

TEN STRESSES ON THE PLANET

Toxic Chemicals

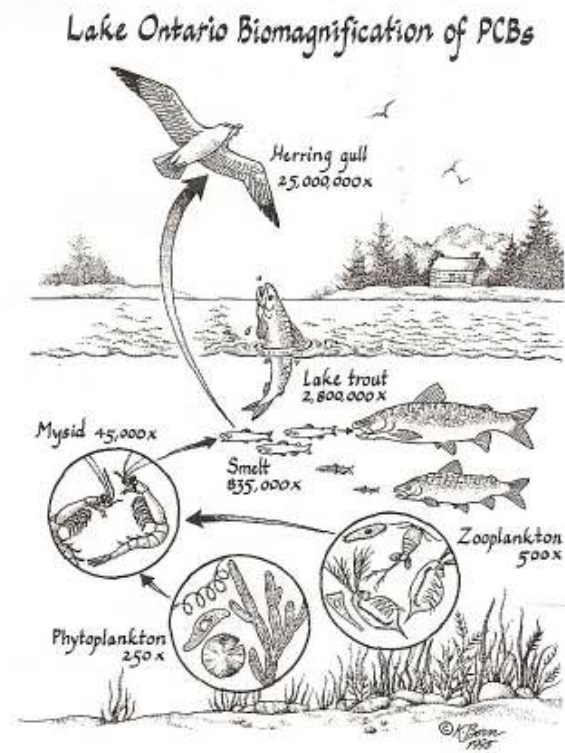
Throughout most of human history, nature could handle the few toxins our species contributed. But in the 20th century we began producing synthetic chemicals in types and amounts that nature couldn't assimilate. Of more than 85,000 chemicals registered in the United States, nearly 300 are produced in volumes of more than one million pounds per year.ⁱ From gulls nesting with infertile eggs to significant rises in cancer rates in humans, the effects of the accumulation of chemicals in our air, water, and soil are showing up.

Many toxic chemicals persist in the environment long after they are released, with their effects magnified as they move up the food chain. In Lake Ontario, plankton were found to have levels of PCBs 500 times the level in the water. As fish ate the plankton, and larger fish ate smaller fish, the PCB level was magnified. A gull at the top of the food chain was measured with 25 million times the level of PCBs found in the water. PCBs and DDT are still found in living organisms today, even though they were phased out in North America in the 1970s. Persistent toxins also travel long distances in air, water, and animals. Canadian Inuit women, far from industrial pollution, carry the highest amount of persistent toxins ever measured in human breast milk.ⁱⁱ

ORGANOCHLORINES

Some of the most persistent, bio-accumulative toxic substances are the synthetic chemicals containing chlorine. One of the largest-volume chemicals produced in the US, chlorine is used to manufacture synthetic chemicals for pesticides, solvents, plastics, and countless other products.ⁱⁱⁱ In addition to the pesticide DDT and the industrial chemical PCB, organochlorines include PVC and dioxin. PVC, commonly called vinyl, is found in building materials such as siding, piping, window frames, and flooring. It is also found in countless consumer products, such as food containers, rubbery toys, garden hoses, shower curtains, upholstery, and shoes. PVC enters the environment during production and incineration of these products and is the primary contributor of dioxin emissions from municipal and medical waste incinerators. Dioxin also enters the environment from chlorine bleaching of paper and as a by-product of manufacturing pesticides and wood preservatives.^{iv}

Organochlorines accumulate in the fat of animals and tend to concentrate in animals (including humans) at the top of the food chain. Over the past few decades, Beluga whale



As PCBs work their way up the food chain, their concentrations in animal tissue can be magnified up to 25 million times. Microscopic organisms pick up persistent chemicals from sediments, a continuing source of contamination, and water and are consumed in large numbers by filter feeding tiny animals called zooplankton. Larger species like mysids then consume zooplankton, fish eat the mysids, and so on up the food web to the herring gull.

