

Antibacterial products fuel resistant bacteria in streams and rivers

September 19 2013



A person washes their hands with an antibacterial soap. Credit: John Kelly

Triclosan – a synthetic antibacterial widely used in personal care products – is fueling the development of resistant bacteria in streams and rivers. So reports a new paper in the journal *Environmental Science and*

Technology, which is the first to document triclosan resistance in a natural environment.

Invented for surgeons in the 1960s, triclosan slows or stops the growth of bacteria, fungi, and mildew. Currently, around half of liquid soaps contain the chemical, as well as toothpastes, deodorants, cosmetics, liquid cleansers, and detergents. Triclosan enters streams and rivers through domestic wastewater, leaky sewer infrastructure, and [sewer overflows](#), with residues now common throughout the United States.

Emma Rosi-Marshall, one of the paper's authors and an aquatic ecologist at the Cary Institute of Ecosystem Studies in Millbrook, New York explains: "The [bacterial resistance](#) caused by triclosan has real [environmental consequences](#). Not only does it disrupt aquatic life by changing native bacterial communities, but it's linked to the rise of [resistant bacteria](#) that could diminish the usefulness of important antibiotics."

With colleagues from Loyola University and the Illinois Sustainable Technology Center, Rosi-Marshall explored how bacteria living in stream and [river sediments](#) responded to triclosan in both natural and controlled settings. Field studies were conducted at three sites in the Chicago metropolitan region: urban North Shore Channel, suburban West Branch Dupage River, and rural Nippersink Creek.

Urbanization was correlated with a rise in both triclosan concentrations in sediments and the proportion of bottom-dwelling bacteria resistant to triclosan. A woodland creek had the lowest levels of triclosan-resistant bacteria, while a site on the North Shore Channel downstream of 25 combined sewer overflows had the highest levels.

Combined sewers deliver domestic sewage, industrial wastewater, and storm water to a regional treatment plant using a single pipe. Overflows

occur when a pipe's capacity is exceeded, typically due to excessive runoff from high rainfall or snowmelt events. The result: untreated sewage flows directly into rivers and streams.

The research team found that combined sewer overflows that release untreated sewage are a major source of triclosan pollution in Chicago's North Shore Channel. In addition, their findings support past work that indicates sewage treatment plants can effectively remove triclosan from wastewater.

John Kelly of Loyola University Chicago, the paper's senior author, comments, "We detected much lower levels of triclosan at a site downstream of a sewage treatment facility as compared to a site downstream of combined sewer overflows. And we demonstrated a strong link between the presence of triclosan in the environment and the development of triclosan resistant bacteria."

Nearly 800 cities in the United States rely on combined sewer overflows, with the Environmental Protection Agency citing them as a major water pollution concern.

Artificial stream experiments conducted at Loyola University confirmed field findings that triclosan exposure triggers an increase in triclosan-resistant bacteria. In addition to the creation of these resistant bacteria, researchers also found a decrease in the diversity of benthic [bacteria](#) and a shift in the composition of bacterial communities. Most notable were a 6-fold increase in cyanobacteria and a dramatic die-off of algae.

Rosi-Marshall explains how these shifts could impact aquatic life, "Cyanobacteria are less nutritious than algae and can produce toxins. In triclosan-polluted streams and rivers, changes in microbial communities could negatively affect ecological function and animal communities."

The study is the latest in an ongoing effort to better understand the environmental and human health consequences of synthetic antimicrobials. Funding was provided by a grant from the Illinois Sustainable Technology Center.

More information: Triclosan Exposure Increases Triclosan Resistance and Influences Taxonomic Composition of Benthic Bacterial Communities, *Environ. Sci. Technol.*, 2013, 47 (15), pp 8923-8930.
pubs.acs.org/doi/abs/10.1021/es401919k

Provided by Cary Institute of Ecosystem Studies

Citation: Antibacterial products fuel resistant bacteria in streams and rivers (2013, September 19) retrieved 24 April 2024 from <https://phys.org/news/2013-09-antibacterial-products-fuel-resistant-bacteria.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.