

# Research provides guidance to clean plumbing systems in buildings after water contamination

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A new study provides guidance to health officials and drinking water providers on how to decontaminate plumbing systems.

"In the wake of recent chemical spills and algal-toxin contamination events in [drinking water](#), decontamination is a standard step in enabling the affected community to regain safe drinking water access," said Andrew Whelton, an assistant professor in Purdue University's Division of Environmental and Ecological Engineering and Lyles School of Civil Engineering. "Within the last two years alone, communities in the United States and Canada have faced [water contamination](#) caused by chemical spills and [algal toxins](#)."

The study is the first step toward science-based flushing protocols that can be applied to recover from a drinking water contamination incident, he said.

"Communities will benefit from this information if government agencies and drinking water providers embrace and build upon this new knowledge," Whelton said. "Information contained in this study can be immediately implemented to protect the public from harm."

Findings are detailed in a research paper published online this week (Aug. 10) in the Royal Society of Chemistry's journal *Environmental Science: Water Research & Technology*. The paper is authored by

graduate student Karen Casteloos, assistant professor Randi Brazeau of Metropolitan State University of Denver, and Whelton.

The study builds on previous work conducted by Whelton's university research team, which in January 2014 responded to the Elk River Chemical Spill in West Virginia. Initially unfunded, his team was later supported by a National Science Foundation RAPID grant and was called in by West Virginia's governor to assist the state.

"Flushing guidance issued during past incidents lacked one or more important considerations," Whelton said. "This resulted in some cases of illness. In the new study, we review these and other deficiencies, outline research needs, and describe which factors officials should consider in plumbing system decontamination."

Some of these factors include protecting building inhabitants from chemical exposure while flushing, avoiding damage to sanitary sewer and septic systems, as well as designing an approach that removes the entire volume of contaminated water from the service line, indoor plumbing pipes and water heater. The research addresses differences in flushing durations required depending on system designs and recommends additional research to answer a variety of remaining questions.

Research by Whelton's team is ongoing and includes work related to nontoxic plumbing system decontamination aids, chemical toxicity testing of the spilled chemicals and methods to predict indoor air contamination risks. Much of the research was inspired by his team's first-hand experience responding to the chemical spill caused by Freedom Industries Inc. in West Virginia. The Purdue researchers also are constructing a new building plumbing testing facility.

"This one-of-a-kind facility will enable us to recreate field conditions,

test our models and decontamination technologies, and also identify problematic situations that render infrastructure unrecoverable," Whelton said. "We have several organizations interested in this capability and are actively seeking additional partners."

Measures to flush [plumbing systems](#) differ according to the design. For example, systems containing the largest water heaters require longer flushing to rid contaminants, said Casteloes, who has developed a water heater flushing model to help provide guidance.

"People can use the model now to inform their plumbing system decontamination decisions," Whelton said.

The research paper concerns only organic chemicals, but the group emphasizes the need for similar efforts to consider biological contaminants such as E.coli, Legionella, and Naegleria Fowleri, a deadly brain-eating amoeba found recently in public [water](#) supplies.

**More information:** "Decontaminating Chemically Contaminated Residential Premise Plumbing Systems by Flushing." *Environ. Sci.: Water Res. Technol.*, 2015, [DOI: 10.1039/C5EW00118H](https://doi.org/10.1039/C5EW00118H)

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