numbers in the St. Lawrence Seaway have plummeted by 90 percent, and organochlorine contamination is the suspected cause. One whale was found to have a level of PCBs ten times the level necessary to qualify as hazardous waste under Canadian law.^v Human health impacts of organochlorines include cancer, birth defects (particularly in the reproductive system), learning disabilities, and immune system damage. A study at the NYC Mt. Sinai Medical Center found that women whose blood contained large concentrations of residues from DDT are four times as likely to get breast cancer as those with low concentrations.^{vi}

HEAVY METALS

Lead, mercury, cadmium, chromium, and arsenic are also persistent, bio-accumulative toxins. Although they are not manmade, humans are extracting them from Earth's crust at an alarming rate. Industry has introduced 300 times as much lead, 20 times as much cadmium, and four times as much arsenic into the atmosphere than is naturally present.^{vii}

Even though the US banned lead in gasoline and household paint in the 1970s, it still exists in homes and the dust around homes that were built before 1978. Two decades after it was banned, government officials estimated that one of six children under five had blood levels of lead high enough to be a health risk. Even in small doses, lead can slow child development and cause IQ deficits of up to eight points. It is correlated with hyperactivity, short attention spans, and aggression. Lead is still used for batteries, fish weights, ammunition, solder, and ceramic glaze.^{viii}

The primary source of mercury in the US is emissions from coal plants and waste incinerators. It can also enter the environment after being used in electronic equipment, cell phones, fluorescent light bulbs, thermometers, and amalgam tooth fillings. Because mercury moves up the food chain, animals and humans that eat contaminated fish are at risk, particularly children and women of child-bearing age. One in six babies is born with higher than safe levels of mercury.^{ix}

PESTICIDES

Since the publishing of Rachel Carson's book *Silent Spring* in 1962, pesticide use has increased tenfold. In California's Central Valley, where much of our nation's produce is grown, state regulators detected pesticides in 95 of 100 locations. More than half of the sites exceeded safe levels for aquatic life and drinking-water consumption.^x

Pesticides have been found to have significant health effects, even at very small levels, in birds, fish, and frogs. Every year agricultural pesticides kill an estimated 76 million birds.^{xi} In one infamous episode, 20,000 Swainson hawks died after eating grasshoppers in an Argentine cornfield that had been sprayed with pesticides.^{xii}

Agricultural workers are particularly vulnerable. A State of Washington study found that one in five workers who mix or spray chemicals has significant health problems. Surprisingly, homeowners, not farmers, use the most pesticides. Homeowners apply an average of ten pounds of pesticides per acre to their lawns as compared to the 2.7 pounds per acre used on farms.^{xiii} That a chemical is approved for use in the home doesn't guarantee its safety. A study of 40 lawn-

care chemicals found that more than half cause long-term health effects in laboratory animals or humans, and nearly one-third are suspected carcinogens.^{xiv}

ENDOCRINE DISRUPTORS

Toxicologists used to say, “The dose makes the poison.” They assumed that everything is safe in small amounts. That assumption was turned on its head with the discovery of endocrine disruptors. In 1991, researcher Theo Colburn, who had been studying reproductive maladies in wildlife in the Great Lakes region, convened other American and European scientists to compile information and seek an understanding of the effects they were observing. In one reported incident, researchers at Tufts Medical School noticed that certain cancer-cell specimens in styrene flasks multiplied like crazy. They later learned that the flasks apparently leached a chemical that acted like estrogen.^{xv}

Scientists now know that very low doses of chemicals may block or mimic hormones in living organisms. Because endocrine disruptor molecules are similar in shape to hormones, they readily fill up hormone receptors, thereby having a significant effect even at low doses. Endocrine disruptors have their greatest impact in a growing fetus because hormones direct each stage of development. Effects in humans include abnormal penis and urethra development, decrease in sperm count and quality, prostate and breast cancer, early sexual maturation, attention deficit syndrome, hyperactivity, and miscarriage.^{xvi}

Organochlorines are endocrine disruptors. So are other chemicals that the public has not heard as much about, such as phthalates, which are produced at a rate of nearly 11 billion pounds a year.^{xvii} Phthalates are added to plastics to make them soft and bendable and are perhaps best known as the chemical that helps create the “new car smell.” They are also a component of paints, carpets, electric cables, nail polish, the coating of time-release pills, and personal care products, especially those with fragrances including perfume, deodorant, soap, shampoo, and hand lotion.^{xviii} We are exposed to them when they migrate out of these products—for example, out of water bottles after repeated use and into food during microwaving of plastics.^{xix}

