CHAPTER 13 TOXICS

INTRODUCTION

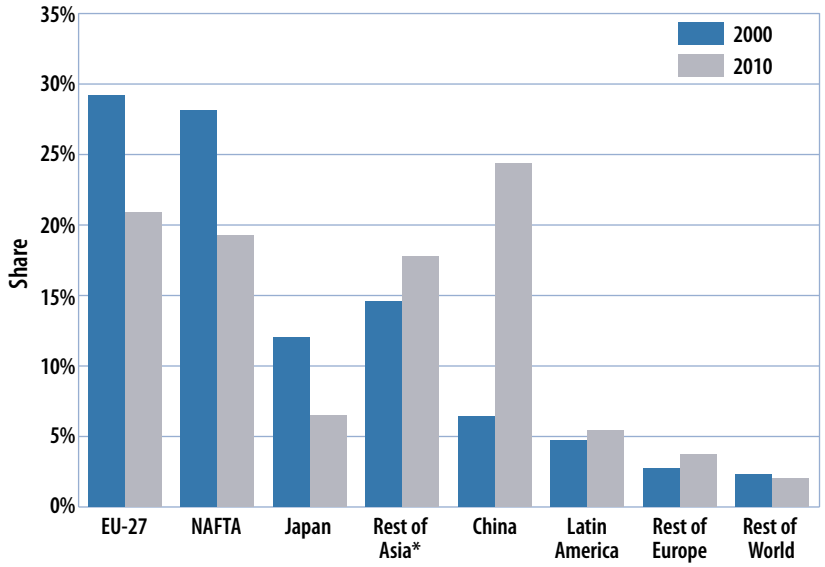
According to Aristotle, science begins with wonder: "It is owing to wonder that people began to philosophize, and wonder remains the beginning of knowledge."

To begin wrapping your head around how chemicals and chemistry influence your life, first consider the electronic device you likely use every day for information, communication and entertainment. The chemicals and heavy metals used to make it are many; some are very toxic and some you may never have heard of. Here are just a few: brominated flame retardants, lead, chromium hexavalent, polyvinyl chloride (PVC), and phthalate esthers.

In 2018, global chemicals sales exceeded $4 trillion. Fueled by emerging markets, world chemicals output has more than doubled over the last decade. This means that every single person in the world, on average, uses $500 worth of chemicals a year. The main users of chemicals are in developed countries where each person uses approximately $1200 worth of chemicals annually. (Data from the website of The Essential Chemistry Industry.)

In the United States, the chemical industry is one of the largest industries, an $812 billion enterprise that creates hundreds of thousands of jobs. The products of chemistry are present in some form in nearly every facet of the American economy. In fact, over 96 percent of all manufactured goods are directly touched by chemistry.

WORLD CHEMICAL SALES



Unless specified, chemicals industry excludes pharmaceuticals. Unless specified, EU refers to EU-27.
* Asia excluding China and Japan.
Source: Cefic Chemdata International

CREDIT

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TERM

Precautionary principle: *the principle that the introduction of a new product or process whose ultimate effects are disputed or unknown should be delayed until scientific consensus is established that it is not harmful.*

Chemical manufacturing creates products by transforming organic and inorganic raw materials through chemical processes. There are approximately 13,500 chemical manufacturing facilities in the United States owned by more than 9,000 companies. Facilities are located all over the country, with many companies in Texas, Ohio, New Jersey, Illinois, Louisiana, Pennsylvania, and the Carolinas. (Data from United States Environmental Protection Agency.)

With over 85,000 commercially produced chemicals, the chemical combinations in consumer products and their wastes are practically infinite. These products and byproducts bring us great benefits and also many negative consequences. Unfortunately, most chemicals have never been tested for possible health or environmental impacts. This creates significant health and environmental risks. (Data from the American Chemistry Council.)

There are two schools of thought when it comes to protecting the public from the potential harmful effects of chemicals. One is often called the **precautionary principle.** According to the precautionary principle the burden is on the manufacturer to prove that their new product or chemical is safe to expose to the public before they can introduce it commercially. U.S. regulations follow a second school of thought, markedly different from the precautionary principle. In the U.S., government and consumer advocates must identify problematic products and then prove that they cause harm. In practice, however, it is extremely difficult and costly to prove harm.

This chapter will explore the problems with current federal legislation in regards to toxics. It will also make the case that the cost of leaving laws as they are is significant in terms of human health and the environment.

This will entail an exploration of the health and environmental impacts of chemicals in the wrong places. After this initial examination of public health and environmental impacts we will shift our focus to individual lives. First we will explore where you are likely to encounter toxics in your everyday life. The final sections focus on strategies and personal choices that can very significantly lessen your exposure to toxic chemicals. You can minimize your use of hazardous products by buying only what you need and seeking out safer alternatives (whether store bought or homemade). We'll also discuss health considerations of plastics used in food packaging.

Master Recyclers can play a significant role in sharing this information so that more people in our region are empowered to make healthier personal choices. Master Recyclers are also well situated to participate in the conversation about changing the regulatory system so that community health comes first. With toxics infused in so many products around us, systemic change is necessary.

PROBLEMS WITH CURRENT POLICY

While chemicals and advances in chemistry have greatly improved our lives and welfare, some can have negative effects both on people and the environment. For example, some chemicals can pose serious risks if they are ingested or inhaled, some are known to cause cancer, and some are hazardous to the atmosphere. Unfortunately, because of the way the chemical industry is regulated, we know very little about most chemicals. In fact, we only know a good amount about just a handful of chemicals.

The federal Environmental Protection Agency (EPA) has access to only limited information about potential health or environmental hazards. And manufacturers have the right to withhold what they consider to be confidential business information. Because of this lack of information, in many instances it is impossible for the EPA to determine whether a chemical is safe or whether it poses a risk. With a weak federal regulatory structure, industry has little incentive to develop safer alternatives.

It is well documented that federal chemicals policy has not been effective in assessing chemical hazards or controlling chemicals of concern. Since the printing of this handbook, Congress passed reform legislation. Visit the EPA website to learn more.

A brief overview of current federal regulations governing chemicals and regulatory shortcomings will help set the stage for exploring possible state and local solutions.

