Researchers find little-known PCB "pretty much everywhere"

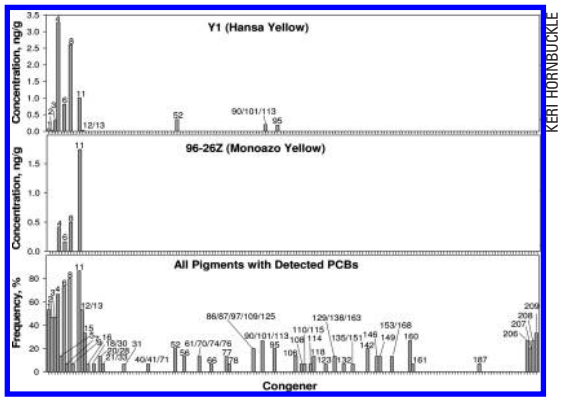
After a half-century of use in products ranging from electrical transformers to caulk to paint, PCBs were banned in the late 1970s as one of the "dirty dozen" persistent organic pollutants. But a little-known PCB is turning up in water and air in cities and watersheds in Illinois, Nova Scotia, and New Jersey. Researchers suspect the chemical is even more widespread, but do not know how—or whether—it affects human health or ecosystems.

In this issue of *ES&T*, Dingfei Hu and Keri Hornbuckle of the University of Iowa's department of civil and environmental engineering report that they found PCB 11 (3,3′-dichlorobiphenyl) "in air all over Chicago," says Hornbuckle (*Environ. Sci. Technol.* DOI 10.1021/es902413k).

PCB 11 is one of 209 compounds, called congeners, in the PCB family. As a group, PCBs accumulate in fatty tissue, and concentrations increase in animals higher up the food chain. However, it is not known whether PCB 11 bioaccumulates.

PCB mixtures known by the trade name Aroclor were manufactured from 1929 to 1979 for commercial use in products, such as electrical transformers, lubricants, and carbonless copy paper. The U.S. banned them after they were linked to cancer and other health problems, but industries were still allowed to produce small amounts of "inadvertent" PCBs as byproducts of other manufacturing processes. In environmental monitoring, however, regulators mainly looked for Aroclor compounds, not inadvertent byproducts, so PCB 11 remained "under the radar" until the late 1990s, Hornbuckle says.

In 1998, Simon Litten, a research scientist with the New York State Department of Environmental Conservation, used a method that could detect all 209 congeners. With this technique, he found high levels of PCB 11 in wastewater in New York Harbor and traced it to effluent from a pigment manufacturing plant.



Examples of PCB profiles in paint pigments tested by Hornbuckle and Hu (top two plots), and frequency of congener detection in the 15 pigments with detected PCBs (bottom plot).

Hornbuckle, who knew of Litten's work, wondered if the PCB 11 in Chicago's air could be coming from paint. She and Hu found >50 PCBs in the pigments used in three common paint brands, but PCB 11 was detected most often. "There are many questions," Hornbuckle says. "Is it toxic? What is its major route into the environment? Can pigments be reformulated so they don't produce those PCBs as byproduct? We don't know, because we have not studied [congeners] that didn't come from Aroclors." Hornbuckle suspects that PCB 11 is released when paint vaporizes, and wonders if the chemical could be deposited in nearby waterways, including the Great Lakes.

If paint is not the culprit, other pigmented products could be, according to Lisa Rodenburg of the Rutgers University Department of Environmental Sciences (*Environ. Sci. Technol.* DOI 10.1021/es901155h). Before they began their study, which is reported in this issue, Rodenburg and colleagues knew PCB 11 was linked to the manufacture of an organic yellow coloring called a diarylide pigment. However, they were surprised to find it in parts of New Jersey's Delaware River watershed where no pigment manufacturers are located. In their search for sources, they discovered PCB 11 in consumer products ranging from printed newspapers to yellow cereal boxes and plastic bags. The only products they tested that did not contain PCB 11 were plain white paper and a manila envelope.

"Once we started to look for it, we started to find it pretty much everywhere," Rodenburg says. With levels of PCBs from other sources declining since the ban, she suspects that PCB 11 is leaching into water from paper and plastic.

The chemical's pervasiveness poses challenges for both industry and water quality regulators. These regulators set maximum daily load limits for PCBs as a group, but the high quantities of PCB 11 in urban wastewater could make the implementation of those limits difficult, Rodenburg says.

If PCB 11 and other congeners are byproducts of manufacturing, the industry may be able to eliminate them by cleaning up the process, although some manufacturers have dodged tighter controls by moving production to other countries.

But PCB 11 is also symptomatic of a larger problem. "There are more chemicals being produced and invented than we're able to analyze in environmental samples. At some point, you have such a mixed soup that the syner-

gistic effect is greater than the individual chemical effect," says Glenn Milstrey, director of the New York State Department of Environmental Conservation's Bureau of Water Assessment and Management. "We are addressing legacy pollutants [such as dioxins and PCBs] that were discharged a generation ago," says Scott Stoner, who heads the department's Pharmaceuticals Work Group. "Let's not let today's emerging contaminants become the legacy pollutants that we leave to our children."

—BARBARA FRASER