Household Hazards

Potential Hazards of Home Cleaning Products

A Report by Women's Voices for the Earth

Household Hazards

A look at the potential hazards of chemicals in household cleaning products and their association with asthma and reproductive harm.

By Alexandra Gorman
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Report design by Amy Kelley, Bozeman, MT.

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Executive Summary

How clean is clean? We all have different answers and personal preferences regarding the cleanliness of our homes and surroundings. The many types and brands of cleaning products available on store shelves is staggering. In most cases, when we choose a cleaning product, we are primarily concerned with whether or not it will do the job, going on the assumption that if a product is sold in the grocery store, it must be safe for use in our homes. This report questions that assumption. Household cleaning chemicals, like tens of thousands of chemicals found in the consumer marketplace, are available to the consumer with virtually no information on the potential consequences for human health and little oversight by the government.

Household Hazards was written to provide information on certain chemicals in cleaning products which may pose health hazards. Specifically, it looks at the research on cleaning chemicals such as monoethanolamine (MEA) and ammonium quaternary compounds linked to asthma, and glycol ethers, alkyl phenol ethoxylates and phthalates linked to reproductive harm (e.g. birth defects and fertility problems).

Some research has associated these cleaning chemicals with health impacts, such as occupational asthma in cleaning workers, so it is reasonable to question their use in household cleaning products. Other research in laboratory settings links exposure to certain cleaning chemicals with reproductive harm, such as birth defects or fertility problems in animals. While the impacts of chronic exposure to these chemicals on reproductive harm in humans have not been fully researched, the scientific data compiled in this report, while inconclusive, does present a valid cause for concern. This report also highlights the need for additional studies to fully ascertain the safety of using household cleaning chemicals over the course of a lifetime. Many consumers, especially those who have asthma or women of childbearing age, are accustomed to making choices to avoid exposure to chemicals with potential for harm. This report is intended to provide additional information to consumers who may prefer a precautionary approach to using certain cleaning products in their home.

Common household cleaning chemicals linked to asthma and reproductive harm

Monoethanolamine (MEA) is a surfactant found in some laundry detergents, all-purpose cleaners and floor cleaners and is a known inducer of occupational asthma.

Ammonium quaternary compounds are disinfectants found in some disinfectant sprays and toilet cleaners that have been identified as inducers of occupational asthma.

Glycol ethers, such as 2-butoxyethanol, are solvents commonly found in glass cleaners and all-purpose spray cleaners that have been linked to reduced fertility and low birth weight in exposed mice.

Alkyl phenol ethoxylates (APEs) are surfactants found in laundry detergents, stain removers, and all-purpose cleaners, which have been found to reduce embryo survival in fish, and alter tadpole development. APEs are commonly detected as contaminants in rivers and streams, and have also been found in household dust.

Phthalates are carriers for fragrance in glass cleaners, deodorizers, laundry detergents and fabric softeners, which have been linked to adverse effects on male children, reduced sperm count in adult men, and increased allergic symptoms and asthma in children.

Introduction

Every day we are exposed to hundreds of different chemicals in products we use to clean our homes, personal care products we use on our bodies, in the pesticides we spray in our homes, offices, gardens, and playgrounds and in our food, water and air. We know from biomonitoring studies (in which human fluid or tissue samples are screened for the presence of contaminants) that many of these chemicals are entering our bodies. Numerous industrial chemicals have been detected in human blood, urine, hair, breast milk and umbilical cord blood. There is now mounting evidence that links chemical exposure to the rising levels of chronic health problems in the general population. While scientists have known for a long time that high levels of exposure to some chemicals can be linked to certain chronic diseases, research now suggests that even minute traces of some chemicals may affect processes like gene activation, hormone production and brain development in newborns.

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At the same time, it appears that the average American citizen has become increasingly concerned about her or his exposure to germs, and the diseases they may cause. Advertisements tell us of new and improved products which will protect our family's health by killing germs found on every surface we may touch. Not surprisingly, over the last several years we have seen an ever-increasing number of cleaning products on the market. Overall, the U.S. market for household cleaning products was $14.4 billion in 2005.[1] One marketing study revealed that the U.S. market for household cleaning products increased 3% between 2004 and 2005. This growth was predominantly driven by the 23% increase in the category of disinfectant products.[2]

Unfortunately, advertisements fail to mention that many cleaning products contain chemicals that may actually be harmful to our health. Women's Voices for the Earth (WVE) published this report to highlight two particular health concerns associated with chemicals in household cleaning products, asthma and reproductive harm. We selected these health concerns for two reasons. First, we believe that asthma and reproductive harm are currently of particular interest to women. Second, we found sufficient research on the links between cleaning chemicals and health to substantiate a valid

concern for vulnerable populations such as children, persons with asthma and women of childbearing age.

This report is not intended to be a comprehensive review of the hazards of all cleaning chemicals. For example, industrial cleaners can contain higher concentrations of chemicals, and in some cases different chemicals altogether, than those used in household cleaners. Some cleaning products also contain chemicals that are linked to cancer and neurological damage, as well as acute hazards such as skin, eye and throat irritation and burns. While these health impacts are important, particularly for workers in the cleaning industry, they are not the focus of this report. Additional resources are listed at the end of the report with more detailed information on these and other hazards.

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Use of Cleaning Products

Given our growing interest in a sanitary home environment, a staggering amount of cleaners and cleaning chemicals are used in the U.S. each year. While overall statistics are difficult to obtain, the following figures help demonstrate the scope of the $14 billion cleaning product industry.