FEDERAL REGULATIONS

Toxic Substances Control Act of 1976 (TSCA) provides EPA with authority to require reporting, record-keeping and testing, and to restrict chemical substances and/or mixtures if they are proven to pose unreasonable risks to public health or the environment. Certain substances are generally excluded from TSCA, including food, over the counter drugs, cosmetics and pesticides, among others. TSCA was amended in 2016 with the Frank R. Lautenberg Chemical Safety for the 21st Century Act. The Lautenberg Act strengthened TSCA in several key areas, including requiring review of existing chemicals in the market (not just new ones), strengthening the way risk assessments are done, calling for protection of vulnerable populations, and expanding testing authority and funding.

- **Primary weaknesses:** Even with improvements made in 2016, TSCA remains inadequate to protect human health and the environment. Under the law, EPA must prove that a chemical poses unreasonable risk to public health or the environment before it can be regulated. When the law first passed, it allowed 62,000 chemicals remain on the market without testing. There are now 85,000 chemicals in the inventory required by TSCA to be managed by EPA. However, only 20 high priority chemicals are required to be evaluated for risk assessment at any given time, and the agency can take several years to evaluate each chemical. This means that only a small fraction of chemicals on the market will end up in review in the next century. Additionally, in deciding whether to approve chemicals under TSCA, the EPA does not holistically consider emission impacts from a chemical to air, water and land because these emissions are regulated by other laws.

DEEP DIVE

More information about the **Toxic Substances Control Act (TSCA)** *is available on the EPA's website.*

DEEP DIVE

To learn more about what you can do about chemical policy and to follow recent proposals, visit the Environmental Defense Act website.

DEEP DIVE

More information about the **Federal Insecticide, Fungicide, Rodenticide Act (FIFRA)** *is available on the EPA's website.*

DEEP DIVE

More information about the **Federal Food, Drug, and Cosmetic Act(FFDCA)** *is available on the EPA's website.*

The Federal Insecticide, Fungicide, Rodenticide Act (FIFRA)

FIFRA provides federal control of pesticide distribution, sale and use. All pesticides used in the United States must be registered (licensed) by EPA. Registration assures that pesticides will be properly labeled and that, if used in accordance with specifications, they will not cause unreasonable harm to the environment. Use of each registered pesticide must be consistent with use directions contained on the label or labeling.

- **Primary weaknesses:** Provisions that restrict or prohibit information disclosure about the pesticide and pesticide application (for example, chemical composition or location of use) on the grounds that this is confidential business information.

The Federal Food, Drug, and Cosmetic Act of 1938 (FFDCA)

FFDCA is a set of laws that authorizes the Food and Drug Administration to oversee the safety, effectiveness and marketing of foods, drugs, cosmetics and medical devices. The law has been amended many times.

- **Primary weaknesses:** FDA lacks sufficient resources to handle the number of violations it encounters. The FDA has come to rely heavily on the cosmetic industry to regulate itself. FDA regulation under the Act has primarily been limited to regulation of cosmetic products after their release into the marketplace; neither products nor ingredients are reviewed or approved before they are sold to the public.

CHEMICALS REFORM: EMERGING SOLUTIONS

In the absence of adequate federal regulations, other countries, states and even the chemistry profession itself, have been developing new and promising ways to tackle problems associated with chemicals.

European Union

In Europe, policy developments have, with a nod to the precautionary principle, shifted the burden of proof away from government and onto industry. The European Union's Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) regulatory framework requires registration by producers and users for an estimated 30,000 chemicals. Canada has also developed a Domestic Substances List that identifies more than 4,300 chemicals requiring further investigation for potential risks. This is great news for consumers worldwide since much of the information gathered from these programs will be universally accessible.

States, local and tribal governments

Recognizing the backlog in assessment and regulatory action at the federal level, a number of states have taken action. Of particular note are California's Green Chemistry Initiative, Washington's Children's Safe Product Act of 2008, and Massachusetts' Toxic Use Reduction Initiative.

The Interstate Chemicals Clearinghouse (IC2) has worked to coordinate these state efforts. The IC2 is an association of state, local, and tribal governments that promotes a clean environment, healthy communities, and a vital economy through the development and use of safer chemicals and products. The goals of the IC2 are to:

- Avoid duplication and enhance efficiency and effectiveness of agency initiatives on chemicals through collaboration and coordination.

- Build government capacity to identify and promote safer chemicals and products.
- Ensure that agencies, businesses and the public have ready access to high quality and authoritative chemicals data, information and assessment methods.
- Ensure that manufacturers will replace harmful chemicals with safer alternatives.

DEEP DIVE

You can find more information on the Interstate Chemicals Clearinghouse on their website.

Oregon

Oregon's regulation and monitoring of toxic chemicals are fragmented among seven agencies, with little coordination. The safety of consumer products is a particular concern, as state agencies lack essential information needed to scientifically assess potential hazards. State tracking of exposure to toxic chemicals in communities and the workplace is incomplete and largely unanalyzed. There is a particular lack of data about health impacts on subpopulations — groups of people who may be more susceptible to risk if exposed. Some of these subpopulations also experience disproportionate exposure to chemicals.

DEEP DIVE

To learn what you can do about Oregon Policy on toxics-free environment visit the Oregon Environmental Council.

In 2015, the Oregon legislature passed toxics reduction legislation aimed at protecting some of Oregon's most vulnerable residents. The Toxics Free Kids Act (Senate Bill 478) establishes a list of chemicals that harm children's health and:

- Requires manufacturers to notify health officials when their children's products (such as toys and car seats) contain these chemicals.
- Authorizes health officials to collect and track this data.
- Ensures manufacturers will replace harmful chemicals with safer alternatives.

At the local level, a number of local governments in Oregon have initiated and passed toxics reduction policy that influences such things as what products government buys and how government manages facilities and landscapes. For example, Multnomah County has adopted a Green Cleaning Policy for County Facilities, in 2014 Metro initiated an Integrated Pest Management Policy for Metro Properties, the City of Eugene banned specific pesticides on City properties through City Council Resolution and the City of Portland has toxic reduction goals associated with the city's Sustainable City Principles Policy.

TERM

Green chemistry: *The design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Green chemistry applies across the life cycle of a chemical product, including its design, manufacture, use, and ultimate disposal. Green chemistry is also known as sustainable chemistry.*

CHANGE WITHIN THE INDUSTRY

While the role of government is changing, important changes are also taking place within the chemical industry itself. Traditionally, organic chemistry is taught in a vacuum. Chemists are taught how chemicals work without regard to the consequences of their use. There is no ethics course in the old school chemistry department.

