

CONTAMINANTS OF EMERGING CONCERN IN CONSUMER PRODUCTS:

What Can We Do to Reduce Risk?

Often described as “contaminants of emerging concern” (CECs), low levels of unregulated chemicals were first documented in rivers and streams in the 1990s. Some have been found to harm aquatic organisms. Their presence in drinking water, where most of them are not currently regulated, has raised concerns about possible effects of human exposure.

Federal biomonitoring programs have identified a large number of environmental chemicals to which people are exposed through consumer products, water, food, and indoor air. Although some epidemiological studies have shown associations between the concentration of these chemicals in the general population and adverse health outcomes, our understanding of their health effects lags behind our ability to measure them. Fortunately, scientists are gaining a clearer sense of the sources and typical levels of CECs in the environment. Research on animals indicates that some of them can cause effects at extremely tiny doses, including reproductive and developmental problems. This is why their potential effects on vulnerable individuals, especially unborn or young children, are of great concern. Here we describe some CECs and suggest how citizens can take action to protect their families and their communities.

WHERE ARE CECS FOUND?

The universe of products that contain CECs includes plastics made with the additives bisphenol A and phthalates; fire retardants (PBDEs and Tris); nonstick coatings (PFCs); personal care products (shampoos, hair dyes, sunscreens, cosmetics and antibacterial soaps); perchlorate; pesticides; surfactants in detergents and other cleaning products; and pharmaceuticals (over-the-counter and prescription human and animal medications including hormones). Some CECs are endocrine disrupting chemicals (EDCs) that can interfere with the actions of natural hormones. Since some pharmaceuticals are themselves hormones (e.g. birth control pills), they

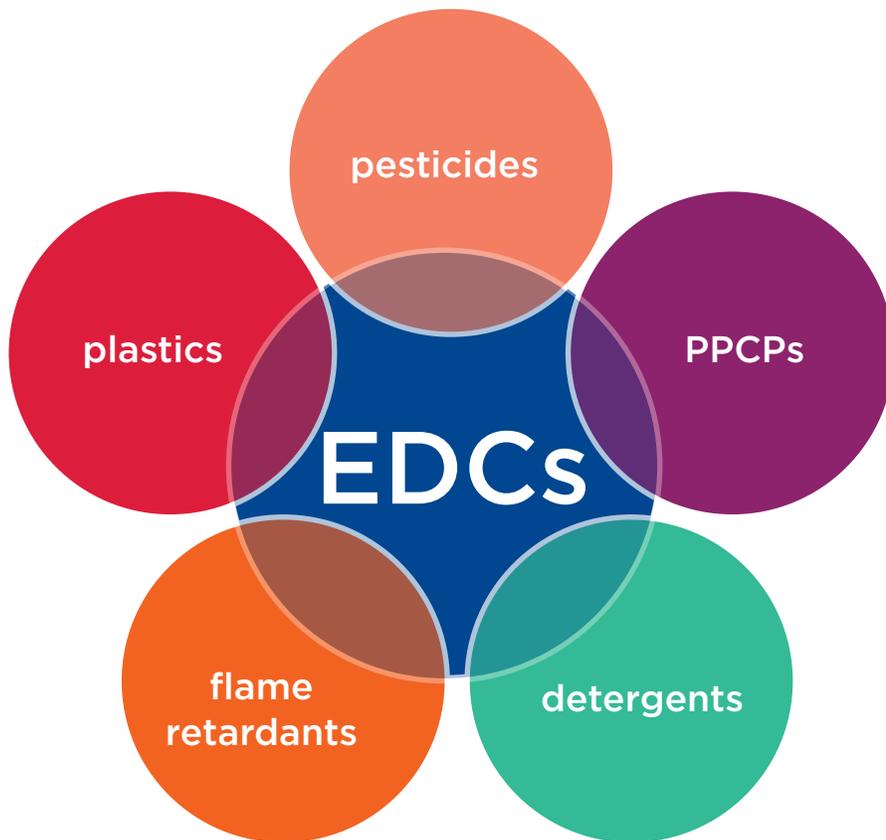
can affect many others besides the person they were meant for.

HOW PEOPLE MAY BE EXPOSED TO CONTAMINANTS OF EMERGING CONCERN

- **Consumer Products:** Foods can become contaminated when plasticizers such as phthalates and bisphenol A leach from plastic linings or packaging and when nonstick coatings wear off of cooking utensils. Traces of pesticides from air or irrigation water can contaminate foods, and people can be exposed to other kinds of CECs through the skin during bathing and when makeup and sunscreens are applied.
- **Indoor Air and Dust:** Endocrine disrupting chemicals including phthalates, pesticides and flame retardants have been found in indoor air and dust. Tiny particles from fabrics and furniture become dust and phthalate plasticizers offgas from flexible plastics.
- **Drinking Water:** After use by consumers some products containing CECs are flushed down the drain. Similarly some medications people use are not broken down but are excreted and enter sewage in the same way. If they are not removed by sewage treatment plants or septic systems they end up in ground and surface waters and eventually enter our drinking water. EPA addresses this concern by requiring public drinking water systems to periodically monitor for specific unregulated contaminants of concern. EPA uses these results to develop regulatory decisions for emerging contaminants.