- Americans wash approximately 35 billion loads of laundry each year. [3]
- Nationally, the institutional cleaning industry is estimated to use five billion pounds of chemicals each year.[4]
- On the state level, data from California show that in 1997, 34 tons of air fresheners[5], 74,000 tons (147 million pounds) of all-purpose cleaners, 109 tons of toilet bowl cleaners and 102 tons of glass cleaners were sold each day in California[6].
- A study on chemicals used in household products in New Jersey and Massachusetts showed that in those two states alone, 28 million pounds of chemicals that are known or suspected neurotoxins, carcinogens, or reproductive or developmental toxicants were used in soaps and other detergents. An additional 259 million pounds of these chemicals were accounted for in specialty cleaners and polishers.[7]

Impacts to Indoor Air Quality

While much attention is paid to outdoor air pollution, it is important to note that we spend the vast majority of our time (87%) indoors.[8] In fact, indoor air is often more polluted than outdoor air, and cleaning products play a role in generating some of that pollution.[9] There are concerns with the volatile nature of cleaning product chemicals since they evaporate into the air we breathe. This problem is exacerbated when we clean in small unventilated spaces such as a windowless bathroom, where levels of cleaning chemicals in the air can be highly concentrated. Cleaning chemicals can also end up in household dust. Studies of household dust have shown high levels of volatile organic compounds (VOCs), asthmagens and other toxic chemicals.[10,11]

A May 2002 nationwide study by the U.S. Geological Survey (USGS) showed that nearly 70% of the streams tested contained breakdown products of detergents, while 66% contained disinfectants.

Impacts to Water Quality

Cleaning products also have an impact on water quality. After normal use, cleaning products are rinsed down the drain and eventually released with the effluent of wastewater treatment plants or from septic tanks into our ground and surface waters. While there is relatively little data available on the impacts of cleaning chemicals on the environment, we do know that cleaning products containing phosphorus or nitrogen can contribute to nutrient-loading in water bodies, leading to adverse effects on water quality.[12] Many cleaning chemicals survive the sewage system intact and are released into streams. A May 2002 nationwide study by the U.S. Geological Survey (USGS) showed that nearly 70% of the streams tested contained breakdown products of detergents, while 66% contained disinfectants.[13] Nationally, concern is growing about these chemicals in wastewater, particularly in terms of the impacts they may have on fish and wildlife exposed downstream of a wastewater treatment plant.[14]

Impacts of Cleaning Products on Human Health

Cleaning chemicals can also take a toll on human health. We are exposed to these chemicals through regular application of these products in our homes and the subsequent presence of cleaning chemicals in our air, water and household dust. We are well aware of some of the short-term impacts of cleaning chemicals, such as skin, eye or lung irritation. This information is usually recorded on the product label with a caution or warning. However, we know considerably less about the impacts of long-term exposure, and the possible connections to chronic diseases. In the next few sections of this report, we will discuss a growing body of research that examines the link between cleaning chemicals and chronic health impacts with a particular emphasis on asthma and reproductive effects.

Who is Uniquely Affected by Exposure to Cleaning Chemicals?

Women in the Home

Traditionally, cleaning has been deemed "women's work," and while gender roles have changed culturally over time, one study showed that women today are still doing over 70% of the housework in the average home.[15] Women who spend most of their time at home may also have a higher exposure to potentially hazardous cleaning chemicals.

Women and Men Working in the Cleaning Industry

The cleaning industry in the U.S. employs about 3.4 million cleaning workers. While both men and women work in the cleaning industry, men make up nearly two-thirds of the work force in janitorial and building cleaners, and women comprise nearly 90% of maids and housekeeping cleaners. Nationally, over one-third of housekeeping cleaners are Latina women, while another 20% are African-American.[16] Rates of minority employment in the cleaning industry also vary by region. One study conducted in San Francisco found that 99% of hotel room cleaners were female, 31% were Filipina, 35% were other Asians and 28% were Latina. For 95% of these hotel workers, English was a second language.[17]

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Children in the Home and at School

Children are disproportionately impacted by cleaning chemicals, both at home and at school. Children are often more vulnerable to chemicals because their organs and immune systems are not yet fully developed, and certain chemicals may interfere with the development of their neurological, endocrine and immune systems. At the same time, babies' and children's exposure to chemicals are generally higher because they breathe more often and more deeply than adults, and consume more food and water per pound of body weight than adults.[18] Young children also crawl on the ground and frequently put their hands in their mouths, thus transferring chemicals from floor and carpet finishes and cleaners directly into their mouths. Children are also at greater risk from accidental poisoning incidents associated with cleaning products. Data from the American Association of Poison Control Centers indicates, household cleaners were the third largest category of substances associated with calls to poison control centers, with over 218,000 calls made in 2005. Over half of those calls (121,000) were made in response to an incident involving children ages six and under.[19] The Soap and Detergent Association (SDA) recommends protecting children from exposure to cleaning chemicals in a number of ways including only cleaning while children are out of the house, and securing cleaning products in locations that are not accessible by children.[20]

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Specific Health Concerns Associated with Cleaning Chemicals

Asthma

What is Asthma?

Asthma is a chronic condition in which constriction and inflammation of the airways can cause wheezing, coughing, tightness in the chest and shortness of breath. There are two types of asthma, allergic (or sensitizer-induced) asthma and irritant asthma. Allergic asthma occurs after the immune system becomes sensitized to an environmental allergen, such as from animal dander, dust mites, pollen, or chemicals found in the workplace. Once sensitized, these allergens can trigger the immune system to produce an inflammatory response which restricts the airway, causing an asthma attack. Irritant asthma does not involve the immune system, and can be triggered by a single exposure to an irritant such as exercise, cold air, tobacco smoke or other chemical exposure.[21,22] Asthma triggers in the environment can also include mold, and chemical components of architectural finishes, floor care products and cleaning products.[23] While most asthma develops in childhood, it can also occur in adults. Occupational asthma, for example, is acquired later in life and caused by exposures to chemicals or other substances on the job.[24]

A 2004 report from the National Center for Health Statistics states that the incidence of asthma among pre-school-aged children rose by 160% between 1980 and 1994, accounting for 14 million missed school days each year and $3.2 million in treatment expenses.

The Rising Incidence of Asthma in the U.S.

Rates of asthma are increasing for both adults and children. According to the U.S. Environmental Protection Agency (EPA), 20 million people in the U.S., including 6.1 million children, have asthma.[25] Asthma accounts for more than 14 million outpatient clinic visits and nearly 2 million emergency room visits each year.[26] A 2004 report from the National Center for Health Statistics states that the incidence of asthma among pre-school-aged children rose by 160% between 1980 and 1994[27], accounting for 14 million missed school days each year and $3.2 million in treatment expenses.[28] According to the Centers for Disease Control, an estimated 9 million children (12.5% of children, or one out of 13) under 18 years of age in the United States have had asthma diagnosed at some time in their lives.[29] Asthma is the most common serious chronic childhood disease, and is the

third-ranking cause of hospitalization of children under age 15. The annual cost for health care and lost productivity associated with asthma is estimated by the National Heart, Lung and Blood Institute to be $16 billion.[30]

Chemicals in Household Cleaning Products Linked to Asthma

Several chemicals present in some household and industrial cleaning products have been identified as asthma triggers or are known to aggravate existing respiratory symptoms. These chemicals include monoethanolamine, ammonium quaternary compounds, tall oil or rosin, chlorhexidine and several others.[31] This report will focus on monoethanolamine and ammonium quaternary compounds, as they have specifically been identified in commonly used household cleaning products.