Today in some academic settings, chemistry and the chemical enterprise are progressing towards a sustainable chemistry philosophy and practice. The federal Green Chemistry Research and Development Program promotes and coordinates federal research, development, demonstration, education and technology related to **green chemistry**.

Oregon is a leader in educating the next generation of more environmentally aware chemists. In 1998 the University of Oregon developed a groundbreaking approach to teaching organic chemistry that placed environmental concerns in the forefront. Since the development of UO's Green Chemistry Program, over 200 schools across the country have adopted the UO model, and the UO chemistry department has recently been enlisted by the National Science Foundation to share the program with institutions around the world. Perhaps as a result, Oregon also leads in some areas of greener chemicals, such as the design and development of chemical products and processes that reduce or eliminate the use or generation of hazardous substances.

TOXIC IMPACTS OF CHEMICALS IN THE WRONG PLACE

Chemicals are not static. Rather they move through the environment throughout their life cycle (production, transport, use and disposal). And they often move in unintended and unexpected ways. It is difficult to fully understand the toxic impact of individual chemicals at these myriad points; and we are just beginning to consider the impact of the almost infinite combination of chemicals on living organisms and the planet. It is clear, however, that there are significant public health impacts from chemicals and that chemical contamination is widespread.

Public and governmental awareness of how chemicals can increase cancer risk and other negative health outcomes has increased substantially in recent years as scientific and health care communities, policymakers, and individuals strive to understand and ameliorate the causes and toll of human disease. A growing body of research documents established and suspected environmental factors (including chemical contamination) linked to genetic, immune and endocrine dysfunction that can lead to cancer and other diseases.

While all Americans now carry many foreign chemicals in their bodies, women often have higher levels of many toxic and hormone-disrupting substances than do men. Some of these chemicals have been found in maternal blood, placental tissue, and breast milk samples from pregnant women and mothers who recently gave birth.

Research on chemical contaminants in breast milk spans several decades and dozens of countries. The ability to use this research as an environmental indicator is limited because of a lack of consistent protocols. For example, most studies have focused only on a small panel of persistent organic pollutants, despite indications that a wide range of additional chemical contaminants may also enter breast milk. Despite these shortcomings scientists have detected many different chemicals in breast milk throughout the world. Chemicals often tested for and found in breast milk globally include: organochlorine pesticides, polychlorinated biphenyls (PCBs), polychlorinated dibenzodioxins (PCDDs), polybrominated diphenyl ethers (PBDEs), metals, and solvents. This substantial body of research shows that chemicals often end up in the wrong place — in this case in human breast milk.

Humans and all other organisms are exposed to many chemical mixtures present in the surrounding environment (water, air, soil), in food or in consumer products. However, with a few exceptions, chemical risk assessment considers the effects of single substances in isolation, an approach that is only justified if the exposure to mixtures does not bear the risk of increased toxicity. This would be the case, for example, if only one chemical of the mixture is toxic while the others are biologically inert.

However, there is strong evidence that chemicals with common specific modes of action work together to produce combination effects that are larger than the effects of each component applied singly. Fewer studies have been conducted with mixtures composed of chemicals with diverse modes of action, but results clearly point in the same direction: the effects of such mixtures are also higher than those of the individual components. Recent research shows that this applies to a host of different endpoints of relevance to mammalian toxicology and ecotoxicology, and holds true for a diverse set of chemicals.

"The question is not whether we should feed our babies chemically contaminated, yet clearly superior, breast milk or chemically un-contaminated, yet clearly inferior, formula. The question is, what do we need to do to get chemical contaminants out of clearly superior breast milk?"

Sandra Steingraber,
Having Faith: An Ecologist's
Journey to Motherhood.

HEALTH IMPACTS OF TOXICS

Asthma inducing toxics

Asthma, a chronic lung disease that narrows and inflames airways, is often triggered by airborne chemicals. Nearly 27 million Americans have at one time in their lives been diagnosed with asthma by a physician. People of all ages have asthma; it occurs in all countries and among all populations around the world. Over the past 20 years, asthma has become increasingly common in many parts of the industrialized world. We are in the midst, some physicians would say, of an "asthma epidemic" and increased chemical exposure is likely one of the drivers of this.

The causes of asthma are not fully understood. Its symptoms are caused by inflammation, which makes the airways red, swollen, narrower and extra-sensitive to irritants. Asthma is probably usually caused by a mixture of hereditary factors that you are born with and environmental factors. But how these factors work together is still largely unknown.

There are many environmental asthma triggers and some come easily to mind: secondhand smoke (composed of as many as 7,000 chemicals, 250 of which are known to be harmful, and at least 69 of which cause cancer), outdoor air pollution (small particles and ground level ozone from car exhaust, road dust and factory emissions), mold, dust mites, and smoke from wood-burning stoves and fireplaces (which contains a mixture of harmful gases and small particles).

At sufficient concentrations in the air, many chemicals in any number of products in your home can trigger an asthmatic reaction. As well, asthma can be worsened by the presence of products such as cleaners, paints, adhesives, pesticides, cosmetics and air fresheners.

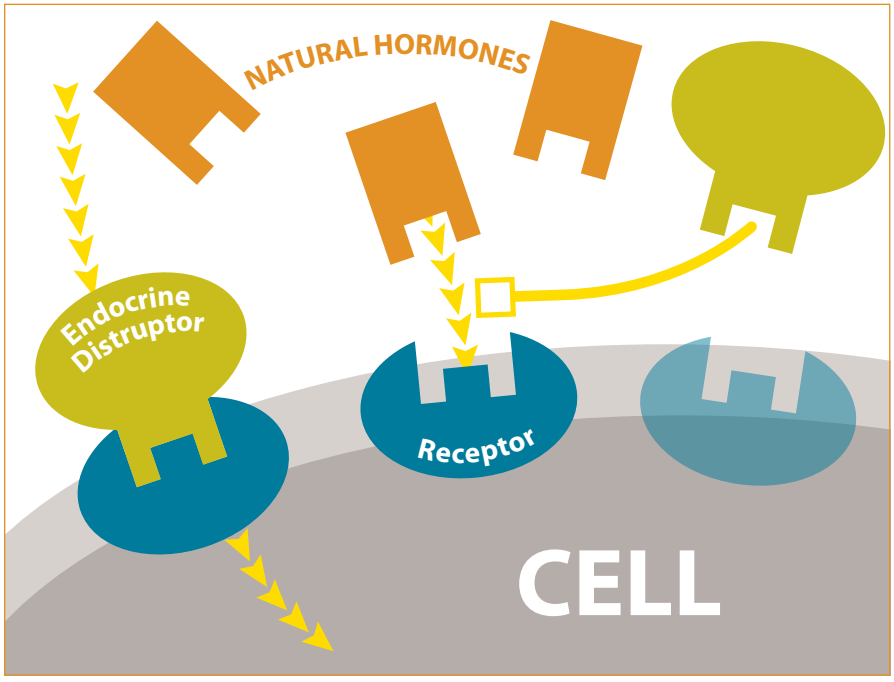
Perhaps one of the most ubiquitous groups of chemicals that can be found in indoor air is the fragrance chemicals. People who have asthma may be more sensitive to fragrances and may experience allergy symptoms, or worsening asthma symptoms, from exposure to perfumes, fragrances, and other chemicals. Once the primary arena of the perfumer and derived primarily from natural sources, synthetic fragrance development is a growing multi-billion dollar industry. Fragrances can be found in most products. They are used to add flavor or scent to a product or to mask a product's unpleasant smell. They may come from natural (animals or plants) or synthetic sources. Consider the variety: perfumes and colognes, scented candles, facial tissue and toilet papers, household cleaners, car care products, soaps, cleansers, cosmetics, detergents, hair care products, creams and lotions, fabric softener and some foods and beverages.

