

New tool helps consumers measure their emerging contaminant footprint

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Humans use a wide variety of chemicals in their everyday lives — including over-the-counter medications, prescription drugs and personal care products — that become part of the wastewater stream, potentially harming the environment. A new tool developed by Penn State researchers can help consumers calculate their emerging-contaminant footprint. Credit: Quadell, via Wikimedia Commons

Consumers who want to calculate and reduce their use of products containing chemicals that can contaminate water supplies now have a tool to assist them, thanks to a Penn State researcher and her students.

Heather Gall, assistant professor of agricultural and biological engineering, led the creation of an emerging contaminants footprint calculator, which is a downloadable spreadsheet consumers can use to document the types of [products](#) they have in their homes and calculate the potential water-quality impacts of those chemicals.

Three students, working with Gall as part of summer undergraduate research programs at Penn State over a three-year period, developed the calculator, which one of the students presented at the American Society of Agricultural and Biological Engineers International Meeting earlier this year.

Humans use a large variety of chemicals in their everyday lives—including over-the-counter medications, prescription drugs and personal care products—that become part of the wastewater stream, Gall explained.

"Wastewater treatment plants were not designed to remove these chemicals, so these products and their metabolites persist in the effluent," she said. "These chemicals then are introduced into the environment during combined-sewer overflow events, wastewater effluent irrigation and land-application of biosolids."

Gall noted that many of these chemicals are known or suspected endocrine disruptors and cause adverse impacts to aquatic organisms at trace concentrations. "There currently are no surface- or drinking-water standards for these chemicals. Therefore, the best way to reduce their presence in the environment is to reduce their use."

The goal of this project, she said, was to develop a calculator that the public can use to estimate an individual's footprint of emerging contaminants—primarily endocrine disrupting compounds, or EDCs.

"Studies have shown that these compounds can cause gender-skewing in fish and amphibians, in which organisms develop intersex characteristics," Gall said. "This has been a problem in the Susquehanna and Juniata rivers, and although pesticides are thought to be a major cause, personal-care products also are a factor."

Modeled after existing water and carbon footprint calculators, the spreadsheet contains lists of products grouped under three categories: cleaners, laundry, and health and beauty. The user conducts an inventory of these products in the home and inserts the amount of each product they own by volume (milliliters) or mass (grams).

The Excel-based calculator is programmed with average values of the EDCs in each product, which enables it to calculate an estimate of the user's contaminant footprint based on the products present in the home at that moment. The results are summarized visually in several graphics to help with interpretation.

"The EDC footprint is estimated in grams, so the total mass of EDCs in products owned by an individual family may seem insignificant," Gall said. "But given the potential environmental impact of these contaminants in the environment even at trace concentrations, these estimated footprints are significant."

To help consumers understand the implications, amounts are presented to show a hypothetical total impact if everyone in the United States was using the same amount of EDC-containing products as the person using the calculator. The mass is then converted to the equivalent number of commercial aircraft to provide a way for the user to visualize the results

Provided by Pennsylvania State University

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