) 322-8282.

For individuals with sensory disabilities, this document is available in Braille, large print, audio cassette or computer disk. Please contact ARB's Disability Coordinator at (916) 323-4916 by voice or through the California Relay Service by calling 711, to place your request for disability services. If you are a person with limited English and would like to request interpreter services, please contact ARB's Bilingual Manager at (916) 323-7053.

The Air Resources Board (ARB) is a department of the California Environmental Protection Agency. ARB's mission is to promote and protect public health, welfare, and ecological resources through effective reduction of air pollutants while recognizing and considering effects on the economy. The ARB oversees all air pollution control efforts in California to attain health-based air quality standards.