Hormone and endocrine disruptors

Endocrine disruptors are chemicals that can interrupt the healthy functioning of the human body by preventing hormone systems from working properly. Hormone systems, also referred to as endocrine systems, are found in all mammals, birds, fish, and many other types of living organisms and are essential for most biological processes.

Simply put, the endocrine system is a network of glands that secrete chemicals called hormones to help your body function properly. This system regulates all biological processes in the body from conception through adulthood and into old age. Hormones interact with cells that contain matching receptors on their surfaces. The hormone binds with the receptor, much like a key would fit into a lock. The hormones, or keys, need to find compatible receptors, or locks, to work properly. Once a receptor and a hormone bind, the receptor carries out the hormone's instructions.

Chemicals in the environment can disrupt the endocrine system in a variety of ways. For example, some chemicals mimic natural hormones, fooling the body into over-responding to the stimulus or responding at inappropriate times. Other endocrine disrupting chemicals block the effects of a hormone from certain receptors. Still others directly stimulate or inhibit the endocrine system and cause overproduction or underproduction of hormones. Certain drugs are used to intentionally cause some of these effects, such as birth control pills. In many situations involving environmental chemicals, however, an endocrine effect is not desirable nor is it intended.



When absorbed in the body, an endocrine disruptor can decrease or increase normal hormone levels (left), mimic the body's natural hormones (middle), or alter the natural production of hormones (right).

The Dirty Dozen of hormone disrupters:

- *BPA*
- *dioxin*
- *atrazine*
- *phthalates*
- *perchlorate*
- *fire retardants*
- *perfluoronated chemicals*
- *glycol ethers*
- *organophosphate pesticides.*

In recent years, some scientists have proposed that chemicals might inadvertently be disrupting the endocrine systems of humans and wildlife. A variety of chemicals have been found to disrupt the endocrine systems of animals in laboratory studies, and there is strong evidence that chemical exposure is associated with adverse developmental and reproductive effects on fish and wildlife in particular locations. The relationship of human diseases of the endocrine system and exposure to environmental contaminants, however, is poorly understood and scientifically controversial.

There is growing recognition in the scientific community, however, that exposure to even low doses of certain chemicals, particularly in the womb or during early childhood, can disturb our hormonal, reproductive, and immune systems, and that multiple chemicals can act together to harm human health.

Of the many known and suspected endocrine disruptors, Bisphenol A (BPA) has received perhaps the most public attention in recent years. BPA is used in numerous plastic products, including baby bottles, and food and beverage can liners. It disrupts the endocrine system by mimicking the estrogen hormone. Extensive research has linked the disruption from BPA to breast cancer, obesity, diabetes and other serious medical problems.

Cancer causing toxics

Despite overall decreases in incidence and mortality, cancer continues to shatter and often steal the lives of Americans. Approximately 41 percent of Americans will be diagnosed with cancer at some point in their lives, and about 21 percent will die from cancer. The incidence of some cancers, including some most common among children, is increasing for unexplained reasons.

Factors impeding control of environmental cancer risks include limited research on environmental influences on cancer; conflicting or inadequate exposure measurement, assessment and classification; and ineffective regulation of environmental, chemical and other hazardous exposures.

Known carcinogens: arsenic, asbestos, benzene, bisphenol A (BPA), chromium hexavalent compounds, dioxins, formaldehyde, polybrominated diphenylethers (PBDE), polycyclicaromatic hydrocarbons (PAHs) and vinyl chloride.

Toxics that affect brain development

According to the U.S. Centers for Disease Control and Prevention (CDC), about 1.8 million more children in the U.S. were diagnosed with developmental disabilities between 2006 and 2008 than a decade earlier. During this time, the prevalence of autism climbed nearly 300 percent, while that of attention deficit hyperactivity disorder increased 33 percent. CDC figures also show that 10 to 15 percent of all babies born in the U.S. have some type of neurobehavioral developmental disorder. Still more are affected by neurological disorders that don't rise to the level of clinical diagnosis.

While earlier and more rigorous diagnosis accounts for some of this increase, it doesn't explain all of it. Researchers credit genetic factors for 30 to 40 percent of the cases. But a growing body of research suggests that exposure to environmental pollutants is implicated in the rise in children's neurological disorders. The benefits of avoiding exposure to known, suspected or potential neurotoxicants are clear.

For a brain to develop properly, neurons must move to precise places in a precise sequence. They do so under the direction of hormones and chemical neurotransmitters. The process is an intricate, fast-paced dance on a very tiny scale. At any point, neurotoxins have the potential to disrupt this dance, in a slight or serious fashion.

One of the main problems in studying the effect of chemical exposures on subsequent brain function is the possibility of a long latency period between exposure and recognition of functional deficit. For example, impaired language or reading skills may not become apparent until school age.

