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How safe are green cleaning products?

Plant-based or natural ingredients don't always mean a cleaning product is safe. The market is largely unregulated.

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JENNIFER MARTINÉ threw a party Thursday night, and her guests brought food, wine -- and empty spray bottles.

Using vinegar, baking soda, essential oils and castile soap, they spent the evening making batches of natural household cleaners. Martiné, 28, is one of more than 100 women who've signed up to host so-called green cleaning parties across the country this spring, part of a nationwide campaign led by Women's Voices for the Earth, a nonprofit group based in Missoula, Mont.

Martiné's interest in green cleaning stemmed from reading that mopping agents might harm her new puppy -- and coming home one day to find that her husband had passed out while cleaning their unventilated bathroom. He had been using a combination of products and had hit his head as he fell to the floor. He was just coming to when Martiné, a food photographer, returned home to San Francisco.

"It was really scary," she said. Her husband, Tyler, suffered no other problems, but the incident had at least one lasting effect. "I definitely don't buy those strong cleaners anymore," Martiné said.

Like her, a growing number of Americans are seeking so-called green cleaners -- products made with natural, nontoxic, biodegradable ingredients. Few consumers may be going the straight DIY route, but sales of natural cleaning products totaled $105 million during the last 12 months, up 23% over the previous 12 months, according to SPINS, a Schaumburg, Ill.-based market research and consulting firm for the natural products industry.

Such cleaners make a variety of claims. Some promise that they contain natural (instead of synthetic) agents, break down quickly in the environment or pose less of a toxic threat to humans and ecosystems than do traditional cleaners. Others say they're concentrated, packaged in recycled or recyclable materials, have never been tested on animals or are free of specific chemicals, such as petroleum distillates, phthalates, phosphates or CFCs. (Never mind that CFCs, proved to deplete the Earth's ozone layer, have been banned for decades.)

Many of them also typically eschew known asthma triggers, common in many household cleaners, such as chlorine bleach and ammonia. Studies of people who work with cleaning products for a living have indeed suggested a link between conventional cleaners and an increased risk of asthma and skin irritation. So-called green cleaners rely on ingredients such as hydrogen peroxide to kill germs and remove stains, as well as citric acid and alkyl polyglucoside, a coconut-based detergent, to break down grease and dirt.

But critics caution that just because the ingredients in green cleaners are plant-based or natural doesn't necessarily mean they're safe. They too can cause skin irritation or trigger allergic reactions -- and in a large enough dose, any ingredient can be toxic.

And though green cleaners may purport to list all ingredients, the market is largely unregulated -- which means consumers still must be wary of what's in the bottle. Even cleaning products labeled "natural" may contain some fraction of synthetic chemicals. Or they may contain natural ingredients consumers would rather avoid, such as petroleum distillates, some of which (namely, benzene) can cause cancer, and all of which come from oil, a nonrenewable (read: environmentally unfriendly) resource.

"This is not a regulated space," said Matt Kohler, brand manager for Green Works, the brand of green cleaners launched by Clorox in January. "Any fly-by-night company can take a drizzle of lemon oil, pour it over a vat of chemicals and call it a natural cleaner."

Focus on risks to humans

To most shoppers, going green is as much about their own and their family's health as about the health of ecosystems.

It hasn't taken scientific studies to prove that chlorine-based cleaners can irritate the eyes, nose and throat and harm living things. (Chlorine is, after all, employed for its ability to kill germs.) But concern about other ingredients' effects has grown.

In the 1970s, several states, beginning with Illinois, enacted bans on phosphates in laundry detergents. The chemicals, which help produce spot-free glasses and dishes, cause algae to proliferate in lakes, streams, rivers and other bodies of water, eventually depleting the water of oxygen and choking out other marine life. Some states are now passing bans on phosphates in dishwashing detergents too.

In 2006, Wal-Mart announced that it would avoid stocking products that contain nonylphenol ethoxylates, or NPEs. The surfactants, or foaming agents, often found in detergents and other cleaning products, have been found to cause reproductive defects, liver and kidney damage, and death in fish and shellfish. In Canada and the European Union, but not in the U.S., regulations limit the chemicals' use in cleaning products.