SOME MAJOR CHEMICALS CONSIDERED TO BE CECS

- **Bisphenol A (BPA)** is a chemical found in the lining of canned foods, thermal printing paper used for receipts, and some dental fillings and sealants.



DETERGENTS, FLAME RETARDANTS, PESTICIDES, PLASTICS, AND PPCPS (PHARMACEUTICALS AND PERSONAL CARE PRODUCTS) CAN SOMETIMES HAVE ENDOCRINE DISRUPTING EFFECTS. ADAPTED FROM DR. LAUREL SCHAIDER, SILENT SPRING INSTITUTE.

This chart illustrates that many different kinds of consumer products have been found to contain endocrine disrupting chemicals (EDCs). A Silent Spring Institute study tested many consumer products for EDCs. They found that everyday products contain a wide range of potentially harmful EDCs. Many detected chemicals were not listed on product labels, and they concluded “Disclosure of product ingredients would enable researchers to identify exposures for study and risk evaluation and allow consumers to make decisions consistent with their personal values.

Polycarbonate plastic products like water bottles and infant formula bottles are another potential source of exposure, although many companies have stopped using BPA in water and baby bottles. CDC’s National Health and Nutrition Examination Survey (NHANES), considered representative of exposures in the United States, found detectable levels of BPA in 93% of 2517 urine samples from people six years and older. The National Toxicology Program (NTP) expressed concerns for its effects on the brain, behavior, and prostate gland in fetuses, infants, and children at current level of human exposure.¹

- **Diethylhexyl phthalate (DEHP)** is found in many plastics and other products made of polyvinyl chloride (PVC), including medical devices, vinyl shower curtains, plastic food packaging, and plastic toys. These exposures pose a particular risk because DEHP exposures in children tend to exceed those of the general population. The results reported in laboratory animals indicate a potential for similar adverse effects in human populations. In particular, the developing reproductive tracts of male fetuses and infants are very sensitive to the adverse effects of DEHP.

Exposure may occur through medical procedures, diet, and/or mouthing of DEHP-containing objects.² DEHP is classified as a probable carcinogen by the National Toxicology Program.

- **Polybrominated diphenyl ethers (PBDEs)** are flame retardants added to furniture, electronics, foam insulation, and building materials so they will not easily burn. They affect the thyroid gland, may interfere with other natural hormones, trigger reproductive problems, and cause developmental and neurological damage. Studies indicate near universal exposure to PBDEs among the general population.^{3,4} Organophosphate flame retardants (OPFRs), used as replacements for PBDE mixtures being phased out, are also ubiquitous in the environment. They have been detected at high concentrations in residential dust, suggesting widespread human exposure may be associated with altered hormone levels and decreased semen quality in men.^{5,6}
- **Perfluorinated chemicals (PFCs)** are used in chemical coatings which repel oil, grease and water on cookware and waterproof, breathable fabrics

for clothing. PFCs released during manufacturing processes or in wastes from the perfluoroalkyl industry are potential sources of exposure for the individuals employed in these industries as well as for the general population. Other potential sources of exposure include consumer products containing PFCs, contaminated drinking and surface waters, airborne PFCs, indoor air, and house dust. PFCs are bioaccumulative in wildlife and humans, persistent in the environment and toxic to laboratory animals and wildlife. Laboratory tests on animals have shown that they can cause tumor development, birth defects, delayed development and early deaths.⁷ These tests also suggest that they may affect the developing nervous system through the reduction of thyroid hormone, which regulates brain development.⁸

- **Perchlorate** is found in soil and groundwater contaminated with chemicals from rocket fuel, fireworks, flares, explosives, and some fertilizers, and is sometimes formed during disinfection of drinking water using chlorine. It is also found in crops like lettuce and leafy greens grown in contaminated soil or irrigated by contaminated water. The main target organ for perchlorate toxicity in humans is the thyroid gland. Perchlorate has been shown to partially inhibit the thyroid's uptake of iodine which is required as a building block for the synthesis of thyroid hormone. Thyroid hormones regulate many vital body functions after they are released into the blood.^{9,10}
- **Pesticides.** Some pesticides are now included in the lists of CECs because although a number of them are currently regulated in drinking water, some have now been found to affect biological processes at levels far lower than the level at which they are regulated.¹¹ Pesticides include insecticides, herbicides, and fungicides. They often are applied in formulations that include surfactants, some of which are also endocrine disruptors.
- **Antibacterials:** Triclosan like many CECs is of concern because it is toxic to fish and harms aquatic life in other ways.¹² It is found in sewage and surface waters and was detected in three-quarters of human urine samples analyzed as part of the NHANES 2003–2004 study. Triclosan is used to control bacteria in hand cleaners, toothpaste, mouthwash, deodorants, soaps, socks, underwear, toys, liquid dishwashing soap, and plastic kitchenware. There are also concerns that the use of antibacterial products contributes to the development of resistant bacteria. In the interest of precaution, and because effective cleaning alternatives exist, use of these antibacterials is discouraged.



