

Ask Natural Life

Answers to reader questions
about sustainable, healthy living

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Should We Eliminate Plastic From Our Lives?

Q: My wife has suggested that our family try to go plastic-free. But the idea of that seems pretty overwhelming. What are the effects of plastic on people and the environment? Is it worth it to make the sacrifices we'd have to make to eliminate plastic from our lives?

A: Plastic is ubiquitous. And that makes it a huge problem for the health of both people and the planet. The main areas of concern are the pollution that occurs during the manufacturing process and in the form of waste when it's discarded, and the health effects from its use in connection with food.

The International Plastics Task Force, a global network of activists, ecologists, non-profit organizations and waste management experts, says that "plastic has become an environmental problem of global scale."

A Polluting Industry

Plastics are essentially a byproduct of petroleum refining – and, of course, petroleum is a non-renewable and rapidly declining resource. The components of oil or natural gas are heated in a "cracking" process, yielding hydrocarbon monomers that are then chemically bonded into polymers, which are

long-chain molecules. Different combinations of monomers produce polymers with different characteristics. Additionally, various chemicals such as plasticizers, antioxidants, anti-static agents, colorants, flame retardants, heat stabilizers and barrier resins are added to give plastic products their performance properties.

Among the 47 chemical plants ranked highest in carcinogenic emissions by the U.S. Environmental Protection Agency (EPA), 35 are involved in plastic production.

In the late 1990s, the Oakland Recycling Association commissioned an analysis of the toxic chemical burden of the plastics industry using data from the EPA, especially the Toxics Release Inventory. In the *Report of the Berkeley Plastics Task Force*, it said that the plastics industry contributed 14 percent of the national total of toxic releases. Significant releases of toxic chemicals included trichloroethane, acetone, methylene chloride, methyl ethyl ketone, styrene, toluene, benzene and 1,1,1 trichloroethane. Other major emissions from plastic production processes include sulfur oxides, nitrous oxides, ethylene oxide, methanol, and other volatile organic compounds.

Dioxins, which are highly toxic even at low doses, are produced when plastics are manufactured or incinerated. While dioxin levels in the environment have been declining for the last 30 years, they break down so slowly that some of the dioxins from past releases will still be in the environment for many years to come.

The Berkeley Plastics Task Force says that although the refining process uses waste minimization methods, air emissions are still high because of inherent difficulties in handling large flows of pressurized gases.

Manufacturing PET resin generates more toxic emissions (nickel, ethylbenzene, ethylene oxide, benzene) than manufacturing glass. Producing a PET bottle generates more than 100 times the toxic emissions to air and water than making the same size bottle out of glass, according to the Berkeley Plastics Task Force.

PVC is another type of plastic that presents notorious environmental problems. Its manufacture involves the use of hazardous raw materials, including the basic building block of plastic, vinyl chloride monomer (VCM), which is explosive, highly toxic and carcinogenic. PVC production facilities have a long history of generating complex and hazardous chlorinated wastes, some of which are inevitably released into the surrounding environment. ▷

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Health Issues

People are exposed to these chemicals not only from the manufacturing process, but also by using products made from plastic, by eating food contained in plastic packaging and even by breathing them as they off-gas in the indoor environment.

One substance of concern is Bisphenol-A (BPA), an endocrine disruptor that has been widely used in polycarbonate products like food con-

tainers, water bottles, baby bottles, eyeglass lenses, nail polish, dental sealants, water pipes and the plastic lining of food cans. Endocrine disruptors behave like the hormones estrogen and androgen and could wreak havoc on the body's endocrine system. The National Clearinghouse for Worker Safety and Training reported in its newsletter in 2000 that University of Missouri researchers found that extremely low amounts – 100,000 times smaller than thought – of BPA causes reproductive problems in mice.

Earlier this year, researchers at the University of Cincinnati announced in the journal *Toxicology Letters* that when polycarbonate bottles were exposed to boiling water, BPA was released 55 times more rapidly than when exposed to cold water. That finding had huge implications, given the widespread use of this plastic for baby bottles, which are regularly boiled for sterilization purposes. Researcher Dr. Scott Belcher stresses that it is still unclear what level of BPA is harmful to humans. But he urges consumers to think about how cumulative environmental exposures might harm their health. And children are, of course, more at risk due to their small body size.