Monoethanolamine, also known as MEA, is a chemical commonly found in detergent. MEA is a surfactant, which enhances the cleaning power of a detergent. Surfactants work by getting in between dirt and a surface (a kitchen counter, a piece of fabric or even human skin), allowing water to more easily wash away the dirt. MEA is used in household cleaning products such as laundry detergents, all-purpose cleaners and floor cleaners, among others.(See Appendix 1 for a partial list of common products containing monoethanolamine.) Monoethanolamine has been identified as a known inducer of occupational asthma in cleaning workers.[32,33] Research has not been conducted to assess the impact, if any, on asthma in individuals cleaning their own homes with products containing monoethanolamine.

Photo: www.flickr.com/photos/shizu_bara/250619864/in/photostream

Ammonium quaternary compounds are a family of chemicals known for their disinfectant and detergent properties. They are also used as fabric softening agents. Ammonium quaternary compounds, are found in household cleaning products such as disinfectant sprays and toilet cleaners among other applications. (See Appendix 1 for a partial list of common products containing ammonium quaternary compounds.) These chemicals have also been identified as inducers of occupational asthma in cleaning workers.[34,35] Research has not been conducted to assess the impact, if any, on asthma in individuals cleaning their own homes with products containing ammonium quaternary compounds.

Research on Asthma Linked to Cleaning Products

Photographer: Thomas Widmann.

As stated above, there is scant research available on asthma in individuals caused by the cleaning products they use in their homes. However, research on the incidence of occupational asthma among cleaning workers clearly demonstrates a link with exposure to cleaning chemicals. These studies provide a sound rationale for a precautionary approach to using these chemicals in the home, particularly for vulnerable populations such as individuals with existing respiratory conditions, pregnant women and children.

Studies on Cleaning Workers and Asthma

A January 2001 study published by the American Journal of Industrial Medicine reported that janitorial workers have twice the rate of occupational asthma than other workers.[36] A May 2003 study in the Journal of Occupational and Environmental Medicine on cleaning products and asthma concluded that about twelve percent of work-related asthma can be linked to cleaning product exposure.[37] Data from Washington State show that some 6 percent of janitors experience a job-related injury from chemical exposure to cleaning products every year.[38] In New York, a study of urban minority asthma sufferers revealed that 61% of individuals working in janitorial jobs reported exacerbations of their asthma symptoms associated with their workplace. In Spain, several asthma studies of more than 4,000 women highlight the impacts of working in the domestic cleaning industry. One study found that women who did (or had done) domestic cleaning work had a much higher prevalence of asthma than women who had never done domestic cleaning work. Researchers concluded that 25% of asthma cases seen in study

Photographer: Brandy Lintz.

participants were linked to domestic cleaning work.[39] Another Spanish study of cleaning workers found that private home cleaners reported the highest prevalence rates of asthma. Asthma risk in this study was associated with kitchen cleaning, specifically oven cleaning, and furniture polishing.[40] A third follow up study in Spain found that female domestic cleaners had asthma or chronic bronchitis and suffered short term exacerbations of their respiratory symptoms more commonly on days that they worked, and specifically in relation to exposure to cleaning chemicals such as diluted bleach, degreasing sprays and air fresheners.[41]

Cleaning Product Use and Respiratory Effects in Children

Use of cleaning products has also been shown to exacerbate or increase the incidence of asthma in children. A 2004 study in the United Kingdom published in the journal Thorax[42] found that frequent use of household products was associated with persistent wheezing among pre-school age children. Other recent studies have shown that exposure to household cleaning chemicals increases the likelihood of asthma among children.[43] Past studies have also shown that institutional cleaning chemicals used in schools have impacts on asthma and other respiratory problems in school-age children.[44]

Reproductive and Developmental Effects

Exposure to chemicals can have adverse impacts on both human and wildlife reproductive systems. Reproductive effects include alterations in sexual behavior, decreases in fertility, menstrual changes, changes in the onset of puberty, cancers of reproductive organs, miscarriage, premature birth and other effects. Sometimes the effects of exposure are not seen until the next generation. For example, when a pregnant mother is exposed to chemicals, this exposure can also impact the developing child and lead to developmental effects, such as birth defects, low birth weight, impacts on cognitive development or other harmful outcomes. Reproductive and developmental impacts occur at varying doses and exposures to environmental chemicals. In some cases, very low doses will have one impact, while higher doses of the same chemical will have a different impact. The research described below involves laboratory animal research conducted at many different dose levels, which may or may not be comparable to human exposure associated with using household cleaning products containing these chemicals. The research does, however, provide a rationale for a precautionary concern about the release and ubiquitous presence of these chemicals in our environment.

How Common are Reproductive and Developmental Effects?

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Unfortunately, there has not been systematic or comprehensive tracking of reproductive or developmental effects in the U.S., making it difficult to establish known trends in human conditions overtime. While there are certain birth defects that have known causes, such as those due to nutritional deficiencies or maternal alcohol abuse, many reproductive and developmental effects have unknown causes. Many scientists now believe that chemical exposure, even at very low levels, can have adverse impacts on the reproductive system, and important research is underway to better understand the mechanisms and consequences of chemical exposure.[45] Due to both practical and ethical considerations, most of this research is conducted in the laboratory and does not involve human testing. Despite the limited amount of data on reproductive and developmental effects in humans, what we do know raises sufficient cause for concern. For example, research indicates that there is a widespread incidence of neurobehavioral problems at birth and in childhood; birth defects involving malformations of the male reproductive tract have been increasing; breast cancer incidence has risen for decades and only recently began to decline; the incidence rate of testicular cancer in young men is rising; and declining sperm counts have been documented worldwide.[46] While the exact chemicals or mechanisms to

Photographer: Yi-Hue Men

explain these impacts are still uncertain, they teach a precautionary lesson about our ubiquitous exposure to environmental chemicals.