A variety of other chemicals are now drawing attention for their potential to harm not just ecosystems but human health too. Environmental activists have singled out such common cleaning ingredients as phthalates, volatile organic compounds (VOCs), glycol ethers, quaternary ammonium compounds and ethanolamines. For most of these chemicals, solid evidence of human health effects is only just emerging.

In the case of phthalates, evidence has been strong enough for lawmakers to take action. The class of chemicals, widely used in the plastics industry to make plastics soft, are added to conventional household cleaners (as well as cosmetics, bath soaps and shampoos) to help the products retain fragrance.

Researchers at the Centers for Disease Control and Prevention have demonstrated that most Americans have detectable levels of phthalates in their blood and urine, and preliminary findings have linked high bodily levels of phthalates to sperm damage in men and reproductive defects in newborn boys. The evidence persuaded California legislators to ban the chemicals from children's toys, beginning next year.

The health effects of VOCs, volatile gases emitted by many cleaning products (as well as paints, markers, building materials and other products), have also come under scientific scrutiny. The solvents can irritate the nose and throat and cause dizziness, and long-term exposure may have more lasting effects. A handful of well-designed studies suggests a correlation between exposure to VOCs and an increased risk of asthma or other respiratory problems. In one, a study of more than 950 U.S. adults, published in Environmental Health Perspectives in 2006, high blood levels of 1,4-dichlorobenzene, a VOC found in air fresheners and deodorizers, were associated with measurable decreases in lung function.

But other chemicals targeted by environmental advocates -- solvents called glycol ethers, the disinfecting quarternary ammonia compounds and detergents called ethanolamines -- have been shown to pose risks only to people who work with high doses of the chemicals for long periods.

Cleaning for a living

In fact, most of the evidence suggesting that cleaning products may pose harm comes from studies of people who clean for a living.

Researchers at the National University of Singapore published results in the American Journal of Industrial Medicine in 1994 showing that people employed as cleaners had nearly twice the risk of asthma as people in other professions. A study of more than 15,000 working adults in Europe, published in the Lancet in 1999, found a similar increase in asthma risk among professional cleaners. A study by researchers at the Finnish Institute of Occupational Health, published in the European Respiratory Journal in 2002, found that professional cleaners were 50% more likely to develop asthma than administrative professionals.

Such studies included people who cleaned streets, chimneys and factories -- admittedly dirty, hazardous environments. Professional cleaners working in factories or institutional settings also tend to use industrial cleaners, which are more highly concentrated and stronger acting than household cleaners. Nonetheless, researchers at Barcelona's Municipal Institute of Medical Research have produced evidence suggesting asthma rates are increased among people who clean homes for a living too.

In a paper published in the Scandinavian Journal of Work, Environment and Health in 2001, the Barcelona researchers reported that housecleaners were roughly three times as likely to have asthma, compared with office workers. In 2003, they reported that women who had been employed as domestic cleaners were twice as likely to have asthma, compared with ones who had never been employed as cleaners.

In a 2005 report, the researchers showed that frequency and severity of asthma symptoms in housecleaners was directly correlated with how much bleach they used, though they could not rule out whether other chemicals in cleaning products they used contributed to their symptoms.

People who clean for a living are exposed to such a variety of combinations of chemicals (not to mention dust) over such a long period of time that's it's nearly impossible for studies to pinpoint the cause of symptoms -- or to link them to individual chemicals.

That challenge is precisely what has some critics of the cleaning products industry concerned.

Figuring out which chemicals are safe, and at what levels, is a "highly imprecise science," said Arthur Weissman, president and chief executive of Green Seal, an independent organization that certifies environmentally responsible products and has helped Los Angeles County and the state of California draft green purchasing policies. "We just don't know that much about how chemicals act in the environment and in our bodies," he said.

Long-term concerns

The gap in scientific understanding stems from the fact that chemicals included in consumer products are studied for their immediate toxic effects, and they're often studied in isolation. In reality, however, chemicals -- such as those in cleaning products -- are used in a variety of combinations, and people are often exposed to low doses over long periods.

