

Drinking water odors, chemicals above health standards caused by 'green building' plumbing

October 21 2014, by Emil Venere



Andrew Whelton, an assistant professor of civil engineering in Purdue's Lyles School of Civil Engineering and Division of Environmental and Ecological Engineering, is leading research into the effects plastic pipes have on drinking water in eco-friendly green buildings in the United States. Credit: John Underwood

Several types of plastic pipes in eco-friendly green buildings in the

United States have been found to leach chemicals into drinking water that can cause odors and sometimes exist at levels that may exceed health standards.

Buildings are being plumbed with many types of plastic drinking water [pipes](#). These include crosslinked polyethylene (PEX), high-density polyethylene (HDPE), polyvinylchloride (PVC), chlorinated PVC (cPVC) and polypropylene (PP) pipes, said Andrew Whelton, an assistant professor of [civil engineering](#) in Purdue University's Lyles School of Civil Engineering and Division of Environmental and Ecological Engineering.

Plastic pipes are generally less expensive, lighter and easier to install than metal pipes. A 2012 comparison showed PEX pipe was the least expensive among plastic pipes, costing 43 cents per foot compared to the most expensive metal, copper pipe, at \$2.55 per foot.

Thousands of dollars can be saved during construction by installing plastic instead of metal plumbing systems, and proponents assert plastic pipes require less energy to manufacture - generating less carbon dioxide compared to metal pipes - ostensibly making them a good fit for green buildings.

"Little is known about the degree to which plastic pipes sold in the U.S. affect drinking water quality," Whelton said.

He will detail research findings in a presentation during the 2014 U.S. Green Building Council's Greenbuild International Conference & Exposition on Friday (Oct. 24) in New Orleans with Rebecca Bryant, managing principal of Watershed LLC of Fairhope, Alabama. Some testing results were published online in September in the journal *Water Research*. There, the researchers describe drinking water impacts caused by six brands of PEX pipes available in the United States.

In the September study, drinking water was tested from a PEX plumbing system in a "net-zero energy" building in Maryland six months after the system had been installed. The testing revealed the presence of 11 chemicals that were PEX pipe ingredients and ingredient degradation products. Research with PEX pipes in the laboratory also showed that six brands caused drinking water to exceed the U.S. Environmental Protection Agency's maximum recommended drinking water odor limit, Whelton said. The U.S. EPA's maximum drinking water odor limit is a "threshold odor number" of 3, or 3 TON. Compliance is voluntary because the standard is based on aesthetic - not health - considerations.

Odor and chemical levels were monitored with and without chlorine treatment over a 30-day period for the six pipe brands. Chlorine, the most popular disinfectant chemical used in the United States, protects drinking water from disease-causing organisms as it travels to the tap. When chlorine reacted with chemicals leached by the [plastic pipes](#), odor levels for one brand of PEX pipe tripled. While the total mass of chemicals leached by PEX pipes was found to decline after 30 days of testing, odors generally continued as the pipes aged, Whelton said.

A general assumption in the United States is that chemicals responsible for drinking water odors pose no health dangers. Although, several chemicals found in the plumbing research have regulated health limits, and one PEX pipe brand caused drinking water to exceed the ethyl-tert-butyl ether (ETBE) drinking water health standard. ETBE is a PEX pipe manufacturing byproduct with drinking water standards in New Hampshire and New York state.

When establishing the ETBE limit in New Hampshire, public health officials specifically added a 10-fold reduction to allow for its suspected carcinogenic potential. However, no federal drinking water standard exists, Whelton said.

The researchers found ETBE drinking water levels as high as 175 parts per billion (ppb) during the first three days of PEX pipe use and then 74 ppb after 30 days of use when the testing ended. New Hampshire has the most stringent drinking water health standard of 40 ppb. Michigan also has an ETBE standard, but it is based on limiting drinking water odor caused by ETBE.

The presence of drinking water odor can prompt homeowners to avoid their [drinking water](#) altogether.

"A contractor who installed PEX in parts of a million-dollar home in Oklahoma asked us for help because the homeowners reported gasoline-like odors in a bathroom's tap water," Whelton said. "The homeowners refused to take showers in the PEX-plumbed bathroom because they were concerned about their health."

By testing tap water from the home, Whelton's team discovered that toluene, a solvent used for plastic resin synthesis and ETBE were present above levels where odors would be detected. Neither toluene nor ETBE exceeded health standards, however. The gasoline smelling water was safe to use.

More information: "Release of drinking water contaminants and odor impacts caused by green building cross-linked polyethylene (PEX) plumbing systems." *Water Res.* 2014 Sep 10;67C:19-32. [DOI: 10.1016/j.watres.2014.08.051](#) . [Epub ahead of print]

Provided by Purdue University

Citation: Drinking water odors, chemicals above health standards caused by 'green building' plumbing (2014, October 21) retrieved 11 May 2024 from <https://phys.org/news/2014-10-odors->

[chemicals-health-standards-green.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.