Chemicals in Household Cleaning Products Linked to Reproductive and Developmental Effects

This report will focus on three groups of chemicals commonly found in household cleaning products that are of concern for their potential as reproductive or developmental toxics. These chemicals are glycol ethers, alkyl phenol ethoxylates (APEs) and phthalates.

Glycol ethers are a large group of organic solvents widely used in cleaning chemical formulations for both industrial and household applications.[47,48] Solvents are degreasing chemicals which help dissolve stains or dirt, particularly those made of fats or oils. Several glycol ethers have been identified as reproductive toxins. It is worth noting, however, that slight differences in glycol ether structure can drastically change their toxicity. Thus the potential reproductive effects listed below cannot be attributed to all glycol ethers.

The US EPA's hazard summary for glycol ethers states:

Animal studies have reported testicular damage, reduced fertility, maternal toxicity, early embryonic death, birth defects, and delayed development from inhalation and oral exposure to the glycol ethers.[49]

Occupational exposure to glycol ethers has also been shown to result in reproductive and developmental impacts. Studies of exposed male workers show some indication that glycol ethers can reduce sperm counts among human males.[50] Pregnant women exposed to glycol ethers in their work environments were significantly more likely to have children with birth defects such as neural tube defects and cleft lip.[51] A recent study in California was the first to assess exposure to glycol ethers from use in home cleaning. The study measured actual emissions of glycol ethers and other volatile organic compounds (VOCs) under normal home cleaning conditions and assessed their contribution to indoor air quality.[52] These researchers suggest that potential exposures to VOCs such as glycol ethers like 2-butoxyethanol from home cleaning can be high enough to exceed threshold safety levels established for industrial settings. In particular, potentially dangerous levels of these chemicals were seen in smaller, poorly ventilated rooms (such as a bathroom), where floor cleaners were used in combination with air fresheners.

2-butoxyethanol, also known as **ethylene glycol monobutyl ether (EGBE)**, is among the more commonly used glycol ethers in cleaning products. 2-butoxyethanol is a volatile chemical which evaporates into the air as cleaning products are used. In addition to inhaling 2-butoxyethanol vapor, research has shown that skin can also absorb 2-butoxyethanol vapor from the air, making skin a major pathway of exposure to this chemical.[53] 2-butoxyethanol appears to show weaker reproductive effects than some of the other glycol ethers.[54] However, studies on laboratory mice found reduced fertility among female mice exposed to 2-butoxyethanol, and lower birth weight in their offspring.[55] 2-butoxyethanol is also the most potent glycol ether in terms of red blood cell damage, which can lead to anemia.[56,57] There is widespread use of 2-butoxyethanol in household products, including glass cleaners, carpet/rug cleaners, floor cleaners and oven cleaners among others. (See Appendix 1 for a list of common products containing 2-butoxyethanol.)

Photographer: Rebecca Parkin.

2-(2-Methoxyethoxy)ethanol, also known as **diethylene glycol monomethyl ether (DEGME)** is another glycol ether commonly found in household cleaning products, particularly floor cleaners. (See Appendix 1 for a partial list of common household cleaning products containing 2-(2-Methoxyethoxy)ethanol.) 2-(2-Methoxyethoxy)ethanol has also been identified as a reproductive and developmental toxin. In laboratory studies, offspring of rats exposed to 2-(2-Methoxyethoxy)ethanol developed various birth defects including malformations of the ribs and cardiovascular system.[58]

Alkylphenol ethoxylates (APEs) are a class of chemicals which act as surfactants and include **nonylphenol ethoxylates (NPEs)** and **octylphenol ethoxylate**. Surfactants are chemicals which get in between dirt and a surface (on a kitchen counter, a piece of fabric or even human skin), allowing water to more easily wash away the dirt. APEs are often added to laundry detergents, laundry stain removers, hard surface cleaners and all-purpose cleaners to increase their cleaning efficiency.[59] Approximately 450 million pounds of APEs are produced annually in the U.S., of which 15%, or approximately 68 million pounds, are used in the manufacture of household cleaning products.[60] It is estimated that half of the APEs manufactured ultimately pass through wastewater treatment systems into surface waters.[61] The USGS found breakdown products of detergents in 70% of North American streams.[62]

APEs, and particularly NPEs, are of great concern, as they are the only detergent additives which become more toxic as they degrade.[63] Nonylphenol (NP) is a breakdown product of NPEs which is known to mimic the hormone estrogen[64] and impact the production of testosterone, both of which can have numerous reproductive and other health impacts.[65] In female rats, exposure to nonylphenol delayed the onset of puberty and altered fertility. In male rats, octylphenol and octylphenol ethoxylate decreased testicular size and sperm production[66], and nonylphenol also reduced testicular size.[67] Both octylphenol and nonylphenol stimulated the growth of human estrogen-sensitive breast cancer cells; and octylphenol was found to be ten times as potent as nonylphenol in generating this effect.[68]

APEs are found in rivers and sediments at levels that can cause harm to aquatic organisms such as fish, frogs and turtles. Exposure to APEs at levels as low as 3-10 micrograms/ liter reduced the number of fertilized trout eggs.

Photographer: Eric Engbretson, U.S. Fish and Wildlife Service Div. of Public Affairs.

A significant concern around the use of APEs centers around their impact on wildlife, particularly in aquatic ecosystems. APEs are found in rivers and sediments at levels that can cause harm to aquatic organisms such as fish, frogs and turtles. Exposure to APEs at levels as low as 3-10 micrograms/ liter reduced the number of fertilized trout eggs and caused reduced embryo survival and abnormal embryos in another fish, the Japanese Medaka. The development of leopard frog tadpoles was affected by exposure to a combination of octylphenol and UV light.[69]

APE contamination has also been found in human environments. For example, in one study, 4-nonylphenol was detected in the house dust of each of 120 American homes tested.[70] Another study showed that nonylphenol was detected in food purchased in German supermarkets. In that study, 40 kinds of adult food and 20 baby foods were tested and all samples showed some level of nonylphenol.[71] Not surprisingly, nonylphenol is also found in humans during biomonitoring. A recent study detected nonylphenol in the urine of 51% of human volunteers tested.[72]

Some progress on APEs and NPEs in cleaning products has been made in recent years. Both the European Union and Canada have banned NPEs from these products.[73] Proctor & Gamble, a major cleaning products manufacturer, also voluntarily eliminated NPEs from their products.[74] In 2006, WalMart

announced a new initiative to encourage its product suppliers to eliminate NPEs from products sold in WalMart stores.[75] Without mandates, however, APEs and NPEs will likely continue to be used in many cleaning products.

