

# Harvey samples saddled with antibiotic-resistant genes

July 25 2018

---



Rice University students collect water samples from a flooded Houston home after Hurricane Harvey in 2017. Rice researchers have issued the first report to quantify levels of contamination in floodwaters and sediments deposited by the storm. Credit: Jeff Fitlow/Rice University

Rice University scientists have released the first results of extensive

water sampling in Houston after the epic flooding caused by Hurricane Harvey. They found widespread contamination by *E. coli*, likely the result of overflow from flooded wastewater treatment plants.

The microbial survey showed high levels of *E. coli*, a fecal indicator organism, trapped in homes that still contained stagnant water weeks after the storm, as well as high levels of key genes that indicate [antibiotic resistance](#).

The study led by Rice environmental engineer Lauren Stadler appears in the American Chemical Society journal *Environmental Science & Technology Letters*. A pair of National Science Foundation RAPID grants helped the team collect and analyze samples.

Rice environmental engineers Stadler, Qilin Li and Pedro Alvarez and their students were on the front lines, even before Harvey subsided, to take samples from floodwaters near the overflowing Brays and Buffalo bayous, in public spaces and inside and outside residential homes to compare their microbial content. Samples of stagnant water were taken from homes that had been closed off for more than a week, while others were taken from homes that had floodwater flowing through them.

Early samples from each location carried elevated levels of *E. coli*. But most striking was the fact that sampled water and, later, sediment showed abundant levels of two indicator genes, *sul1* and *intI1*, that mark the presence of [antibiotic-resistant bacteria](#), even weeks after the flood. In particular, samples from floodwaters inside closed homes showed concentrations of *sul1* were 250 times greater and *intI1* 60 times greater in than in bayou samples.

"*Sul1* is a gene that confers resistance to sulfonamide antibiotics," said Stadler, an assistant professor of civil and environmental engineering. "*IntI1* is not an antibiotic-resistant gene, but an integron-integrase gene

that encodes for a system of gene capture and dissemination and can lead to the spread of antibiotic-resistant genes among [bacteria](#). A lot of antibiotic-resistant genes are on or associated with mobile genetic elements like plasmids that can be shared among bacteria.

"We target *intI1* because integrons are often found on mobile genetic elements and indicative of the genetic mobility of a gene," she said.

"They are also often associated with antibiotic resistance, and the abundance of these genes gives us a sense of the potential for horizontal gene transfer among bacteria.

"That matters because while we see these genes in [environmental bacteria](#) all the time, we really worry when pathogenic bacteria acquire resistant [genes](#) from environmental bacteria," Stadler said. "That's when there's an issue—when there's an antibiotic-resistant pathogen. If you're exposed to one of those, that's when you see infections that are really hard to treat."

The immediate takeaway from the study, she said, is that people should take extra care to avoid direct contact with stagnant floodwaters, especially in flooded homes with niches for pathogens to grow.

"Wear protective gear, and don't go in at all if you're immunocompromised or have open wounds," she said.

Stadler's research group is using the experience gained during Harvey to advance development of tools to measure [horizontal gene transfer](#) as it takes place in the environment.

**More information:** Pingfeng Yu et al, Elevated Levels of Pathogenic Indicator Bacteria and Antibiotic Resistance Genes after Hurricane Harvey's Flooding in Houston, *Environmental Science & Technology Letters* (2018). [DOI: 10.1021/acs.estlett.8b00329](https://doi.org/10.1021/acs.estlett.8b00329)

Provided by Rice University

Citation: Harvey samples saddled with antibiotic-resistant genes (2018, July 25) retrieved 25 April 2024 from

<https://phys.org/news/2018-07-harvey-samples-saddled-antibiotic-resistant-genes.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.