Bisphenol A, an endocrine disruptor produced at a rate of 6 billion pounds per year, is found in clear plastic water and baby bottles, fiberglass, the lining of food cans, children’s dental sealants, and CDs. In his research on animals, Frederick vom Saal found that amounts as small as 0.1 part per trillionth of a gram could have adverse health effects.^{xx}

CHEMICALS IN OUR BODIES

In 2003, the Environmental Working Group did a body burden study to determine how many chemicals are in human blood and urine. Of 210 chemicals studied, they found 167 including PCBs, dioxins, heavy metals, pesticides, and phthalates.^{xxi}

Other body burden studies have heightened our awareness about common chemicals, such as flame retardants. Flame retardants are used in computers and other electronics, and in polyurethane foam found in couches, mattresses, and carpet pads. They are found in textiles such as draperies, and in the plastic coverings of auto interiors.^{xxii} Studies of US mothers in 2003 indicated that their breast milk contained flame retardants at 10-100 times the level in

European mothers.^{xxiii} Another example is the chemical used in Teflon and Gortex. According to researcher Jane Houlihan, the Teflon chemical showed up in all people tested by 3M. It is found in carpet and textile treatments and in the coating of food packaging such as french fry and pizza boxes, as well as in the coating of cooking pans.

WHAT IS BEING DONE?

The most common action by governments has been to ban chemicals once their danger has been proven. Many pesticides have been banned in the US, the most recent one being guthion, which is widely used in orchards. A European Union (EU) directive that took effect in 2006 calls for the elimination of lead, mercury, cadmium, chromium, and two types of flame retardants from electronic and electrical equipment.^{xxiv} The EU also passed a rule banning probable carcinogens, mutagens, and reproductive toxins from cosmetics.^{xxv}

A hopeful development in the effort to minimize toxic chemicals is an emerging acceptance of the precautionary principle. The precautionary principle states that if the introduction of a chemical raises a threat to human health or the environment, preventive measures should be taken even if cause and effect relationships are not fully established scientifically. In 2000, the European Commission stated that the precautionary principle must be considered in all new legislation of the EU. In 2003, the principle was adopted by the City of San Francisco.^{xxvi}

ⁱ “Disturbing Behavior,” *Environmental Health Perspectives*, June 2000

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ⁱⁱⁱ Union of Concerned Scientists newsletter, March/April 1991

^{iv} Platt McGinn, Ann, *WorldWatch*, March/April 2000

^v Colburn, Theo, et al, *Our Stolen Future*, 1996

^{vi} Fagin, Dan, *The Oregonian*, 9/11/93

^{vii} Misch, Ann, *Worldwatch*, March/April 1993

^{viii} Misch, Ann, *ibid.*

^{ix} Houlihan, Jane, presentation in Portland, Oregon, 2/19/04

^x Cook, Christopher, www.earthisland.org/eijournal/new_articles.cfm?articleID=941&journalID=82, accessed 4/23/06

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^{xii} Youth, Howard, "The Plight of Birds," *WorldWatch*, May/June 2002

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^{xiv} Thomma, Steven, "Study Links Cancer, Lawn-Care Chemicals," Knight-Ridder News Service, 1988

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^{xvii} Montague, Peter, *Rachael's Democratic & Health News*, 2/9/06

^{xviii} *Oearth*, Winter 2006, and Weise, Elizabeth, *USA Today*, 4/24/03

^{xix} vom Saal, Frederick, *ibid.*

^{xx} vom Saal, Frederick, *ibid.*

^{xxi} Houlihan, Jane, *ibid.*

^{xxii} Patel, Neha, Oregon Center for Environmental Health, February 2006, and Plungis, Jeff, *Detroit News*, 1/30/06

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^{xxiv} Grossman, Elizabeth, *Yes!*, Spring 2004

^{xxv} Pennypacker, Mindy, *WorldWatch*, May/June 2005

^{xxvi} "Precautionary Principle," <http://en.wikipedia.org>, 7/4/06