

Art per. w  
Wilson

Adriana  
Lopez  
9/6/11

1:55  
read

"Cleaning Products without  
Formaldehyde"

2:15  
design logo

Students need to come up with  
a brand new logo for a new  
company that makes healthy  
products:

- what is the name?
- what would be a good symbol  
to communicate the company's  
values?

- need 4 ideas  
DUE FRIDAY 100 pts.

OR redesign the logo of an existing  
brand/cleaner to communicate the  
hazardous nature of their products.





## Cleaning Products without Formaldehyde—

Does Your Household Cleaner Contain Terpenes?

by David Steinman

After years of fighting political pressure from business interests, the National Cancer Institute recognized formaldehyde as a known human carcinogen. There are only twenty or so chemicals the government has rated as "known" to cause cancer, so when a chemical gets this rating, you can figure it is a real health mobster. It's long been suspected that people who work with this chemical—such as morticians—experience higher cancer rates. More recent research suggests that in-home exposure, particularly for people who work with cleaning products, is significant. And what's more, these products may produce formaldehyde in your breathing environment by interacting with other chemicals. This means even if a product doesn't list formaldehyde, it could actually be quite a significant contributor, creating unhealthy indoor air.

Several years ago, when a handful of new studies raised the concern that consumer products may be contributing to indoor pollution levels in ways that were not fully understood, the California Air Resources Board (ARB) commissioned William Nazaroff, a UC Berkeley professor of environmental engineering, and his team to study the problem.

The ARB asked Nazaroff and his team to focus their work in two areas: an investigation of toxic air contaminants in household cleaning products and air fresheners, especially a class of chemicals known as ethylene-based glycol ethers; and an examination of the chemistry that occurs when such products are

used indoors—in particular, products that contain a reactive group of chemicals called terpenes.

Ethylene-based glycol ethers are common, water-soluble solvents used in a variety of cleaning agents, latex paints and other products. They are classified as hazardous air pollutants under the U.S. Environmental Protection Agency's 1990 Clean Air Act Amendments and as toxic air contaminants by California's Air Resources Board. Their toxicity varies with their chemical structure. However, these are frequently used in all-purpose and window cleaners such as Simple Green and Windex.

Terpenes are a class of chemicals found in pine, lemon and orange oils that are used in many consumer products either as solvents or to provide a distinctive scent. Although terpenes themselves are not considered toxic, some recent studies have shown that they may react with ozone to produce a number of toxic compounds. (The primary constituent of smog, ozone enters the indoor environment from infiltration of outdoor air, but is also produced indoors by some office machines such as copiers or printers, and by some devices marketed as "air purifiers" that purposely emit ozone into the indoor environment.)

The research team's first task was to determine which household products contain terpenes and glycol ethers, and in what quantities. It compiled a list of the household cleaners and air fresheners available at any of five chain retail outlets in Northern California, then examined the labels and advertising claims (e.g., "pine-scented") for these products and reviewed available product data sheets. Based on this information, they selected the 21 products most likely to contain significant amounts of terpenes and ethylene-based glycol ethers: four air fresheners and 17 cleaning products, including at least one each of disinfectants, general-purpose degreasers, general-purpose cleaners, wood cleaners, furniture maintenance products, spot removers and multi-purpose solvents.

A complete chemical analysis of these 21 products revealed that:

- + Twelve contained terpenes and other ozone-reactive compounds at levels ranging from 0.2 to 26 percent by mass.
- + Six contained levels of ethylene-based glycol ethers of 0.8 to 9.6 percent by mass.
- + Among the four air fresheners studied, three contained substantial quantities of terpenes (9-14 percent by mass).



When the researchers tested the terpene-containing products in the presence of ozone, they found that the amounts of terpenes converted into pollutants was dependent on the amount of ozone present.

The researchers ran a series of 18 experiments to determine the levels of exposure people might be subjected to when using the products in a confined space. The tests were conducted in a 230-square-foot room with ventilation at an ordinary level which provided approximately one air change every two hours. In some tests of terpene-containing products, ozone was introduced into the room at levels mimicking those that could occur in households or offices.

The products were used in various ways according to package directions: some at full-strength and others at various dilutions as recommended on their labels.

The tests produced various results—some reassuring, and some raising concerns. The good news, the researchers reported, is that when people use the products under ordinary circumstances, their exposure to ethylene-based glycol ethers, formaldehyde and fine particles will normally not reach guideline values: that is, levels set by regulatory agencies as the maximum exposure levels believed to be safe. However, the authors pointed out, because formaldehyde is also released from other sources such as plywood and pressed wood products that are found in most buildings, any increase in formaldehyde emissions is undesirable.

In several realistic use scenarios, the tests showed that people could be exposed to potentially dangerous levels of toxic pollutants. Some scenarios included:

Cleaning in a small, moderately ventilated bathroom. In calculations based on emissions from one of the glycol-ether containing products, the team found that a person who spends 15 minutes cleaning scale off of a shower stall could inhale three times the "acute one-hour exposure limit" for this compound set by the California Office of Environmental Health Hazard Assessment.

Air freshener and ozone in a child's bedroom. This scenario could occur when people use both air fresheners and ozone-generating devices simultaneously in a room. This could lead to exposures to formaldehyde that are 25 percent higher than California's guideline value.

Multi-house cleaning by a professional home cleaner. Under this scenario, a person who cleans

four houses a day, five days per week, 50 weeks per year, would take in about 80 micrograms per day of formaldehyde, double the guideline value set by California's Proposition 65. In addition, the person's intake of fine particulate matter during the hours spent cleaning would exceed the average federal guideline level for an entire year. These quantities are in addition to the formaldehyde and particulate matter that the person would be exposed to from all other sources and activities during the year.

According to Nazaroff, the message from these studies is that everyone—and especially cleaning professionals—should be cautious about overuse of products with high levels of ethylene-based glycol ethers and terpenes. Rooms should be ventilated during and after cleaning, some products should be used in diluted solutions as opposed to full-strength, and cleaning supplies should be promptly removed from occupied spaces once cleaning is done. Also, people should avoid the use of ozone generators or ionizing air cleaners, especially in the same space where terpene-containing cleaning products or air fresheners are being used.

#### HOW TO GO FORMALDEHYDE-FREE

Going formaldehyde-free might be one of the more difficult things to do these days. And even if companies don't intentionally add formaldehyde-releasing ingredients like quaternary compounds, their raw material suppliers might do so, leaving the products vulnerable to unknown additives and preservatives. Other companies use such ingredients for manufacturing.

In contrast, Earth Friendly Products, which completely controls its own manufacturing with cradle-to-grave procedures and zero waste policies, has implemented ultraviolet light treatment instead of chemicals. The company completely avoids the use of petrochemicals and the terpenes that act as precursors.

Becoming formaldehyde-free is not the easiest change to make, but it's not impossible. Read labels and be sure to select products that are specifically taking steps to eliminate formaldehyde donors.

The take-home message from this study is that some products contain formaldehyde directly used as a disinfectant, but products containing a class of chemicals called terpenes form undesirably high levels of formaldehyde when exposed to normal levels of ozone in the home environment.

Look for companies that have taken a pledge, like Earth Friendly Products, to eliminate both. ■



#### Resources

Earth Friendly Products' line of formaldehyde- and terpene-free cleaning products deliver great performance and value and are available at your favorite store. Visit [www.ecos.com](http://www.ecos.com) for more information.