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# Chemical Exposure Linked to Billions in Health Care Costs

Researchers conclude they are 99 percent certain that hormone-altering chemicals are linked to attention problems, diabetes, other health problems.

By **Elizabeth Grossman**, for [National Geographic](#)

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Exposure to hormone-disrupting chemicals is likely leading to an increased risk of serious health problems costing at least \$175 billion (U.S.) per year in Europe alone, according to a study published Thursday.

Chemicals that can mimic or block estrogen or other hormones are commonly found in thousands of products around the world, including plastics, pesticides, furniture, and cosmetics.

The new research estimated health care costs in Europe, where policymakers are debating whether to enact the world's first regulations targeting endocrine disruptors. The European Union's controversial strategy, if approved, would have a profound effect on industries and consumer products worldwide.

Linda Birnbaum, the leading environmental health official in the U.S. government, called the new findings, which include four published papers, "a wake-up call" for policymakers and health experts.

"If you applied these [health care] numbers to the U.S., they would be applicable, and in some cases higher," says Birnbaum, director of the U.S. National Institute of Environmental Health Sciences.

The researchers detailed the costs related to three types of conditions: neurological effects, such as attention deficit disorders; obesity and diabetes; and male reproductive disorders, including infertility.

The biggest estimated costs, by far, were associated with chemicals' reported effects on children's developing brains. Numerous studies have linked widely used pesticides and flame retardants to neurological disorders and altered thyroid hormones, which are essential for proper prenatal brain development.

The researchers concluded that there is a greater than 99 percent chance that endocrine-disrupting chemicals are

contributing to the diseases, according to the studies published in the *Journal of Clinical Endocrinology and Metabolism*.

### **Tip of the Chemical Iceberg**

The estimate was limited to a handful of chemicals commonly found in human bodies: bisphenol-A (BPA), used in hard plastics, food-can linings, and paper receipts; two phthalates used as plasticizers in vinyl products; DDE, the breakdown product of the banned insecticide DDT; organophosphate pesticides, including one called chlorpyrifos used on grain, fruit, and other crops; and brominated flame retardants known as PBDEs that were extensively used in furniture foams until they were banned in Europe and the United States.

BPA, DDE, and the phthalates were examined for their links to obesity and diabetes, phthalates for male reproductive effects, and flame retardants and organophosphate pesticides for neurological effects.

Together, these represent about 5 percent of endocrine disruptors—or “the tip of the proverbial iceberg,” says Leonardo Trasande, an associate professor of pediatrics and environmental medicine at New York University School of Medicine. He was the main study’s lead author.

“The chemicals were chosen based on the quality and amount of available evidence,” says Bruce Blumberg, a University of California, Irvine, professor of developmental and cell biology and co-author of the obesity and diabetes paper.

Evidence linking the pesticides and flame retardants to neurological effects was the strongest, showing "near certainty of causation," Trasande wrote in a summary.

The researchers also reported that chemicals contribute "substantially" to obesity, diabetes, and male reproductive disorders. Those findings were based on previous research, largely in the United States and Europe, that tracked the exposures and health of people over extended periods of time.

The estimated health care cost associated with chemicals in plastics is at least \$28 billion per year, according to the researchers.

### **Extent of Harm Debated**

Nevertheless, at the heart of the debate about endocrine disruptors is whether the science has adequately established that they actually are contributing to increases in human disorders.

Daniel Dietrich, a toxicologist at University of Konstanz in Germany, questions whether the traces of chemicals that people encounter through products, food, and environment are large enough to cause harm. He also questions whether hormone disruption itself should be considered a health effect, an issue which is central to the European Union's policy debate.

"You can only judge on the available science. Maybe in 30 years we will judge this differently," says Dietrich, who has served on European Union science panels and is a former adviser to a chemical industry-funded group called the European Centre for Ecotoxicology and Toxicology of Chemicals, or ECETOC.

Representatives of pesticide-manufacturing companies criticized the report, saying that "to ascribe these disorders to endocrine disrupting chemicals in the environment is misleading and potentially harmful." Pesticides undergo thorough testing for effects, and "based on the results for estrogenic activity, pesticides are not of concern," according to a statement by the trade group CropLife America. Some pesticides, however, have been linked in some studies to estrogenic and other hormonal effects.

Chemical manufacturers expressed similar concerns, saying without proven health effects, the study could "create potentially unnecessary public health concerns" and misallocation of scarce funds.

### **Neurological Effects Most Costly**

To arrive at their cost estimates, the researchers used data that their expert panels agreed provided "the strongest causal evidence," Trasande says. To calculate the likelihood of a particular chemical causing a specific health effect, they used methods previously developed by the U.S. Institute of Medicine, the World Health Organization, and the Intergovernmental Panel on Climate Change. This enabled them to calculate each chemical's contribution to the prevalence of a disorder, then assign a value to the health care costs.

"A major surprise was that the neurological effects were the most costly," totaling at least \$146 billion per year, says study co-author Philippe Grandjean, a professor of environmental medicine at the University of Southern Denmark and an adjunct professor at

Harvard's T. H. Chan School of Public Health. Those estimated costs included treatment as well as providing special education and other services for children and others with lower IQs or learning or behavioral disorders.

On its own, hormone disruption is not a health effect, Grandjean says, but it leads to "very important adverse effects and is something we can test for and therefore prevent."

Birnbaum, who did not participate in the new research, said evidence is mounting that people's health is being jeopardized by an array of commonly used chemicals.

"The point is that there is a wide variety of effects being seen in the general population related to endocrine-disrupting chemicals. We have increasing amount of data raising concerns about their use," Birnbaum says. "We are seeing effects from [chemical] levels that are present in the general population."

To put \$175 billion in perspective, it is more than the combined proposed 2016 budgets for the U.S. Department of Education, Department of Health and Human Services, National Park Service, and Environmental Protection Agency combined.

"The overall estimates in my opinion are very conservative," says study co-author [R. Thomas Zoeller](#), a University of Massachusetts, Amherst biology professor who specializes in chemicals that disrupt thyroid hormones.

Following years of analysis, the European Commission is now reviewing more than 27,000 public comments on its controversial proposal defining endocrine-disrupting chemicals. A

lawsuit has been filed against the commission by Denmark, Sweden, and the EU Council of Ministers over failing to meet a December 2013 legal deadline for introducing this definition.

The European Commission expects to complete an "impact assessment" of potential regulation of the chemicals in 2016, an effort begun in 2013.



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