The Dirty Dozen for Child Development:

- *methylmercury*
- *polychlorinated biphenyls*
- *ethanol*
- *lead*
- *arsenic*
- *toluene manganese*
- *fluoride*
- *chlorpyrifos*
- *tetrachloroethylene*
- *polybrominated diphenyl ethers*
- *dichlorodiphenyltrichloroethane*

Our understanding of what constitutes safe thresholds of known neurotoxins has been continually revised downward as scientific knowledge advances. For example, the initial safe level of blood lead was set at 60 micrograms/dl in 1960. That was revised to 10 micrograms/dl in 1990, and by 2012 that number was 5 micrograms/dl. Today, no safe blood lead level has been identified. Any lead in blood for children is shown to affect IQ. It is estimated that over half a million U.S. children (ages 1 to 5) have blood lead levels at, or above, 5 micrograms/dl.

Classifying human neurotoxins can be tricky and expensive. While laboratory research has identified more than 1,000 chemicals to be animal neurotoxins, the known list for humans is small by comparison. Only 214 chemicals have been classified as human neurotoxins, and only 12 have been identified as affecting fetal and child development. Much more research is needed in these areas, and as this occurs, the list of known neurotoxicants will likely grow dramatically.

Even if developmental toxicity can be measured in lost IQ points during childhood, it is much more difficult for researchers to explore the impacts of chemicals in later life. Could in-utero exposure increase the chance of developing neurodegenerative diseases like dementia? And if the effects do not show up until a person's sixth decade, will we continue to expose future generations to these chemicals?

TOXICS IN THE ENVIRONMENT

Air quality and climate change

The United States chemical sector produces many negative environmental impacts. It is one of the largest users of natural gas, which is required for energy and as a feedstock. In 2011, the chemical industry emitted more than half a million tons of criteria air pollutants, of which more than 70 percent were carbon monoxide (CO), sulfur dioxide (SO2), and nitrogen oxides (NOx). The industry also manages a huge amount of chemicals that are reported to EPA's Toxic Release Inventory. About 5 percent of the more than 10 billion pounds of chemicals managed are disposed of or otherwise released to air and water, while the rest goes to treatment, energy recovery, and recycling.

Like many global industries, the primary environmental impacts of the chemical industry are through the industry's extensive consumption and combustion of fossil fuels used to produce and use chemicals. Most people are aware of the costs of toxics to the environment and public health. Many are less aware that one of the largest negative impacts from the production and use of chemicals is its impact on the earth's climate. Researchers, using life cycle assessment methods, have calculated that energy-related factors account for 40 to 80 percent of this industry's negative environmental impact primarily due to the effects they have on the climate.

Soil and water quality

The production, use, and management of waste chemicals also causes much destruction of natural habitat and decreases soil and water quality. Once in the food chain, many of these substances are accumulated to ever-higher concentrations in the tissue of the animals that consume them. These impacts include the following:

- As global population increases so too does the demand for food and industrialized farming. Industrial farmers often use chemical fertilizers and pesticides to kill and suppress insects, fungi and bacteria. This reliance on chemicals comes with an environmental cost to both soil and water quality.
- During the extraction phase of chemical fuels and metals, drilling and mining activities destroy whole landscapes and pollute water systems.
- Household cleaning and disinfecting products are flushed into sewage systems and out through treatment plant discharge, or are washed from property and septic tanks into groundwater and streams.
- In industrialized nations, each household produces tons of garbage each year. Much of that garbage is made from products containing chemicals. Although some of this waste is recycled the majority of it remains in landfills or litters urban and natural landscapes.

WHERE TOXICS ARE FOUND

Consumable and durable products

Consumable goods, also known as nondurable goods or consumables, are those goods that are capable of being consumed, wasted, dissipated, used up or spent. Consumables are products that consumers use recurrently, that is, items which get used up or discarded. These kinds of chemical goods include solvents, personal care products, pesticides, glues and adhesives, pharmaceuticals, fuels and ink cartridges.

Durable goods are a category of consumer goods that do not have to be purchased frequently. As the name suggests, such goods have an extended product life (three years or more) and are not typically worn out or consumed quickly when you use them. Almost all durable goods contain or are manufactured using chemicals. Durable goods include: consumer electronics, carpets, furniture, clothing, toys, building materials and many other products.

Personal care products

The text in this section comes from the report by the Oregon Environmental Council and Metro, ***What's in my Makeup Bag?!*** *The full text is available online.*

Personal care products include any product that is put on the body to cleanse, enhance, or cover up one's natural features. They include shampoos, conditioners, soaps, lotions, perfumes and colognes, as well as makeup and hair color.

By some estimates, women who use personal care products every day are exposed to dozens of toxic chemicals in these products. Women of reproductive age use twice as many personal care products in more combinations than men, resulting in daily exposures to higher levels of toxics through their use.

While the chemicals in these products exist in small amounts, exposure occurs every day and in multiple combinations through the use of a variety of personal care products. These exposures add up. The scientific community is just beginning to uncover what these multiple and cumulative exposures mean for our health.

Independent scientific researchers have found many unregulated and untested chemicals among the 10,000 ingredients widely used in personal care products. Some chemicals known to have toxic properties, including formaldehyde, phenoxyethanol, and parabens, are used as preservatives in personal care products. Some of these chemicals are known carcinogens, endocrine disruptors and neurotoxins. Studies indicate that these chemicals end up in our bodies.

The market for personal care products is strong, but regulation of the industry is weak. In the U.S., personal care product companies generate billions of dollars of revenue a year. Four personal care product companies are on the 2010 Fortune 500 list with company revenue ranging from $7.3 to $79.7 billion. Personal care products, however, are among the least-regulated products under the United States Food and Drug Administration's authority. The FDA requires personal care products to carry labels identifying ingredients by order of prominence. But fragrances and trade secret ingredients are exceptions to this requirement. If a manufacturer tells the FDA that their ingredients are secrets important to the product and its profitability, the manufacturer does not have to list those ingredients.

Nanomaterials

Nanotechnology, the manipulation of matter on an atomic, molecular, and supramolecular scale, is a relatively new science that is being applied in a variety of fields, including: chemistry, physics, biology and engineering. Research and development in these fields is leading to new products and nanomaterials with applications in pharmaceuticals, electronics, coatings and chemical remediation.

Nanomaterials are extremely small (a nanometer is one millionth of a millimeter, approximately 100,000 times smaller than the diameter of human hair) and can exhibit unique characteristics that are leading scientists to question what implications they may have on our health. Nanoscale materials can, in theory, be engineered from minerals and nearly any chemical substance, and they can differ with respect to composition, primary particle size, shape, surface coatings and strength of particle bonds.