In 2006, the Canadian government selected BPA as one of 200 toxic substances deserving of thorough safety assessment; it had not previously been studied by them in depth, having been grandfathered when stricter regulations were passed in the 1980s. Research is ongoing but some retailers have stopped selling polycarbonate bottles.

Plasticizers, which are commonly added to PVC as softeners, pose another concern. Also known as phthalates, they make plastics flexible and durable and are used in everything from electrical cables, hoses, gaskets and vinyl sheet flooring to toys, teething rings and medical equipment. They have also been found in infant shampoos, powders and such.

Although there is conflicting research, some phthalates are endocrine disruptors. The use of some phthalates in children's toys is restricted in the European Union and will be in California starting next year. The majority of Americans tested by the Centers for Disease Control and Prevention have metabolites of multiple phthalates in their urine.

About ten years ago, scientists at the

Consumers Union found that some plastic deli wraps use a plasticizer known as DEHA, which has been shown to be an endocrine disruptor in rats, and that it could leach from the plastic into fatty foods such as cheese and meat.

A study by Finnish researchers, which was published in the *American Journal of Public Health* in 2000, showed that plastics found in flooring and indoor wall surfaces may have adverse respiratory effects on children. Many of these materials, which are PVC-based, can emit plasticizers, solvents and alcohols. The study, involving over 2,500 children, showed that the risks of respiratory symptoms typical of asthma were associated with the presence of plastics. The overall risks of asthma and pneumonia were also increased in those children exposed to plastics than those unexposed. In 2004, a joint Swedish-Danish research team found a very strong link between allergies in children and the phthalates DEHP and BBzP.

Disposal Issues

Plastics are very stable and therefore stay in the environment a long time after they are discarded, especially if they are shielded from direct sunlight by being buried in landfills. Decomposition rates are further decreased in food containers by the antioxidants that are often added to enhance their resistance to attack by acidic contents.

At the same time, the low cost of plastics has enabled the development of disposable products, which has increased the amount of trash. Plastics account for an estimated one-quarter of all waste in landfills. Tens of billions of pounds of plastic are used for packaging designed to be discarded as soon as the package is opened.

Some types of plastic are accepted in municipal recycling programs. But, as the International Plastics Task Force points out, plastics don't actually recycle. Instead of being reformed back into the original products, they are reprocessed into secondary (and usually non-recyclable) products. This is due to several factors, including structural/chemical sensitivity, the extremely low cost of virgin plastics and poor product design. Extended producer responsibility would change that, with manufacturers

Chasing the Misleading Arrows

To assist recycling of disposable items, the plastics industry has devised a scheme to mark plastic bottles by plastic type:



Polyethylene terephthalate: soft drinks, water, salad dressing, juice, mouthwash, peanut butter, wine



High-density polyethylene: household cleaners, milk jugs, cosmetics, grocery bags, extruded pipe, shipping containers



Polyvinyl chloride: grocery and domestic shrink wraps, pipe, decking, outdoor furniture, blister packs and clamshell packaging



Low-density polyethylene: dry-cleaning bags, produce and bread bags, garbage bags, toys, squeezable bottles, shrink wrap



Polypropylene: bottle caps, medicine bottles, drinking straws, yogurt containers, ketchup bottles, most Rubbermaid containers



Polystyrene: packing materials, CD cases, cups, tableware, meat trays, clamshell containers for take-out food, egg cartons, toys



Other: usually polycarbonate. food containers like Tupperware and Nalgene bottles; most plastic baby bottles; clear plastic "sippy" cups, large water bottles, toys

All plastics bear a label, not just ones that are recyclable. Numbers one and two are most commonly recycled.



legally required to ensure socially and environmentally sound product design, which would include biodegradability or producer take-back policies.

While containers are usually made from a single type and color of plastic, which makes them relatively

easy to sort for “recycling,” a consumer product like a cellular phone may have many small parts consisting of over a dozen different types and colors of plastics. The resources needed to separate those various components often exceed their value on the secondary products market.