Phthalates are a class of chemicals widely used in consumer products, primarily as plasticizers to make brittle plastics soft.[76] They are also used in cosmetics and household cleaning products (in deodorizers, laundry detergents and fabric softeners).[77] One particular type of phthalate, **dibutyl phthalate (DBP)**, is also found in floor polish and window cleaners.[78] It is difficult for the consumer to determine if phthalates are present in cleaners or other consumer products. Generally, phthalates are incorporated in the fragrance, the contents of which are protected by trade secret laws. A 2002 study of cosmetics detected phthalates in nearly three-quarters of products tested, despite the absence of any mention of phthalates on any of the products' labels.[79] The label, if it lists ingredients at all, will often simply state "fragrance" without identifying the specific components. Thus, in this report, we were unable to compile even a partial list of household cleaning products containing phthalates.

Certain phthalates have been shown to cause reproductive and developmental harm in laboratory animals, as well as more acute impacts such as organ damage.[80] Reproductive effects associated with exposure to phthalates include changes in male sexual characteristics, reduced sperm count, and damaged sperm.[81] A May 2005 report showed an association between adverse effects to male children and their mothers' exposure to phthalates during pregnancy.[82] A study on children with allergic symptoms found a correlation between levels of phthalates in housedust and allergic symptoms and/or asthma in children in those homes.[83]

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Phototgrapher: Karen Struthers | Agency: Dreamstime.com

A Special Note on Air Fresheners:

Air fresheners are a category of cleaning products that have experienced enormous growth in recent years. Development of new products, ranging from scented candles to battery-operated or plug-in devices and a great variety of scented aerosols and "air sanitizers," has been rapid. One study noted that the market for battery-operated air fresheners increased 191% between 2004 and 2005.[84] Advertising and marketing of these products has also intensified, aiming to convince consumers that air fresheners are an essential part of a healthy, good-smelling home.

However, the mechanics of air fresheners only provide a superficial impression of cleanliness and may contain a number of particularly hazardous chemicals. First, they contain fragrances, which are irritants associated with watery eyes, headaches, skin and respiratory irritation, asthma and allergic reactions. Exposure to phthalates, which carry the fragrances in these products, can also aggravate asthma[85] and are linked to reproductive harm. Finally, air fresheners may also contain VOCs such as xylene, ketones and aldehydes[86] as well as benzene and formaldehyde, both of which are known carcinogens.[87]

Photographer: "Iwillnotsuccumb" | www.flickr.com

A study of 14,000 pregnant women in the United Kingdom performed by epidemiologists at the University of Bristol in England showed a link between the use of air fresheners and aerosol sprays and an increase in headaches and depression in the mothers, as well as ear infections and diarrhea in their babies. In homes where air fresheners and aerosol sprays were used on most days, women experienced 25% more headaches and 19% more post-natal depression than women in homes where such products were used less than once a week. Babies under six months old who were exposed to air fresheners on most days had 30% more ear infections and a 22% greater chance of diarrhea than babies exposed less than once a week.[88] While it is not clear which chemicals (or which combination of chemicals) found in air fresheners may be responsible for these effects, the results of this study raise concern about the safety and necessity of these products.

Regulation of Chemicals in Household Cleaners

Home cleaning products are minimally and inadequately regulated in the United States. Agencies such as the Food and Drug Administration (FDA), Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA), all of which have the scientific expertise to regulate chemicals found in these products, lack the jurisdiction to do so. OSHA only regulates occupational exposure to industrial chemicals, including industrial cleaning chemicals. The EPA does not regulate chemicals used in the home unless they are registered as pesticides. Similarly, household cleaning chemicals do not come under the jurisdiction of the FDA, which regulates, among other things, food, over-the-counter and prescription drugs, animal feed and veterinary medications, medical devices such as pacemakers, and nominally, cosmetics and personal care products. The Consumer Product Safety Commission, the agency with the most relevant jurisdiction over household cleaning chemicals, has 480 staff responsible for monitoring over 15,000 consumer products nationwide. As a result, they tend to limit their focus to acute hazards such as poisoning.

At the core of the toxic chemical threat to human health and the environment is the fact that tens of thousands of chemicals are used in American industry, placed in products, and released to our environment, with virtually no information on the potential consequences for human health and little oversight by the government.

Household products often contain the same chemicals found in industrial cleaning products, at a lower concentration. Information on household products, however, is even more difficult to obtain than information on industrial chemicals. No legal requirements exist for listing ingredients on the labels of household cleaning products. Industrial products, however, are required by OSHA to have a Material Safety Data Sheet (MSDS) that lists ingredients and health hazards associated with a particular product. No such requirement exists for household products, although many companies voluntarily produce MSDSs for household cleaning products as well. Despite this, MSDSs are generally incomplete, and certainly difficult for the layperson to access and understand. MSDSs often do not list carrier chemicals such as phthalates, nor do they specify fragrances or other compounds present in small quantities. Many of the chemicals of concern described above, however, can have toxic effects even at low levels, especially when you are exposed to them every day.

Phototgrapher: Miguel Agullo | Agency: Dreamstime.com

The National Institutes of Health maintains a database of ingredients for household products (householdproducts.nlm.nih.gov/ingredients.htm.) The information in the Household Products Database comes from product labels and MSDSs where they exist, and is therefore incomplete. While it is currently the most comprehensive information available on household cleaning product ingredients, numerous consumer products are simply not included due to a lack of information provided by the manufacturer.