Much of what is known about their health effects comes after decades of understanding the effects from natural or incidentally formed nano-sized materials such as ultrafine particles from dust or incomplete combustion. Unfortunately, much is still unknown and research is needed to determine whether exposure to manufactured nanomaterials can lead to adverse effects on the heart, lungs, skin; alter reproductive performance; or contribute to cancer.

Given what we know, caution is warranted. Nanomaterials may enter the body by routes not typical for other chemicals because of their small size. If nanomaterials of certain sizes are able to enter the body, they may pass through cell membranes or cross the blood-brain barrier because of their small size. When used for drug delivery and disease treatments this can be beneficial. But, this could also result in unintended impacts for manufactured nanomaterials not designed for disease therapies. Nanomaterials may also interact with environmental media and pollutants to produce by-products that may have the potential to negatively affect the health of humans and wildlife.

With the global nanotechnology market expected to reach $27 billion by the end of 2015, it is increasingly essential that we more fully understand the potential human health risk of manufactured nanomaterials.

PERSONAL CHOICES CAN MAKE A DIFFERENCE

Everyone can make thoughtful and more informed choices about the products that they buy and use. Whether we are choosing paint for the baby's room, sunscreen for the toddler, carpeting for the master bedroom, wallboard for the new renovation project, fertilizers for the yard or furniture for the living room. Taking time with these choices can help us steer clear of products with unwanted chemicals in them. Master Recyclers can play an important role in understanding these choices and empowering the community to make healthy and safe choices.

Toys with phthalates

DEEP DIVE

You can find the Oregon Environmental Council's ***Pollution in People*** *report online.*

Cathy Bloom was 36 when she volunteered to participate in Oregon Environmental Council's Pollution in People Project (2007). The study selected a small diverse group of Oregonians to test for a select group of six chemicals. The report explains: "Cathy's main motivation to participate in this study was to help educate the general public about toxic chemicals, especially around choices that can be made during pregnancy and while nursing. When she was pregnant with her first child, she wasn't aware of the potential health hazards in some consumer products. With her second child, Cathy knew of the dangers of phthalates and bisphenol A and made the choice to avoid them when possible." Cathy had the fewest number of chemicals detected in her body in this report. She was one of two participants with no detectable bisphenol A and her total phthalates level was less than half of the second lowest participant.

RESOURCE

Learn the LD50 of any pesticide chemical on the National Pesticide Information Center's website or by calling 1-800-858-7378.

Identifying hazards

Read the label! Look for these signal words: danger, warning or caution. These federally mandated words indicate the degree of immediate hazard posed by a product. Generally, danger indicates that a product is extremely hazardous because it is poisonous, extremely flammable, or corrosive. Warning or caution on labels indicates products that are somewhat less hazardous, but which still require precautions in their use and waste disposal. Products not listing these signal words are usually the least hazardous.

The chemical industry evaluates toxicity by determining what the lethal dose is for 50 percent of laboratory test animals (LD50) exposed to the product to die.

Product labels can provide clues to the hazard of the product. A product is hazardous when it contains one or more of the following properties:

- **Flammable/combustible** – can easily be set on fire or ignited.
- **Explosive/reactive** – can detonate or explode through exposure to heat, sudden shock or pressure.
- **Corrosive/caustic** – can burn and destroy living tissue.
- **Toxic/poisonous** – capable of causing injury or death.
- **Radioactive** – can damage or destroy cells and chromosomal material.

All products with these characteristics should be handled with care and attention given to the directions on the label.

Safely using hazardous products

Sometimes there are no satisfactory alternatives to household hazardous products. When this is the case, it is important to select the products carefully and use them safely. Here are some tips for selection and use:

Buy only what you need. How much do you actually need? If it's a small amount, see first if you can borrow it from a neighbor. Don't purchase the economy size to save a few cents per unit if that will create a future storage or disposal problem. Instead, buy the quantity that best fits your immediate need and share what's left with a neighbor or friend. Do not, however, give away old pesticides because they can contain chemicals that are now banned (for example, DDT, Kelthane). **Always follow label directions and use only the amounts indicated.**

Wear protective clothing when directions call for it. Gloves, goggles and long sleeved shirts can prevent direct contact with chemicals and absorption through the skin. Respirators and dust masks prevent inhalation of particulates, mists, vapors and fumes.

Use products in well ventilated areas. Avoid breathing fumes and keep containers tightly closed to prevent evaporation. Use products outdoors when possible. When indoors, open as many windows and doors as possible to provide maximum air circulation. Position a fan between your work area and an open door or window with the fan pointed outward to pull the fumes or vapors away from the work area and circulate fresh air into the room. A kitchen or bathroom exhaust fan or one open window will not provide adequate ventilation.

The small size of aerosol particles makes it easy for them to be inhaled deeply into the lungs and quickly absorbed into the bloodstream. Aerosol cans are also explosive when exposed to heat or pressure.

Never mix chemical products. Mixing hazardous products can start a chemical reaction that could create highly toxic fumes or even cause an explosion.

Store hazardous products safely. Store unused portions of products in their original container, tightly sealed. Identify the area where you keep toxic products by permanent marker. Keep items high so that if there is flooding the materials do not contaminate water, and far away from hot water heaters and furnaces to avoid potential explosions if there is a fire.

Store toxic products out of reach of children and pets. If a poisoning occurs, immediately call a doctor or the Poison Control Center at 800-222-1222. First aid advice and antidotes on the product labels are sometimes incorrect.

Disposing of hazardous products

People dispose of hazardous household products in many different ways. They flush them down drains and toilets; toss them into the garbage; pour them down storm drains, on driveways or streets; and they dump them illegally. None of these are safe ways to dispose of hazardous products. To understand why, it is helpful to understand what happens to the waste when it goes away.

Risk to the environment

In the Metro region, most garbage is transported to the state-of-the-art Columbia Ridge Landfill in Arlington, Oregon. The hazardous waste goes to a separate facility next to the general landfill.

Some hazardous products will eventually degrade into harmless elements, but others will not. In a landfill, they will be more concentrated than if used uniformly in the environment. Although the hazardous waste landfill is also state-of-the-art, specially regulated and engineered, there is always the potential for hazardous chemicals to end up where they can cause harm.

Hazardous wastes should never be diluted and flushed down an inside household drain or street drain. At sewage treatment plants, bacteria are utilized to break down organic solids in the water. Most toxic wastes cannot be processed in this way. Many can damage the sewage system and kill the helpful bacteria needed to treat sanitary waste. After the bacteria breaks down organic solids at the treatment plant, water is returned to the natural waterways, along with any toxic chemicals that people put down the drain.