In addition, a significant amount of plastic never even ends up in landfills or recycling programs. Plastic trash has made its way to coastal ecosystems and the ocean, presenting a danger to marine and bird life. Greenpeace says that about ten percent of the 100 million tonnes of plastic produced each year ends up in the sea, notably in a floating “island” in the north Pacific that is twice the size of Texas and swept together by ocean currents. (See page 38.) The plastics act as a sort of “chemical sponge,” concentrating many damaging pollutants and transferring them up the food chain.

Solutions

Biodegradable plastics made with plant-based materials have been available for many years but have not replaced traditional mass market plastics. Traditional plastics are not biodegrad-

able because their long polymer molecules are too large and too tightly bonded together to be broken apart and assimilated by organisms that aid decomposition. However, plastics based on plant polymers derived from wheat or corn starch have molecules that are readily attacked and broken down by microbes.

The biotechnology and agricultural industries have tried three main approaches: converting plant sugars into plastic, producing plastic inside microorganisms and growing plastic in corn and other crops.

However, these processes have proven to be just as energy-consuming and chemical-emitting as traditional plastic manufacturing. Two scientists who work in industry and academia to develop technologies for making biodegradable plastics – Tillman Gerngross from Dartmouth College and Steven Slater with Monsanto subsidiary Cereon Genomics – have decided that the formerly most promising approach of growing plastic in corn plants would consume even more fossil resources than most petrochemical manufacturing routes. They concluded that, “The environmental benefit of growing plastic in plants is overshadowed by unjustifiable increases in energy consumption and gas emissions.” Both Monsanto and Cargill Dow have been considering using biomass to solve that problem.

They might be encouraged to work harder on the problem as one way to clean up a dirty industry with some dirty secrets if we refuse to buy plastic products and avoid its use as a packaging material. So we encourage you to do what you can to decrease or eliminate plastic from your life.

- NL -

Avoid The Plastic Menace

- Store foods, especially those with high fat content, in something other than plastic, preferably glass jars or Pyrex-like containers. Note: aluminum foil is a questionable option; if you must use it, wash and reuse as many times as possible, then recycle it.
- Avoid microwaving foods in plastic and do not allow plastic wrap to touch food when microwaving.
- When purchasing foods wrapped in plastic, trim off a thin layer where the food comes into contact with the plastic and store the rest of the food in a non-plastic container.
- Buy cheese and meat from a dairy and butcher and ask them not to wrap it in plastic.
- Avoid plastic bags at stores by taking reusable cloth bags.
- Buy foods like peanut butter, as well as laundry soap, shampoo and other products in bulk, using your own containers.
- Avoid canned and take-out food.
- Make your own yogurt at home.
- Buy eggs in paper cartons and return them for reuse or recycling.
- At coffee shops, take your own mug or, if you’re not having it “to go,” ask for a china mug.
- Wash and reuse any plastic containers you feel you must buy.

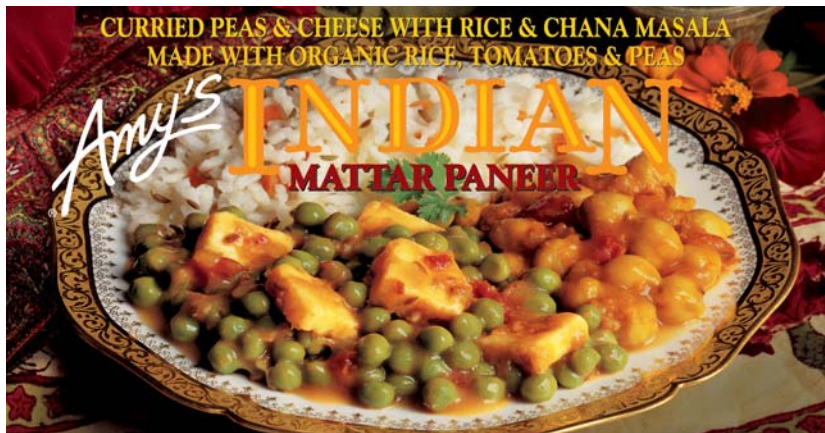
Learn More

PVC-Free Consumer Campaign
www.pvcfree.org

International Plastics Taskforce
www.ecologycenter.org/iptf

Berkley Plastics Taskforce
www.ecologycenter.org/ptf

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