The lack of regulation and disclosure of chemicals in cleaning products is part of a much larger problem. At the core of the toxic chemical threat to human health and the environment is the fact that tens of thousands of chemicals are used in American industry, placed in products and released to our environment, with virtually no information on the potential consequences for human health and little oversight by the government. It is estimated that between 85,000-95,000 chemicals are registered for use in the U.S., yet only a small fraction have been adequately tested for safety, and less than half of them have ever been tested for any form of chronic toxicity. Federal law does not require any mandatory pre-market health testing for chemicals used in most consumer products. In 2004, the Toxics Release Inventory (TRI), an EPA program which tallies the inventories of toxic releases and emissions from a variety of industrial sectors, showed that industries released 4.2 billion pounds of toxic chemicals to the environment. Yet, the total quantity of chemical waste managed, a broader indicator of the greater hazard, was 29 billion pounds.[89] The collective impact of this quantity and mixture of chemicals in our environment is simply unknown.

Conclusion and Recommended Actions

Shopping for cleaning products involves personal choices on a number of levels. Which products make your house feel clean? Which products give your clothing the softness or brightness you are looking for? Which products are priced right for your budget and available at your nearest store? Sometimes it comes down to which products you have found to be tried and true for years. This report aims to provide additional information for consumers who may have concerns about their exposure to chemicals in cleaning products. With a growing awareness about the widespread use of toxic chemicals in the consumer marketplace, women are looking for information on how to reduce unnecessary and harmful exposures. While research presented in this report does not prove that the use of cleaners containing these chemicals causes disease, it does validate reasonable concern about the potential health effects. Clearly, more research is needed to better understand the impacts of household cleaning chemicals on human health, which can translate into greater transparency about product ingredients, increased use of safer alternatives and precautionary policies that serve to protect public health. In the meantime, some consumers may prefer to be safe rather than sorry in the absence of conclusive proof of harm.

What You Can Do

1. Make your own non-toxic cleaning products. Many recipes are available to make your own non-toxic cleaning products. Simple and inexpensive ingredients like vinegar, baking soda and borax can be used in many different ways for effective cleaning. Refer to the Resources section of this report for links to specific recipes.

2. Use less toxic products. It is not always easy to determine which cleaning products are less toxic. Simply having a "natural sounding" brand name does not preclude a product from containing chemicals you may want to avoid. Below are some tips to help you choose less toxic cleaning products.

a. Avoid products marked "Danger", "Poison", and reduce your use of products marked "Caution." "Caution" or "Warning" appears on numerous cleaning product labels and indicates a mild hazard from normal exposure, such as skin and eye irritation. "Danger" on a label indicates possible permanent

Photographer: John Glenn (Crowolf).

damage, and is found on drain and oven cleaners. "Poison" is rarely found on cleaning products.[90] Each of these warning labels indicates an approximate volume of the product that can be harmful. However, these warning labels generally only apply to acute hazards such as poisoning or burning. No such warning signs are required for chemicals with long-term effects such as reproductive harm or asthma.

b. Reduce your use of products containing Volatile Organic Compounds (VOCs). Reducing the use of products containing VOCs is particularly important if you or someone in your home has asthma. The U.S. EPA's Indoor Air Quality Program states that the following products types are likely to contain VOCs: aerosol sprays, cleaners and disinfectants, moth repellents and air fresheners.[91]

c. Avoid chemicals that are linked to reproductive or developmental effects. Products that contain endocrine disrupting chemicals such as butoxyethanol and other glycol ethers include all-purpose cleaners, glass cleaners, tub/tile cleaners, degreasers, carpet cleaners, stain removers, floor strippers and cleaners, metal polishes, and oven cleaners.[92] Products that contain APEs are found primarily in laundry detergents, multi-purpose cleaners, floor care products and carpet cleaners, non-chlorine sanitizers, toilet bowl cleaners and deodorizers. Look for products that use alcohol ethoxylates (sometimes listed as ethoxylated alcohols) instead.

d. Look for products which have been certified by an independent institution such as GreenSeal. These products are increasingly available on the market for industrial cleaning applications.

e. Use fewer products. An all-purpose cleaner can handle a lot of cleaning jobs around the house. It is not necessary to have a different product for each room (bathroom cleaner, kitchen cleaner, etc.)

3. Buy products from manufacturers that disclose ingredients on the label. While labeling for household cleaning products is limited, you can reduce your exposure to chemicals with long-term health effects by purchasing products from manufacturers who list ingredients on their labels. If a product does not include ingredients on the label, call the customer service number on the product and ask the company to disclose the ingredients.

4. Encourage product manufacturers to replace toxic ingredients with safer alternatives. Alternatives do exist for many of the chemicals of concern in cleaning products. If your favorite cleaning product contains a chemical of concern, call the manufacturer and let them know you would prefer they use an alternative chemical.

5. Never mix products. Chemicals in cleaning products can have dangerous reactions with one another. For example, when bleach and ammonia are combined, this mixture creates deadly chloramine fumes.[93]

6. Demand that government require companies to disclose product ingredients and replace toxic chemicals with safer alternatives. Contact your congressional representative and ask them to support legislation that would require companies to disclose their product ingredients. Also ask them to support chemical policy reform. For more information go to: www.louisvillecharter.org/

7. Join Women's Voices for the Earth (www.womenandenvironment.org) or other environmental health advocacy organizations in your area that are working to change chemical policy.

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Resources

Books

Clean: The Humble Art of Zen-Cleansing by Michael de Jong, Joost Elffers Books, 2005.

Creating a Healthy Household: The Ultimate Guide for Healthier, Safer, Less-Toxic Living by Lynn Marie Bower, Healthy House Institute, 2000.

Home Safe Home: Protecting Yourself and Your Family from Everyday Toxics and Harmful Household Products by Debra Lynn Dadd, Jeremy P. Tarcher, Putnam 1997.

Naturally Clean: The Seventh Generation Guide to Safe & Health, Non-Toxic Cleaning, by Jeffrey Hollender et al

Safe Shopper's Bible: A Consumer's Guide to Non-Toxic Household Products, Cosmetics, and Food by David Steinman and Samuel S. Epstein, M.D. MacMillan 1995

Web Resources

Co-op America's National Green Pages: www.coopamerica.org/pubs/greenpages/about.cfm

Greener Cleaning: Buying Guide. Consumer Reports, Greener Choices website: www.greenerchoices.org/products.cfm?product=greencleaning&pcat=homegarden

Healthier Home Cleaning. The Green Guide: www.thegreenguide.com/doc/98/clean

Janitorial Products Pollution Prevention Project: www.wrppn.org/Janitorial/jp4.cfm

National Institutes of Health Household Products database

http://householdproducts.nlm.nih.gov/products.htm. (Note: This database is not comprehensive. The information on products is obtained from Material Safety Data Sheets provided by manufacturers, which may be incomplete or out of date).