Do not flush any product if you are on a septic system. Toxic substances in the septic system can kill the helpful bacteria in the tank and percolate through the drain field into the soil where they can contaminate groundwater and local wells.

Responsible disposal

Although collection opportunities are many in the Portland metro area, household hazardous waste is still found in the trash. Fortunately, the prevalence of this is declining as access to hazardous collection opportunities has improved. Research in 2015 shows that the percentage of hazardous waste in the household garbage amounts to .21 percent. This is a small but not insignificant amount, adding up to about four million pounds derived from total regional tonnage.

Two transfer stations presently accept most of the region's hazardous waste: You can take your toxic trash to Metro's permanent hazardous waste facilities year-round. Closed on major holidays

Metro Central	Metro South
6161 NW 61st Avenue, Portland (between Front Ave. and St. Helens Rd.) Open 9 a.m. – 4 p.m., Mon-Sat, closed Sun	2001 Washington Street, Oregon City Open 9 a.m. – 4 p.m., Daily

Call 503-224-3000 for more information.

Metro recycles as many wastes as possible, including latex paints, antifreeze, motor oil, lead acid batteries, some household batteries and metal containers.

Metro schedules community collection events across the tri-county area. These events are smaller, scheduled frequently and community-friendly.

Free household hazardous waste collection events take place from 9 a.m. to 2 p.m. every week (except Memorial Day, Fourth of July and Labor Day weekends) between early March and mid-November in many communities across the Portland metropolitan area. Call Metro, 503-234-300 for details.

Back to basics

Keeping things simple is our best defense, because it lets you know more fully what you are exposing yourself and your surroundings to. To start getting back to basics you can take an inventory of all the chemicals you have in your home. These are those consumable products that are under your kitchen sink, in your garage, and on the shelf in the bathroom. Familiarize yourself with what you have. Read the labels. Consider getting rid of the most hazardous products first. Do you have any products that you don't really need? Do you really need three types of cleaners for the bathroom? Consider how many fewer chemicals will be in your bathroom airshed if you use one product instead of three.

Some of the most hazardous chemicals used in our homes are pesticides. Many are designed to kill anything that moves rather than specific targets. Tackle a pest or problem (i.e. ants, spiders, mice) one at a time. Identify first and know thy enemy. Take the time to figure out where the pest is coming

RESOURCE

For pesticide free gardening advice visit Metro's ***Yard and Garden*** *web resources.*

RESOURCE

Search more than 70,000 personal products at EWG's (Environmental Working Group) ***Skin Deep cosmetics database****, available online.*

in and seal that area off. It may take some sleuthing, but eventually you will keep that pest out. Remember, pesticides kill living things and they are probably not the chemical you want to spray on your kitchen counter.

A clean house doesn't need to smell like a packaged fragrance. Reconsider all the products you use that have fragrances as part of their chemical makeup. Also, choose products that are water-based and not solvent-based. This will help the air quality in your home. Durable goods also off-gas adhesives and other volatile organic chemicals. When you are thinking about bringing new carpets and furniture into your home consider what the product is made of. Natural fiber products may be a better air quality choice. And look for stuffed furniture that doesn't contain flame retardants. Often you can pay for a couch spill warranty and not have to spray scotch guard on your couch.

A home garden should be a place of beauty, play and rest. There are many resources in our community and on the web that can help you garden without pesticides.

Your skin is the largest organ of your body; take care of it by keeping chemicals away from it. Be selective about your personal care products. Minimizing how many products you use will help you steer clear of chemicals that may not be good for you. Take time to do the research required to understand your choices.

RESOURCE

For safe cleaning tips visit ***Metro's Green Cleaning*** *web resources. You can also Google* ***Body Care Recipes*** *for all sorts of ideas for homemade shampoos, lotions and creams.*

Greener cleaners

Often people want names of alternative, greener cleaning products. Unfortunately, it is not that easy. No regulations exist that define what can be labeled as non-toxic, safe or green. Products that state that they are natural or non-toxic may still have chemicals in them that simply have not yet been proven to be unsafe. Product labels are also allowed to hide ingredients that are claimed to be trade secrets.

For this reason, a back to basics list of seven ingredients that you can use to clean your house is the best. However, if you are seeking a more specialized product, it is easy and incredibly cheap to make your own.

Use these seven ingredients to keep your house clean:

Baking soda (sodium bicarbonate). Absorbs odors and is a mild abrasive. Found in the baking section of the grocery store.

Essential oils deodorize or add scent. Mint, eucalyptus, lavender, lemon, tea tree and other oils can be found in the natural food section of many grocery stores or herbal supply shops.

Glycerin. An antiseptic and moisturizes the skin. Found in pharmacies or in some grocery natural food sections. Use vegetable oil-based glycerin.

Hydrogen peroxide is a disinfectant. Use the 3 percent household concentration, found in pharmacies.

Vegetable oil-based liquid soap or detergent. Sometimes referred to as castile soap. Found in many grocery natural food sections.

Vinegar. Removes soap scum, grease and mineral deposits and acts as a deodorizer. Use white distilled vinegar for most of these recipes. Found in the condiments aisle of the grocery store.

Washing soda (sodium carbonate). Removes grease and is slightly caustic. Found in the laundry section.

KNOW YOUR FOOD PLASTICS

Unfortunately, plastics labeling only identifies the main resin used. There may be any number of additional unnamed chemicals. Furthermore, there is a lot that is not known or fully tested about each plastics resin. However, there are some that are known to be worse, and there are ways to minimize potential risk.

