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News Release

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Note to reporters: A list of compounds analyzed and their uses can be found in tables in Appendix B (pp 28-36) of the report at http://pubs.usgs.gov/sir/2008/5173/

Traces of Pharmaceuticals and Household Chemicals Found in Northeast Ohio Streams

That morning cup of coffee, the medicines we take, the soaps and shampoos we use, household cleaners, pesticides and a host of chemicals…. What do they have in common? They all eventually end up in the environment.

A wide variety of medicines, household chemicals, and other organic wastewater compounds have been detected at very low concentrations in Ohio's Tinkers Creek watershed. Chemicals found in diesel fuel, asphalt and asphalt sealers, explosives, fragrances, tobacco, caffeine, insect-repellants, and medicines are among the compounds that U.S. Geological Survey (USGS) scientists detected.

Using innovative sampling devices as well as traditional methods, USGS scientists collected water and streambed sediment samples in Tinkers Creek watershed and two other tributaries to the Cuyahoga River in northeast Ohio and analyzed the samples. Collection sites were upstream and downstream from seven wastewater treatment plants in the Tinkers Creek watershed. The two sites in nearby watersheds were sampled and served as reference sites to compare with results found in the Tinkers Creek watershed.

"It was common to have more compounds detected in samples collected downstream from wastewater treatment plant outfalls than in corresponding samples collected upstream from the outfalls," said John Tertuliani, USGS biologist and lead author of the recently released report about the study.

"We are very proud to have taken part in this important scientific study," said Ken Heigel, Chief Engineer with the Ohio Water Development Authority (OWDA). "This study established that the chemicals are present in the watershed. In the future, I hope USGS will continue to utilize OWDA's Research and Development Program for support of this important scientific work."

Four USGS laboratories used a variety of analytical methods to measure organic wastewater compounds in samples. A total of 12 antibiotic, 20 pharmaceutical, and 63 organic wastewater compounds were detected at very low concentrations at one or more sites in water, and 8 pharmaceutical and 37 organic wastewater compounds were detected at very low concentrations in streambed sediments. This study did not examine the potential aquatic or human health effects of exposure of chemicals in trace amounts

"Collecting water samples to analyze for organic wastewater compounds is difficult because these compounds are often present in very low concentrations that are measured in micrograms or nanograms, which, for the quantities of samples analyzed, is equal to parts per billion or trillion," said Tertuliani. "Our first challenge was finding a way to detect these compounds at the concentrations they are present in the environment."

The Polar Organic Chemical Integrative Sampler (POCIS) is one of the two innovative, passive-sampling devices used in the study. POCIS is designed to accumulate trace concentrations of chemicals over a long-term exposure. When sampling over an extended period, chemicals in the water are captured and held in the POCIS media, resulting in concentrations that are high enough to be identified during laboratory analysis.

The other passive-sampling device, the Semipermeable Membrane Device, is designed to sample fat-soluble (hydrophobic) organic chemicals in water, mimicking the bioconcentration of contaminants that can accumulate in the fatty tissues of organisms.

Both devices were deployed for 28 days at sites in Tinkers Creek watershed and in the two nearby reference-site watersheds.

Additional study findings:
Caffeine and N,N-diethyl-meta-toluamide (DEET, found in some insect repellants), and three compounds found in coal tar and asphalt (fluoranthene, phenanthrene, and pyrene) were detected in water at all sites in the Tinkers Creek watershed, irrespective of whether the site was upstream or downstream from a wastewater treatment plant.

Carbamazepine (anticonvulsant), sulfamethoxazole (antibiotic), trimethoprim (antibiotic), and hexahydrohexamethylcyclopentabenzopyran (or HHCB, a musk fragrance) were detected in water at 100 percent of the sites downstream from wastewater treatment plant outfalls, but much less frequently at sites upstream from outfalls.

Fifteen organic wastewater compounds were detected in streambed sediments at all sites in the Tinkers Creek watershed, irrespective of whether the site was upstream or downstream from a wastewater treatment plant. The 15 compounds detected are those found in diesel fuel and kerosene; coal tar and asphalt; wood preservatives; explosives; lubricants; fumigants; fragrances in detergents, tobacco, and coffee; dyes used in manufacturing and textiles; plasticizers; and plant or animal products found in cells that are often a fecal indicator.

Many of the pharmaceutical compounds detected in sediment also were detected in water. One notable exception was miconazole (antifungal drug), which was detected in more than 25 percent of the bed-sediment samples yet never detected in water. In contrast, some pharmaceutical compounds (such as trimethoprim, an antibiotic, and carbamazepine, an anticonvulsant and mood stabilizer) that were detected in water at all sites downstream from wastewater outfalls were either not detected or detected at a much lower frequency in streambed sediments.

“Results such as these point out the need to sample both water and sediment when we are looking for organic wastewater compounds in streams,” said Tertuliani.

USGS completed this study in cooperation with the OWDA; National Park Service; Cities of Aurora, Bedford, Bedford Heights, Solon, and Twinsburg; and Portage and Summit Counties and in collaboration with the Ohio Environmental Protection Agency.

The scientific report “Occurrence of Organic Wastewater Compounds in Tinkers Creek Watershed and Two Other Tributaries to the Cuyahoga River, Northeast Ohio,” by J.S. Tertuliani, D.A. Alvarez, E.T. Furlong, M.T. Meyer, S.D. Zaugg, and G.F. Koltun, is available at http://pubs.usgs.gov/sir/2008/5173/ . A feature article about the USGS study and POCIS sampling device was published in the Department of the Interior online publication, *People, Land & Water*, at http://www.peoplelandandwater.gov/usgs/usgs_03-30-07_usgs-tests-new.cfm .

Many studies of organic wastewater compounds (also known as emerging contaminants) have been done by the USGS Toxic Substances Hydrology Program and are described at http://toxics.usgs.gov/regional/emc/ . More information about the POCIS is available at http://www.cerc.usgs.gov/pubs/center/pdfDocs/POCIS.pdf and the Semipermeable Membrane Device is available at http://www.ecrc.usgs.gov/pubs/center/pdfDocs/SPMD.pdf .

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