Non-toxic Cleaning Solutions by Annie Berthold-Bond on Care2.com: www.care2.com/greenliving/healthy-home/nontoxic-cleaning

Safe Substitutes at Home: Non-toxic Household Products by Gary A. Davis and Em Turner, University of Tennessee, Knoxville Waste Management Institute http://es.epa.gov/techinfo/facts/safe-fs.html

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End Notes

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Appendix 1: Household Cleaning Products Containing Chemicals of Concern

Part 1: Chemicals Linked to Reproductive Harm

Glycol Ethers
Chemical: 2-butoxyethanol
CAS #: 111-76-2

All Purpose Cleaners:

Name of Product	%	Manufacturer
America's Home Value All Purpose Cleaner	5-10	Chase Products Co.
Aroma Clean by Simple Green	NA	Sunshine Makers, Inc
Aroma Clean by Simple Green All Purpose Cleaner	NA	Sunshine Makers, Inc.
Clean Swipe Spray Cleaner	5	Horizon Distributors Inc.
Crystal Simple Green Cleaner/Degreaser	NA	Sunshine Makers, Inc.
Formula 409 All Purpose Cleaner Grease & Grime	0.5-5	The Clorox Company
Formula 409 All Purpose Cleaner Lemon Fresh	1-5	The Clorox Company
Formula 409 All Purpose Cleaner Lemon Fresh Antibacterial	0.5-5	The Clorox Company
Formula 409 Cleaner Degreaser 1 Qt (Trigger Spray)	0.5-5	The Clorox Company
Formula 409 Spray All Purpose Cleaner	0.5-5	The Clorox Company
Lemon Fresh Formula 409 All Purpose Cleaner	1-5	The Clorox Company
Lemon Fresh Pine-Sol Cleaner & Antibacterial Spray	1-5	The Clorox Company
Pro Formula 409 Degreaser	5-10	The Clorox Company
Savogran Dirtex Spray Cleaner	<10	Savogran Co
Simple Green All Purpose Cleaner Lemon Scented	NA	Sunshine Makers, Inc
Simple Green All Purpose Cleaner Foam	NA	Sunshine Makers, Inc
Simple Green Concentrated Cleaner, Degreaser, Deodorizer	NA	Sunshine Makers, Inc
Simple Green Extreme Clean	NA	Sunshine Makers, Inc
Simple Green Multi-Purpose Cleaner	NA	Sunshine Makers, Inc
SOS All Purpose Cleaner Lemon Scent	0.5-5	The Clorox Company
Whistle All Purpose Cleaner	1-5	Drackett Professional, (S.C. Johnson)
Whistle All Purpose Cleaner	1-5	Drackett Professional, (S.C. Johnson)

Bathroom Cleaners:

Name of Product	%	Manufacturer
America's Home Value Bathroom Cleaner	1-5	Chase Products Co.
Aqua Mix Heavy Duty Tile and Grout Cleaner	NA	Aqua Mix Inc.
Magic American Marble & Granite Magic	<3.0	Magic American Products, Inc.
Tile & Grout Magic	<4.0	Magic American Products, Inc.
Tile & Grout Magic Cleaner	NA	Magic American Products, Inc.

Carpet/Rug Cleaners:

Name of Product	%	Manufacturer
Aroma Clean by Simple Green Carpet, Fabric and Upholstery Cleaner	NA	Sunshine Makers, Inc.
Carpet Stain Remover	<17.0	Magic American Corp.
Its Magic Carpet Cleaner	5-15	Dymon Inc
Simple Green Carpet Cleaner	NA	Sunshine Makers inc
Spot Shot Instant Carpet Stain Remover, Aerosol	25	WD-40 Company
Spot Shot Instant Carpet Stain Remover, Trigger	<2	WD-40 Company
Spot Shot Large Area Multi-Purpose Cleaner	10	WD-40 Company

Degreasers:

Name of Product	%	Manufacturer
Simple Green BBQ Grill Microwave Cleaner	NA	Sunshine Makers, Inc

Floor Cleaners:

Name of Product	%	Manufacturer
Fresh Scent Pine-Sol Spray & Mop Floor Cleaner	1-5	The Clorox Company
Lemon Fresh Pine-Sol Quick Floor Floor Cleaner	1-5	The Clorox Company
Aroma Clean by Simple Green		

Floor Cleaner	NA	Sunshine Makers, Inc.
Break Up Floor Stripper	10-50	Horizon Distributors Inc.

Glass Cleaners:

Name of Product	%	Manufacturer
America's Home Value Glass Cleaner	1-5	Chase Products Co.
Easy Off Glass Cleaner Lemonized With Ammonia	3	Reckitt Benckiser
Formula 409 Glass & Surface Cleaner	1-5	The Clorox Company
Glass Plus Mirror & Glass Cleaner	5-15	Horizon Distributors
Sparkle Glass Cleaner	NA	AJ Funk & Co
Windex Aerosol	1-5	S.C. Johnson and son

Kitchen Cleaners:

Name of Product	%	Manufacturer
Formula 409 Daily Kitchen Cleaner	0.5-5	The Clorox Company

Wipes:

Name of Product	%	Manufacturer
Aroma Clean by Simple Green All Purpose Cleaner Wipes	NA	Sunshine Makers, Inc.
Formula 409 Cleaning Wipes	0.5-2	The Clorox Company
Simple Green All Purpose Towelettes	NA	Sunshine Makers, Inc
Simple Green Lemon Scented All Purpose Wipes	NA	Sunshine Makers, Inc
Simple Green Multi Purpose Wipes	NA	Sunshine Makers, Inc
Simple Green Safety Towels	NA	Sunshine Makers, Inc

Glycol Ethers
Chemical: 2-(2-Methoxyethoxy)ethanol
CAS #: 111-77-3

Floor Cleaners:

Name of Product	%	Manufacturer
Brilliance Floor Finish	2-5	Horizon Distributors Inc.
Jobmaster High Gloss Floor Finish, Self Polishing, Institutional	NA	Huish Detergents
Perk Floor Cleaner and Polish	6.2	Reckitt Benckiser Inc
Prefer Floor Finish	2-8	Horizon Distributors
Rebound Floor Finish Concentrate	<5	Horizon Distributors

Part 2: Cleaning Chemicals Linked to Asthma

Chemical: Monoethanolamine
CAS#: 141-43-5

All Purpose Cleaners:

Name of Product	%	Manufacturer
Cinch Glass and Surface Cleaner	0.1-1	Spic and Span
Clean Swipe Spray Cleaner	1-5	Horizon Distributors Inc.
Formula 409 Orange Power All Purpose Cleaner	<1	The Clorox Company
Mr. Clean Antibacterial Multi-Surface Cleaner (orange & lemon scented)	0.1 - 1	Proctor & Gamble
SOS All Purpose Cleaner Lemon Scent	<1	The Clorox Company
Spic & Span Disinfecting All-Purposee Spray and Glass Cleaner	0.1-1	Proctor & Gamble

Degreasers:

Name of Product	%	Manufacturer
Easy Off Bam Power degreaser	0-1	Reckitt Benckiser

Floor Cleaners:

Name of Product	%	Manufacturer
Break Up Floor Stripper	10-30	Horizon Distributors Inc.

Glass Cleaners:

Name of Product	%	Manufacturer
Glass Pluss Smart-Fill	1-3	Reckitt Benckiser
Glass Plus Glass & Multi-Surface Cleaner (Refills)	1-3	Reckitt Benckiser

Kitchen Cleaners:

Name of Product	%	Manufacturer
Clorox Disinfecting Kitchen Cleaner Easy Off Self Scrubbing	0.5-1.5	The Clorox Company
Kitchen Cleaner	1.0-5.0	Reckitt Benckiser
Easy Off Self Scrubbing Kitchen Cleaner	1-5	Reckitt Benckiser
Dawn Power Dissolver	3-7	Proctor & Gamble

Laundry Detergents:

Name of Product	%	Manufacturer
Ace	0.5-1.5	Proctor & Gamble
Ariel	0.5-1.5	Proctor & Gamble
Ariel Liquid Laundry Detergent	0.5-1.5	Proctor & Gamble
Cheer 2X True Fit	0.5-5	Proctor & Gamble
Cheer Colorguard Regular, Free & Gentle, Fresh Linen	0.5-1.5	Proctor & Gamble
Cheer Complete, High Efficiency	0.5-1.5	Proctor & Gamble
Cheer Liquid Laundry Detergent	0.5-1.5	Proctor & Gamble
Dreft	0.5-1.5	Proctor & Gamble
Dreft 2X Concentrated	0.5-1.5	Proctor & Gamble
Era 2X Concentrated	0.5-5	Proctor & Gamble
Era Liquid Laundry Detergent	1-5	Proctor & Gamble
Gain 2X Concentrated, Gain w/ Bleach Alternative	0.5 - 5	Proctor & Gamble
Gain 2X Simply Fresh/Cotton Fresh	0.5-5	Proctor & Gamble
Gain High Efficiency (HE), Joyful Expressions	0.5 - 5	Proctor & Gamble
Gain Liquid Laundry Detergent	1-5	Proctor & Gamble
Ivory Snow 2X	0.5-1.5	Proctor & Gamble
Ivory Snow Liquid Laundry Detergent	0.5-1.5	Proctor & Gamble
Tide 2X Concentrated	0.5-5	Proctor & Gamble
Tide 2X Con High Efficiency	0.5-5	Proctor & Gamble
Tide Free Ultra Liquid	0.5-1.5	Proctor & Gamble
Tide Ultra 2 with Bleach	0.5-1.5	Proctor & Gamble
Tide Ultra Liquid	0.5-1.5	Proctor & Gamble
Ultra ACE 2X Concentrated, Ultra Ace Free	0.5-5	Proctor & Gamble
Ultra Ace Simple Pleasures	0.5-5	Proctor & Gamble
Ultra Ariel 2X Concentrated	0.5-5	Proctor & Gamble
Ultra Ariel High Efficiency	0.5-5	Proctor & Gamble

Oven Cleaners:

Name of Product	%	Manufacturer
Easy Off Fume Free Max Oven Cleaner	1-5	Reckitt Benckiser
Easy Off Heavy Duty Oven Cleaner	0-5	Reckitt Benckiser
Easy Off Heavy Duty Oven Cleaner-Original	<5	Reckitt Benckiser

Stainless Steel Cleaners:

Name of Product	%	Manufacturer
Stainless Steel Magic	<1.5	Magic American Products, Inc.

Chemical: Benzalkonium chloride
CAS#: 8001-54-5

Name of Product	%	Manufacturer
Lysol Brand Disinfectant All Purpose Cleaner- all scents	<2.0	Reckitt Benckiser Inc
Clorox Disinfectent Floor & Surface Cleaner Crisp Citrus	0.62	The Clorox Company
Clorox Disinfectent Floor & Surface Cleaner Refreashing Clean	0.62	The Clorox Company

NA: Not Available

Source: Information on ingredients in the listed cleaning products were obtained from Material Safety Data Sheets (MSDS) found on manufacturer's websites in May 2007. Women's Voices for the Earth acknowledges that formulations of cleaning products do change over time. The information we used for this report was the most recent information available to us from manufacturer's websites at the time.

Disclaimer: This list does not represent a complete survey of all U.S. household cleaning products and/or manufacturers. To create this list WVE surveyed websites of major manufacturers which produce household cleaning products readily available to the general public. There may be additional products from other manufacturers than those listed which contain these chemicals for which we were unable to obtain MSDS sheets to confirm the ingredients. WVE acknowledges that the presence of a chemical in a product does not imply that these products will definitely cause harm, but rather that the possible impacts of exposure to the chemical present a valid concern.

Women's Voices for the Earth
P.O. Box 8743
Missoula, MT 59807
Phone: 406/543-3747

www.womenandenvironment.org
wve@womenandenvironment.org