PERSONAL ACTIONS AND LINKS TO USEFUL FACTSHEETS

- To learn about many actions you can take and why they are important consult Silent Spring Institute's factsheets: <http://www.silentspring.org/take-action>
- For lists of ingredients in consumer products see: <http://householdproducts.nlm.nih.gov/>
<http://www.ewg.org/guides/categories/2-AllPurpose>
- Avoid products containing CECs — including paints, room fresheners, insect repellents containing DEET, flexible plastic shower curtains, clothing and other items made with PVC fabric, clothing impregnated with pesticides and antibacterials, and pest control products, especially inside the home.
- Use the best possible “point of use” water filters because many CECs are not removed by drinking water treatment and some treated water contains disinfection byproducts. The Silent Spring Institute recommends solid carbon block filters. These websites provide helpful information: <http://www.ewg.org/report/ewgs-water-filter-buying-guide>
<http://bit.ly/17SB0LV>
- Do not use antimicrobial hand cleaners containing triclosan or triclocarban. Warm water and soap or alcohol-based hand sanitizers are effective at removing germs. <http://www.nrdc.org/health/files/antimicrobials.pdf>
- Do not flush expired or unneeded prescription or over-the-counter pharmaceuticals. Take unneeded medications to local collection centers. In some communities this is the police station. <http://water.epa.gov/scitech/swguidance/ppcp/take-back.cfm>
- Switch to simple nontoxic cleaning products which can be made with baking soda, borax, vinegar and alcohol. <http://bit.ly/i6TY48>
<http://bit.ly/14liv1u>
- Damp mop and vacuum frequently, using HEPA filters if possible, to reduce levels of house dust. Use doormats to minimize the amount of dust tracked-in from outdoors.
- Take unneeded paints, solvents and pesticides to hazardous materials collection centers

COMMUNITY - LOCAL CAMPAIGNS

- Sponsor community education meetings for new mothers, seniors groups, and religious organizations.
- Use or promote the establishment of “Drug Take Back” programs at pharmacies.
- Encourage local government officials to upgrade to advanced methods of sewage management. Advocate that your local sewage plant require pretreatment or pollution prevention plans for facilities that likely release emerging contaminants: hospitals, long-term care facilities, hospices, veterinary hospitals and compounding pharmacies. In some areas this might include facilities that manufacture pharmaceuticals. Provide them with examples of how other cities educate businesses and consumers about protecting their sewage.

FOR MORE INFORMATION

- “Safer Chemicals, Healthy Families” is a coalition of diverse groups united by their common concern about toxic chemicals in our homes, places of work, and products we use every day. <http://www.saferchemicals.org/>.
- The Green Cleaning Network advocates full listing of ingredients on the labels of cleaning products. <http://www.greencleaningnetwork.org/>.
- The Green Science Policy Institute provides unbiased scientific data to government, industry, and non-governmental organizations to facilitate more informed decision-making about chemicals used in consumer products. <http://www.greensciencepolicy.org/>.

ENDNOTES

1. “Potential Human Reproductive and Developmental Effects of Bisphenol A”. <http://www.ncbi.nlm.nih.gov/pubmed/19407859>.
2. “NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Di(2-ethylhexyl) phthalate (DEHP)”. <http://ntp.niehs.nih.gov/ntp/ohat/phthalates/dehp/DEHP-Monograph.pdf>.
3. “PBDE Concentrations in Women’s Serum and Fecundability”. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2866688/>.
4. “Polybrominated Diphenylether (PBDE) Flame Retardants and Thyroid Hormone during Pregnancy”. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2957927/?report=classic>.
5. “Semivolatile Endocrine-Disrupting Compounds in Paired Indoor and Outdoor Air in Two Northern California Communities”. <http://pubs.acs.org/doi/abs/10.1021/es100159c>.
6. “House Dust Concentrations of Organophosphate Flame Retardants in Relation to Hormone Levels and Semen Quality”. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2854757/>.
7. “Perfluorooctanoic Acid (PFOA) and Fluorinated Telomers”. <http://www.epa.gov/oppt/pfoa/>.
8. “Exposure to Polyfluoroalkyl Chemicals and Attention Deficit/Hyperactivity Disorder in U.S. Children 12-15 Years of Age”. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3002197/>.
9. “Perchlorate (EPA)”. <http://water.epa.gov/drink/contaminants/unregulated/perchlorate.cfm>.
10. “How can perchlorate affect my health?” <http://www.atsdr.cdc.gov/phs/phs.asp?id=892&tid=181#bookmark05>.
11. “Effect of Endocrine Disruptor Pesticides: A Review” <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3138025/>.
12. “Triclosan: What Consumers Should Know”. <http://www.fda.gov/forconsumers/consumerupdates/ucm205999.htm>.