The Chemicals Within

Many common household products contain compounds that could be affecting our health.

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As an Alaskan fisherman, Timothy June, 54, used to think that he was safe from industrial pollutants at his home in Haines—a town with a population of 2,400 people and 4,000 eagles, with 20 million acres of protected wilderness nearby. But in early 2007, June agreed to take part in a survey of 35 Americans from seven states. It was a biomonitoring project, in which people's blood and urine were tested for traces of chemicals—in this case, three potentially hazardous classes of compounds found in common household products like shampoo, tin cans, shower curtains and upholstery. The results—released in November in a report called "Is It in Us?" by a coalition of environmental groups—were not reassuring. Every one of the participants, ranging from an Illinois state legislator to a Massachusetts minister, tested positive for all three classes of contaminants. And while the simple presence of these chemicals doesn't necessarily indicate a health risk, the fact that typical Americans carry these chemicals at all shocked June and his fellow participants.

As Stephanie Felten, 28, of Aurora, Ill., put it, "Why should chemical companies be allowed to roll the dice on my health?"

Clearly, there are chemicals in our bodies that don't belong there. The Centers for Disease Control and Prevention conducts a large, ongoing survey that has found 148 chemicals in Americans of all ages, including lead, mercury, dioxins and PCBs. Other scientists have detected antibacterial agents from liquid soaps in breast milk, infants' cord blood and the urine of young girls. And in 2005, the Environmental Working Group found an average of 200 chemicals in the cord blood of 10 newborns, including known carcinogens and neurotoxins. "Our babies are being born pre-polluted," says Sharyle Patton of Commonweal, which cosponsored "Is It in Us?" "This is going to be the next big environmental issue after climate change."

The shocking thing to most Americans is that we really don't know the health effects of many chemicals on the market today. Under the Toxic Substances Control Act of 1976, chemicals already in use were grandfathered in without scrutiny. These include the three classes of compounds targeted in "Is It in Us?"—a plastic strengthener called bisphenol A (BPA), brominated flame retardants known as PBDEs and plastic softeners called phthalates. The chemical industry says these compounds have been used safely for decades, and certainly they do not have the overtly toxic properties of mercury or lead. But in animal studies and human cell cultures, they mimic hormones, with effects even at minute levels, down to parts per billion. Scientists say we're now awash in a chemical brew of hormone-mimicking compounds that didn't exist 100 years ago. "We've changed the nature of nature," says Devra Lee Davis, director of the Center for Environmental Oncology at the University of Pittsburgh.

Take bisphenol A. It's a basic constituent of the polycarbonate plastics found in many baby bottles, sippy cups and juice bottles. A highly versatile compound, it is also found in dental sealants, CDs, DVDs and the resin linings of food and beverage containers, including many cans and takeout cartons. But most scientists say small amounts can leach out—and ultimately find their way into our bodies—when the plastics start to break down under high heat or wear and tear. The CDC has found BPA in 92 percent of Americans age 6 and older who were tested. But the chemical industry says it's safe—and the Food and Drug Administration agrees. "It's not possible to contact harmful levels of it," says Steven Hentges of the American Chemistry Council, which represents the major chemical companies.

Reproductive biologists aren't so sure. Patricia Hunt of Washington State University was alerted to possible dangers of BPA in 1999 when her mouse study on an unrelated topic suddenly went haywire, with dozens of female mice unexpectedly developing chromosomal abnormalities in the
eggs they carried in their ovaries. As it turned out, a lab worker had used the wrong detergent to clean the animals' cages—one that caused BPA to leach out of the plastic cages and feeding bottles. Hunt tried washing brand-new cages with the same detergent to confirm the source of the problem. She then began studying BPA exposures in unborn rodents, which she followed into adulthood. The results were striking. Almost half the eggs of female mice exposed to low doses of BPA during gestation carried extra copies of chromosomes or were missing chromosomes. No one has replicated the findings.