"We're not saying these cleaning products are going to kill you tomorrow," said Alexandra Gorman Scranton, director of science and research for Women's Voices for the Earth. "We're concerned about the long-term and cumulative effects, what happens when you add all these chemicals together over a lifetime."

Others are concerned that even limited evidence of toxicity suggests some chemicals in cleaning products may be particularly dangerous for kids, who spend a lot of time crawling on floors and placing hands and toys in their mouths.

But industry representatives are quick to point out that health problems occur only when cleaning products aren't used or stored properly -- and that the toxicity of any chemical is determined by its dose.

"This stuff isn't meant to be eaten, or drank, in any case," said Brian Sansoni, vice president of communications for the Soap and Detergent Assn.

Still, said Deborah Moore, executive director of the Berkeley-based Green Schools Initiative, "if you have kids, why expose them to a chemical that might be toxic if you don't need to?"

Heeding such consumer concerns, makers of natural cleaning products have swapped out petroleum-based foaming agents for plant-based ones, traded chlorine for hydrogen peroxide and opted for citric acid, tea tree oil and pine oil instead of synthetic disinfectants.

Mrs. Meyer's Clean Day products, for example, contain ingredients derived from corn, sugar cane and coconut in place of synthetic solvents , petroleum distillates, bleach and phosphates. Seventh Generation makes a bathroom cleaner that relies on hydrogen peroxide instead of chlorine for stain removal, and Method's all-purpose cleaner relies on soda ash to break down grease and oil.

No standards set

But just because a cleaning product is biodegradable and made from plant-based sources doesn't mean it's without its own potential adverse effects on health.

"Certainly many natural chemicals are toxic too," Weissman said. Plant-based ingredients included in some green cleaners include limonene (a citrus-based oil that helps prevent residue build-up), pine oil and the foaming agent coconut diethanolamide -- all of which can cause allergic dermatitis.

And in March, a study of natural and nontoxic consumer products, commissioned by the watchdog group Organic Consumers Assn., found the suspected cancer-causing chemical 1,4-dioxane in roughly half of 100 tested products -- including several dishwashing liquids with words such as "Earth friendly" and "eco" in their brand names. The chemical is a byproduct of a process that uses petroleum-based chemicals to make detergents less harsh.

"It's really confusing for consumers to try to understand the claims of these products," said Moore, whose Green Schools Initiative has helped several California schools buy greener cleaning products. "You need a PhD to go to the supermarket and understand the labels on products."

The problem, critics say, is that labeling in the cleaning products industry is highly unregulated. The use of terms such as "green" and "natural" is monitored by the Federal Trade Commission, which aims to ensure that such terms are not misleading to consumers. But neither the commission nor any other agency sets standards that products must meet before they can call themselves green.

" 'Green' and 'natural' are marketing terms -- they're not terms of science," Sansoni said.

Cleaning product manufacturers -- green or otherwise -- are also not required by law to disclose all of their ingredients on their labels. Some green cleaner makers say they have disclosed all ingredients -- but there's no way for consumers to be certain that they have.

Consumer advocates therefore have pressed for stricter labeling rules, but the industry has resisted, arguing that long lists of ingredients would create a potentially hazardous distraction on product labels. "The safety and usage information is the most important information on a product label," Sansoni said. "If you try to turn the label into an encyclopedia, you obscure the most important information on there."

Proponents of greener cleaners, such as Weissman, say that if cleaning products didn't include potentially dangerous ingredients, such warnings wouldn't be necessary.

For now, green cleaning product manufacturers can opt to be certified by a third party, such as Green Seal or the Environmental Protection Agency's Design for the Environment program.

Some say these certifiers don't do enough to protect consumers. "There are different shades of green," said Deirdre Imus, wife of radio jock Don Imus, who has created a line of cleaners. She said that some certifiers will give their approval to products containing chlorine or petroleum-based chemicals, with labels that don't disclose all ingredients.

That pitfall isn't lost on Martiné, who's now cleaning her kitchen sink with a homemade baking soda scrub.

"It worries me that companies are doing the green thing just to make money," she said. "I'm excited to make my own cleaners, because then I'll know exactly what's in them."

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