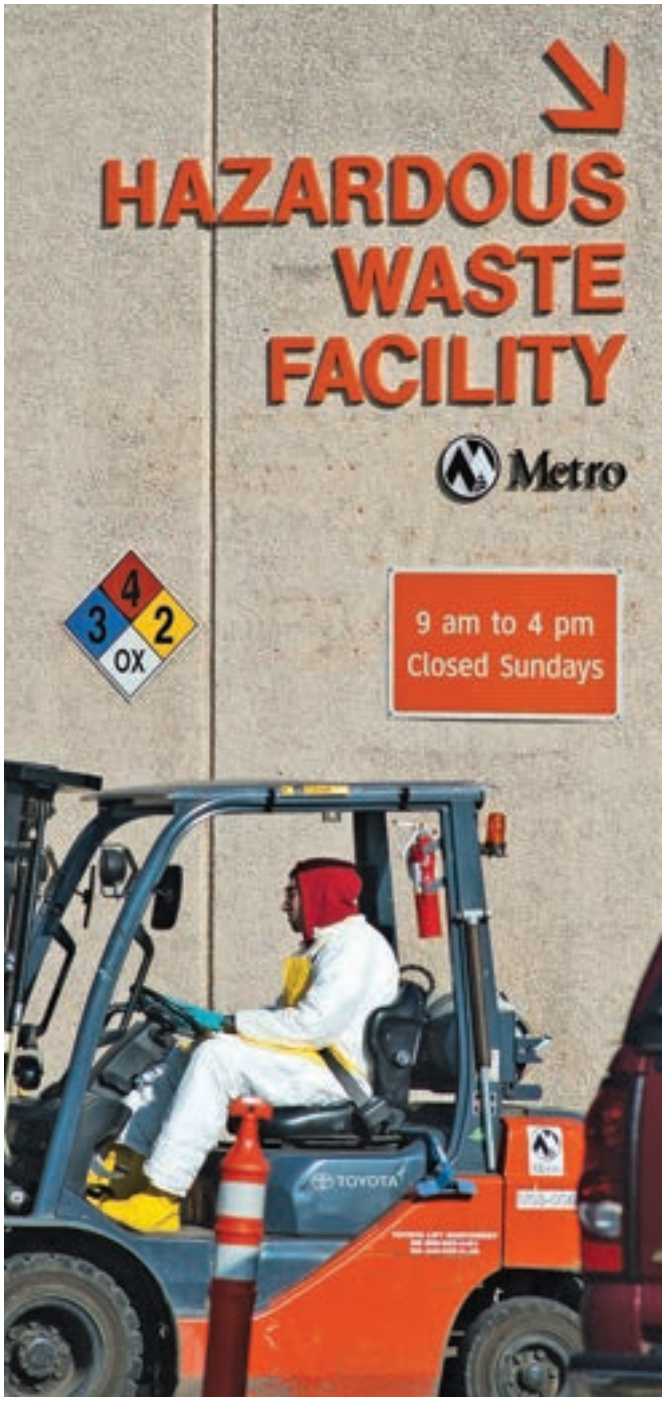
Three steps to safer use of food plastics

1. **Avoid the known problem plastics.**

   - Polycarbonates contain Biphenol A (BPA) which is a known hormone disrupter that can cause cancers and developmental problems. These plastics are labeled #7 (however #7 is used for other resins as well). BPA was used in baby bottles and water bottles, but public awareness has led companies to seek alternatives. In some states it is illegal to use BPA in baby products.
   - Polystyrene (#6) is toxic to the brain and nervous system to workers exposed to it over a prolonged period. This resin is mostly found in take away containers and Styrofoam™.
   - Polyvinyl chloride, also known as vinyl or PVC (#3), poses risks to the environment and human health. Its manufacture is highly toxic, and its use requires additional toxic stabilizers. This plastic is mostly found in cling wraps.
   - Phthalates are hormone disruptors. They are additives in products and packaging such as baby toys, flooring and cling wrap that makes plastic pliable. Because they are additives rather than a resin, they do not have a plastic number. Almost all very flexible plastics have phthalates in them.

2. **Minimize leaching or off-gassing.** Plastic numbers 1, 2, 4 and 5 appear to be fairly stable when at room temperature. However, heating plastics may cause chemicals to seep into the food or release chemicals into the air. Take foods out of plastic packaging and place on ceramic or pyrex glass before microwaving. Avoid extreme temperatures in the dishwasher. If you plan to reuse the plastic, wash it by hand in tepid water. Avoid storing fatty foods in plastic as fats can also absorb plastic chemicals more easily.

3. **Use alternatives to plastics.** Drink tap water from a reusable (BPA-free) water bottle or a glass, and bring food to work in your own glass or metal container.



CONCLUSION: REFORMING A FAILED SYSTEM

In this chapter we have offered an overview of toxics, a complicated and potentially overwhelming topic. We hope you now have a basic understanding of current regulations and of the health impacts of toxic chemicals. You are now also hopefully familiar with the environmental impacts of chemical production and where you are likely to encounter toxics in your daily life. The final section of this chapter presented some strategies that Master Recyclers and others can use to lessen their exposure to toxics. You can: inventory toxic products already in your home; consider safe disposal of unneeded toxic products; always follow safety guidelines when using hazardous products; use simpler products (whether store bought or homemade) with known ingredients; and minimize your use of plastics for food packaging and handling.

While personal action can make a real difference, our current regulatory system is broken. Given this, you can demand new laws that protect our environment, workers and personal health. The country's main chemical safety law -- the Toxic Substances Control Act (TSCA) -- makes it nearly impossible for the Environmental Protection Agency (EPA) to take regulatory action against chemicals, even those that are known to cause cancer or other serious health effects.

When TSCA became law in 1976, the goal was to ensure the safety of chemicals from manufacture to use and disposal. But weaknesses in the law have left the EPA largely unable to act on known health dangers or require testing on specific chemicals that may be unsafe.

As Oregonians, we should also support reform that allows states to maintain laws which exceed federal protections to safeguard their residents. You can familiarize yourself with the federal law and learn the positions of the groups that are working on reform. You can support TSCA reform through personal action (for example, writing to your Senator) or join an organization. Here are some organizations working on chemical reform:

- **The Safer Chemicals, Healthy Families coalition** represents more than 11 million individuals and includes parents, health professionals, advocates for people with learning and developmental disabilities, reproductive health advocates, environmentalists and businesses from across the nation.
- **The American Chemistry Council's mission** is to deliver business value through exceptional advocacy using best-in-class member performance, political engagement, communications and scientific research.
- **Safer States** (based in Portland) is a network of diverse environmental health coalitions and organizations in states around the country that share a bold and urgent vision. "We believe families, communities, and the environment should be protected from the devastating impacts of our society's heavy use of chemicals. We believe that new state and national chemical policies will contribute to the formation of a cleaner, greener economy."

All of the above organizations have websites where you can find more information.

Local and regional action can also influence the changing landscape of chemicals policy. Closer to home, the Oregon Environmental Council, Neighbors for Clean Air, Beyond Toxics, and Physicians for Social Responsibility (Oregon Chapter) all work in the realm of toxics reduction. You can search online to find out more about any of these organizations and discover ways to add your voice to the conversation.

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