There are other potential effects. Hundreds of animal and test-tube studies suggest that low-dose exposures, particularly during gestation, may later lead to breast and prostate cancer, abnormalities in the reproductive tract and behavioral problems, among other things. But there is disagreement about the implications for human health. Two groups convened by the National Institutes of Health have reached opposite conclusions. In 2007, advisers to the government's National Toxicology Program found "minimal" cause for concern. Meanwhile, another scientific panel produced a consensus statement saying that, based on animal data, common levels of exposure could pose a problem and that further study was needed. "We can't say there are conclusive data in humans," says Frederick vom Saal of the University of Missouri, who headed the second panel. "But given the fact that we're seeing irreparable damage in animals, for heaven's sake, let's get this out of products our babies are coming in contact with."

No government in the world has seen the need to do that yet. But two weeks ago, Michigan Rep. John Dingell, chair of the House Committee on Energy and Commerce, sent letters to seven manufacturers of infant formula asking if their cans were lined with BPA and if they had tested their products for it. In 2006 Whole Foods stopped carrying baby bottles made from polycarbonate plastic, which contains BPA. The chain now sells only BPA-free bottles and sippy cups.

Phthalates have also raised concern. The compounds are used to soften the plastics in products ranging from rubber duckies and vinyl shower curtains to certain medical tubing and IV bags. They are also found in hundreds of personal-care products, including many fragrances, body lotions, nail polishes and shampoos. Again, 30 years of data from institutions like the NIH and EPA point to potential problems in animals stemming from prenatal exposure, including abnormalities in the reproductive tract and a decline of sperm quality. Now there is a smattering of human studies, too. In 2006 Danish researchers found that higher levels of a particular phthalate in mothers' breast milk correlated with lower testosterone in male babies at 1 to 3 months of age. Similarly, Dr. Russ Hauser at Harvard studied roughly 500 men at a fertility clinic and found that those with higher levels of certain phthalates in their urine had lower sperm counts and sperm motility. A Swedish study of young military recruits, however, found no such correlation. These are all association studies—which by definition cannot prove cause and effect.

Other scientists are starting to look at what happens when these chemicals are combined. L. Earl Gray Jr., a research biologist at the EPA, has tested mixtures of two or more phthalates in animals. He deliberately selected doses of each that were too low to cause effects individually—yet found that as many as 50 percent of male rats who were exposed to the combination in utero developed abnormalities in the reproductive tract. In his latest study, he combined three phthalates with four pesticides and found that at the highest doses, the effects equaled those of a sevenfold dose of a single phthalate. "All the males were malformed," he says.

The toy industry contends that phthalates pose no danger, particularly a widely used one called DINP. This chemical "has been well studied here in the U.S. and in Europe and found to be safe specifically for kids' products," says Joan Lawrence, a vice president of the Toy Industry Association. She notes that companies cannot easily replace it because none of the potential substitutes "has its lengthy safety record." Nonetheless, last October, California Gov. Arnold Schwarzenegger signed a ban on the use of six phthalates in children's products sold in the state—though three of them, including DINP, are prohibited only in items that kids under 3 are likely to put in their mouths. In December, Toys "R" Us notified its vendors of its intention to comply with the California ban by Jan. 1, 2009, the date the law takes effect. Mattel is already in compliance.

Finally there are the flame retardants, PBDEs. They turn up in fabrics, upholstery, foam mattresses, circuit boards and the casings of computers and televisions—and apparently escape into indoor air and dust. Animal studies show they can have negative impacts on learning and memory, sperm counts and thyroid functioning in rats and mice. PBDEs tend to linger a long time in the body, and one mixture in particular seems "quite biologically active, especially during development, as we've seen in studies on rats, mice and fish," says Linda Birnbaum, director of experimental toxicology at the EPA. "If I were nursing my baby, I wouldn't stop because of PBDEs in breast milk, but many of us wish they weren't there." According to the EPA, 11 states—including California, Maine, Michigan and New York—have bans on two major types.
It could take decades to resolve doubts about the safety of all these chemicals, one way or the other. But Timothy June isn't waiting. He's stopped buying tomato sauce in tin cans to avoid the BPA, which scientists say tends to leach out of can linings when the contents are particularly acidic. He's ditched his vinyl shower curtain in favor of a cloth one. And he's considering getting rid of the foam mattress on his fishing boat. "I guess the survey had a bigger impact on me than I realized," he says. Let's all hope the chemicals aren't having an even bigger impact on us.

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