

Tackling toxics

Most Americans believe that if a chemical is in their cosmetics, their coat, or their couch, someone is making sure it's safe for their health. In reality, little toxicity information or regulation is required for 80,000 industrial chemicals used in commerce in the United States. To address this, legislation to update the ineffective 1976 Toxic Substance Control Act (TSCA) is currently moving through Congress. The hope is that it will lead to improved regulation of chemicals, but the extent and timeliness of the reform are not certain. In the meantime, the widespread use of harmful chemicals continues to pose a threat to our health and environment.

In 1977, Bruce Ames and I published a report that a flame retardant in children's pajamas called "brominated Tris" was a mutagen and potential carcinogen. Three months later, it was banned from children's pajamas, only to be replaced by "chlorinated Tris." We determined that this too was a mutagen, and it was removed from pajamas. Such regrettable substitution of a harmful chemical with a less-studied cousin is like "a game of whack-a-mole," according to Donald Kennedy (former editor-in-chief of *Science* and former commissioner of the U.S. Food and Drug Administration).^{*} Unfortunately, highly fluorinated chemicals are now getting the regrettable substitution treatment. These chemicals provide stain and water repellency in outdoor clothing, nonstick cookware, furniture, carpet, cosmetics, and food contact paper. However, they are highly mobile, have no known degradation pathways in the environment, and can persist indefinitely.

Perfluorooctanoic acid, commonly called C8, has an estimated half-life of 2.3 years or more in humans and is associated with cancer, elevated serum cholesterol levels, and other health problems. C8 was phased out of consumer products in the United States last year, a half-century after toxicologists first revealed its potential for harm. It was replaced with numerous perfluorohexanoic acid (C6) compounds that are more rapidly excreted by humans but also show extreme environ-

mental persistence. Are these replacements safe? There is limited research thus far on the toxicity of the C6 alternatives. However, they are increasing in the environment and in human blood, and they share the potential toxicity of their C8 relatives.

One solution to the regrettable substitution problem is to address entire families or classes containing toxic chemicals rather than tackling them one at a time. For example, the Green Science Policy Institute, an organization of scientists that promotes the responsible use of chemicals, has called for a 50% reduction over the next 5 years in the use of six families of chemicals in consumer products, whose studied members have been found to

be harmful: highly fluorinated chemicals, antimicrobials, flame retardants, bisphenols and phthalates, organic solvents, and certain metals.[†] Before using such substances in products, we should ask "Do we need this chemical, given the potential for harm?"

The good news is that companies are starting to act: Kaiser Permanente, IKEA, Levi Strauss & Co., and Crate and Barrel are phasing out highly fluorinated and other chemical classes of concern from the products they buy, produce, and/or sell.

Scientists can contribute by evaluating health and environmental impacts across a chemical's life cycle

and looking for safer alternatives. They can make policy recommendations and collaborate on consensus documents. In 2015, 230 scientists from 40 countries signed the Madrid Statement,[‡] expressing concern regarding the persistence and toxicity of both the highly fluorinated C8 chemicals and the C6 alternatives. Scientists can catalyze dialogue and action among manufacturers, retailers, and large purchasers and have an immediate impact in reducing the use of harmful chemicals.

Such actions by the scientific community can, along with meaningful TSCA reform, improve the health of the population and the environment. Most important of all, it will make our planet healthier and safer for future generations.

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^{*}D. Kennedy, *Science* **318**, 1217 (2007). [†]<http://greensciencepolicy.org/topics/six-classes/>.

[‡]A. Blum et al., *Environ. Health Perspect.* **5**, A108 (2015).