

## Viewpoint: ‘Health impact of chemicals doubled in last 5 years’? Media misreporting flawed studies misleads the public

“P

lastics and pesticides: Health impacts of synthetic chemicals in US products doubled in last 5 years, study finds,” a July 22 [CNN headline announced](#) to the world. Referring to [a paper](#) recently published in the journal *Lancet Diabetes and Endocrinology*, the media outlet told its readers in no uncertain terms what’s at stake:

The proof is piling up: Many synthetic chemicals can harm your health and that of your children. Evidence has doubled in the last five years about the negative impact on our health of endocrine-disrupting chemicals in plastics, pesticides, flame retardants and other merchandise....

“It’s a global problem,” the paper’s senior author told CNN. “These are chemicals used in consumer products all across the world.”

### Plastics and pesticides: Health impacts of synthetic chemicals in US products doubled in last 5 years, study finds

By Sandee LaMotte, CNN

🕒 Updated 1:21 PM ET, Wed July 22, 2020



In fact, the astounding claim that the “health impact of synthetic chemicals in US products” has doubled in the space of five years is in no way supported by the *Lancet* analysis. The media coverage of the paper, and indeed the paper itself, are part of a decades-long trend among some scientists and activists to amplify the risk of exposure to chemicals in consumer products far beyond what can be justified by the

evidence.

Led by Leo Trasande, a pediatrician at New York University's Langone School of Medicine, researchers reviewed the literature linking "endocrine-disrupting chemicals" (EDCs) to a wide range of health effects—from cognitive deficits and obesity in children to breast and prostate cancer in adults. In reviewing the evidence, the authors highlighted the extent to which data accumulated since 2015 have strengthened the evidence available up to that point.

With 16 pages of text, six tables, and 220 references, the paper presents itself as a comprehensive assessment of what is known about the association between exposure to EDCs and disease—and it paints a picture of a pervasive and urgent problem.

No fewer than 21 different associations were mentioned in the review's abstract for which "evidence is particularly strong," for which "greater evidence has accumulated," or for which "evidence also exists." However, the authors were not concerned with critically evaluating the studies they cited. When one examines the papers cited in support of these associations, both the methods used and the results of the studies are often inconsistent.

For example, the authors cited four studies addressing prenatal exposure to organophosphorus pesticides and intellectual deficits in children. Two of the studies showed some evidence of an effect, whereas the other two did not. Yet the authors judged this association to be supported by "strong evidence" based on these contradictory studies. This same problem occurred with other associations discussed in the paper. Given the small number of studies available on a specific topic, it is meaningless to speak of a "strengthening" of the evidence since 2015. Counting publications is not the same as evaluating the evidence.

## **The long crusade against "EDCs"**

The Lancet review is only the latest attempt to emphasize the threat from potentially endocrine-active chemicals in the environment. Concern about the effects of these substances goes back to the 1990s, when scientists in Europe proposed the endocrine disruption hypothesis to account for falling sperm counts, and the best-selling book *Our Stolen Future: Are We Threatening Our Fertility, Intelligence and Survival? A Scientific Detective Story* came out in the United States. Since 1992, the number of scientific articles published on "endocrine disrupting chemicals" has increased steadily from one to 1,197.

The term "endocrine-disrupting chemicals" encompasses a sprawling and heterogenous class of compounds that can mimic or interfere with the body's hormones that control developmental, reproductive, brain, and immune functions. These include both natural and synthetic compounds: dietary phytoestrogens present in plants and chemicals like bisphenol A (BPA), parabens, phthalates, organophosphate pesticides, pyrethroid insecticides, and flame retardants.



A key fact that the review authors failed to acknowledge anywhere in their paper is that most of the exposures reported in the studies they examined add up to trace amounts of the various compounds. That is, they can be detected with sophisticated analytical techniques but are below the level where they are likely to cause any harm.

This poses a problem for epidemiologic studies, which can detect relatively strong relationships—such as smoking and lung cancer; alcohol and cancer of the mouth and throat; or infection with HPV and cervical cancer—but are much less helpful when it comes to assessing very weak or subtle relationships. In addition to the difficulty of accurately measuring real-world exposure to very low-level chemicals, observational studies are susceptible to confounding and bias, which can distort the results.

While focusing on trace chemical residues, studies investigating EDCs often fail to account for the many lifestyle factors that have documented health effects and are likely to dwarf the possible impacts of EDCs. These include increasing consumption of calorie-dense foods and its attendant effects on the prevalence of obesity and diabetes, medications, endogenous hormone production, and physical activity. In view of these methodological problems, the results of most epidemiological EDC studies are likely to be questionable.

