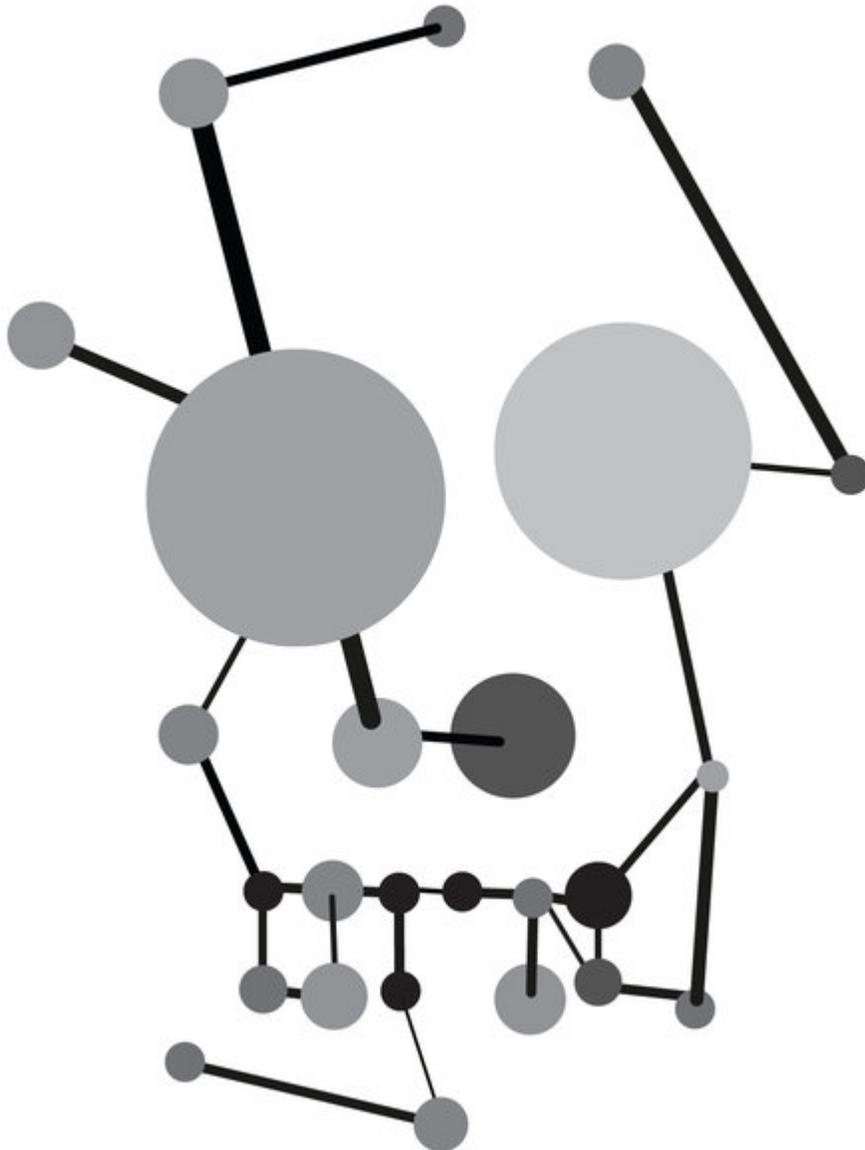


Making Chemistry Green

By ROLF U. HALDEN and ROBERT S. LAWRENCE NOV. 9, 2014

Photo Credit Jamie Keenan



FOR nearly 40 years, the Food and Drug Administration has wrestled with regulating the chemicals triclosan and triclocarban as they have become among the world's most ubiquitous environmental contaminants. Designed to kill bacteria, they have been added to antibacterial soaps, cosmetics and other

consumer products despite longstanding concerns about their impacts on humans and the environment.

The fact that they are still being used underscores the need to reform the nation's regulatory system and manufacturing approach for chemicals.

We just completed an analysis of 143,000 peer-reviewed research papers to track the progress of what we call chemicals of emerging concern. We found that it takes around 14 years from the point at which safety issues are raised about a chemical before scientists' concern peaks and regulators act.

In the case of triclosan and triclocarban, regulatory action has taken a lot longer, even though we know that these chemicals can interfere with the human endocrine system, affecting development and metabolism, and may also be contributing to antibiotic resistance in bacteria that cause human infections.

The F.D.A. considered removing the chemicals from some consumer products in 1974 but concluded that there was inadequate data on their safety and said that it would reconsider the issue in a year. A seemingly unending series of reviews followed. Then, last December, only after being sued by the Natural Resources Defense Council, the agency ordered makers of antibacterial soaps and body washes used with water to show by next month whether these chemicals are safe and effective — or to stop using them.

(This would not be a great loss; antibacterial soaps are no better at killing germs than ordinary soap and water.)

These chemicals belong to a class of persistent, bioaccumulative and toxic (PBT) compounds known as organohalogenes. Perhaps the best known of these is DDT, a widely used pesticide banned in 1972 after devastating fish and bird populations (we still find remnants of it today in the blood of adults, children and

newborns). While triclosan and triclocarban are not DDT, they share similarities that make them slow or impossible to degrade — their carbon-halogen bonds.

Regulators should also sharply curtail the use of two other classes of organohalogens: brominated organics, used primarily as flame retardants, and fluorinated compounds, used in food packaging, textiles and many consumer products.

We've known for decades that organohalogens pose potential hazards. The problem is, we don't regulate chemicals by class, but individually, one compound at a time. And with about 84,000 chemical compounds in commercial use, and another 500 to 1,000 new ones introduced each year, we've created a situation that is impossible to regulate effectively.

Adding to the morass, two federal agencies, the F.D.A. and the Environmental Protection Agency, regulate chemicals depending on their use. The F.D.A. oversees chemicals that are ingested or used on the skin; the E.P.A. regulates the same chemicals when used for agriculture and industry. Little consideration is given to the potential health effects of chronic exposure to even small doses or to the effects of compounds that are likely to persist in the environment.

We have conducted over 30 peer-reviewed scientific studies on pollutant exposure and detected dozens of organohalogens in mothers and their babies; associated health effects include altered hormone levels, lower birth weight and reduced head circumference.

Exposure to many of these chemicals does not end with the consumer product. This 2012 paper evaluates the presence of triclosan in North...

So what should we do?

We must make safety, health and sustainability priorities throughout the life cycle of chemicals: their design, production, use, disposal and degradation. “Waste” is foreign in nature; all material flow is circular. We need to convert our linear approach to chemical manufacturing into a circular one, in which all products have a planned end-of-life.

We should regulate chemicals as we understand them: in groups. Instead of regulating one compound at a time and only after decades of debate, we should manage classes of PBT chemicals. Organochlorines, organobromines and organofluorines in consumer products pose intrinsic risks that rise with each carbon-halogen bond.

Regulations should also encourage industry to make products from benign or “green” chemicals. These are composed of basic, ubiquitous building blocks, not ones that are rare in nature and incompatible with biodegradation. Safer options are feasible and available.

In September, an important step was taken. Senators Chris Coons, Democrat of Delaware; Susan Collins, Republican of Maine; Jay Rockefeller, Democrat of West Virginia; and Johnny Isakson, Republican of Georgia, proposed legislation that would encourage research and scientific collaboration in developing sustainable chemistry and create public-private partnerships to make and market sustainable chemical products.

Synthetic chemicals are vital to our society. But we should be doing everything possible to make sure they are safe.

Rolf U. Halden is an engineering professor and director of the Center for Environmental Security at Arizona State. Robert S. Lawrence is director of the Center for a Livable Future at Johns Hopkins.