For all their weaknesses, studies of EDCs get widespread publicity and reinforce the prevalent view that we are being poisoned by pervasive chemicals in the environment. Agencies like the National Institute of Environmental Health Sciences (NIEHS) continue to fund studies of questionable hazards (like BPA), and professional organizations such as the Endocrine Society and the American Academy of Pediatrics play up the threat from EDCs.

None of this is to imply that we should ignore the possible health effects of exposure to various chemicals. However, the results of these studies need to be examined critically based on what scientists have learned in recent decades. When researchers fail to contextualize new data, they feed the popular

misconception that we are being poisoned on all sides by highly toxic chemicals.

## Potentially harmful vs probably harmless

Scientists need to make distinctions between compounds that, based on accumulated evidence, are unlikely to cause harm and compounds that should be targeted for further study. For example, the *Lancet* review highlighted BPA, which has been widely used for decades in many consumer products, as a potential health hazard, and Trasande reiterated this concern in a [just-released study](#) published in *JAMA Network Open* [a new 'open access' journal that publishes less rigorously vetted stories than *JAMA* itself]. The new paper purported to show that adults enrolled in the National Health and Nutrition Examination Study (NHANES) who were in the highest third for urinary BPA had a 49 percent increased risk for all-cause mortality compared to those in the lowest third.

This conclusion deserves careful scrutiny for many reasons, the most important being that the *Lancet* review and the new *JAMA Network Open* study failed to acknowledge that BPA has been the subject of extensive, high-caliber research over the past two decades. This research has demonstrated that human exposure to BPA is extremely low and that the compound is efficiently metabolized and excreted in urine, even in infants. Furthermore, BPA's estrogenic potency is orders of magnitude lower than that of the natural hormone estradiol.

Follow the latest news and policy debates on sustainable agriculture, biomedicine, and other 'disruptive' innovations. Subscribe to our newsletter.

[SIGN UP](#)

In their introduction, the authors of the *Lancet* paper referred to DDT, an insecticide whose indiscriminate use following World War II gave rise to the environmental movement in the 1960s. But the DDT experience also provides a cautionary tale, which they failed to mention.

In 1993 an early epidemiologic study reported that, compared to women with relatively low blood levels of a DDT metabolite, women with relatively high levels had a three-fold increased risk of developing breast cancer. The results were widely publicized and generated intense concern among women. However, when a large number of further studies were done, their results consistently failed to support the existence of an association.





Collection of pesticides, including DDT, that were still in use by some farmers in the 1970's. Credit: Getty Images

It is significant that Richard Sharpe, a leader in the field of male reproductive development and one of the originators of the “environmental estrogen hypothesis” in the 1990s, became increasingly critical of the hypothesis and the massive research juggernaut it unleashed. Sharpe has pointed out the fundamental bias that underlies the activist position on EDCs—the narrow focus on low or very low-level contaminants as the sole explanation for complex developmental processes, which gives short shrift to other factors that are more likely to have detectable effects.

Sharpe was alluding to medications taken by women during pregnancy, as well as lifestyle factors such as smoking, obesity, and lack of exercise. In an e-mail exchange he wrote,

I ended up disproving my own hypothesis/ideas (on the potential impact of environmental oestrogens on male reproductive disorders) early on in the ED saga. Plus, I was lucky that the question that drove me was ‘what causes these disorders?’ not ‘how do EDCs cause these disorders? Such a simple difference, but it takes your thought processes in a very different direction.[1]

In contrast to BPA and DDT, other compounds (like the organophosphorus pesticide chlorpyrifos) may merit in-depth study to determine whether early reports of adverse effects in children are sound. Studies should be carried out in heavily exposed populations with suitable comparison groups with no, or low, exposure in order to learn about the chemical's effects.

But here, too, one has to keep a sense of perspective. Trasande and other endocrine disruption hypothesis advocates often ignore the fact that pesticides currently in use have been [tested for toxicity](#) and have a safety margin several orders of magnitude below the level at which toxic effects have been observed. Furthermore, most pesticides are applied at particular times in the smallest quantities possible.

The difficult challenge of identifying low-level toxins in the environment will not be advanced by a blunt approach that often relies on crude studies that don't distinguish between harmless exposures and those that may have serious health effects. At best, this effort only serves to scare the public and mislead policymakers.

## Notes:

1. *Getting Risk Right: Understanding the Science of Elusive Health Risks*, p. 113.

Geoffrey Kabat is an epidemiologist and the author, most recently of [Getting Risk Right: Understanding the Science of Elusive Health Risks](#). Visit [his website](#) and follow him on Twitter [@GeoKabat](#)

A version of this article first appeared on the GLP on August 19, 2020.