

## Podcast transcript: Reducing Exposure to Disinfection Byproducts in Drinking Water

[Theme music]

**Ashley Ahearn (Narrator):** You're listening to Environmental Health Chat – a show from the National Institute of Environmental Health Sciences that explores the connections between our health and our world.

I'm Ashley Ahearn.

[Music fades out]

Millions of Americans drink water that is disinfected with chlorine compounds. The compounds kill bacteria, germs, and viruses in drinking water supplies that can make people sick.

Using chlorine to treat water before people consume it is critical to protecting public health, says Dr. Anna Goodman Hoover.

**Anna Goodman Hoover (AH):** It's extremely common and it's extremely necessary.

**AA:** Dr. Hoover is an assistant professor in the Department of Epidemiology and Environmental Health at the University of Kentucky College of Public Health.

**AH:** So, you have issues like cholera, you have issues like typhoid, there are all kinds of reasons we need to treat the water. We put the chlorine in to clean out those kinds of infectious diseases that might otherwise cause us serious problems.

**AA:** There's just one small problem: the chlorine compounds that protect us from waterborne illnesses can interact with organic matter naturally found in water. This interaction creates compounds called disinfection byproducts, which can pose health risks.

**AH:** You might have heard about things like trihalomethane or haloacetic acids – they are byproducts of this process. And it occurs when this organic matter, it could be leaves or other things in the environment, just interact with chlorine and we end up with disinfection byproducts.

**AA:** Organic matter can get into a water system in a number of different ways. Aging pipes can crack or leak, allowing soil, plant, or fecal matter to infiltrate. Water that comes from rivers as opposed to deeper aquifers can also have higher levels of organic matter.

Long-term exposure to disinfection byproducts has been linked with health problems like bladder cancer, liver damage, and decreased nervous system activity.

Disinfection byproducts are regulated by the U.S. Environmental Protection Agency and water utilities must notify people if concentrations exceed certain levels. Dr. Hoover says that these exceedances occur all over the country but in her neck of the woods – Eastern Kentucky – people had been getting notices from their water utilities for some time...

**AH:** Which of course leads to concern when you see the same exceedance month after month after month. So, the folks in the community were very concerned about this.

**AA:** Now, I want to back up here for just a minute because when Dr. Hoover says people in this part of Appalachia – Martin and Letcher Counties in eastern Kentucky, to be more specific – are concerned about their drinking water... there's some historical context for that concern.

**AH:** There was a coal slurry spill around 2000. And it was one of the largest environmental disasters at that point in this part of the world.

**AA:** More than 300 million gallons of polluted water from a coal mining operation spilled into the local water supply.

**AH:** And the types of communication and the types of engagement that occurred afterward did not necessarily support a lot of trust. So once that kernel of distrust is sown, it can really sprout quite quickly and become very difficult to weed out.

**AA:** Now, more than 20 years after the spill, that lack of trust persists. A pilot study conducted by University of Kentucky and community partners found that more than 80% of the people in Martin County drink bottled water, 44% won't even cook with water from their tap.

**AH:** That is an indication of where trust is, to some extent. And thereafter, folks started asking more and more questions about the safety of their water.

**AA:** Nina McCoy was one of the people asking questions about the water in her community.

**Nina McCoy (NM):** So, from that time I became interested in is our water safe? And I just never really got a good answer to that question.

**AA:** Nina is the head of a group called Martin County Concerned Citizens.

She and others asked the government for information about what was in their water. They were worried about arsenic and other toxic pollution from coal.

So, the NIEHS funded a pilot study. And Nina helped connect community members with the researchers.

**NM:** And so, we actually did a pilot study in 2019 that tested homes. I think we did 97 homes across the county – and they were high in disinfection byproducts in 35%.

**AA:** The pilot study didn't find evidence of pollutants from coal. It found disinfection byproducts from the chlorination process needed to make drinking water safe.

**NM:** There were things called trihalomethanes and haloacetic acids that were high, and these over long-term exposure could cause cancer, kidney damage, liver damage.

**AA:** Folks in the community were alarmed. And Nina says that for a long time they weren't getting the answers they wanted about the quality of their drinking water. There was a sense that the extractive industries working in their region, and the governmental agencies responsible for keeping people safe, were dropping the ball.

Dr. Anna Hoover understands that. She's from Tennessee coal country.

**AH:** I think of myself as Appalachian first and everything else second. I grew up in a part of the country where we had a lot of strip mining, a lot of potential environmental exposures...we just had a history of folks from other places who came in to benefit from our amazing natural resources and then leave. And it's something that stays with you.

**AA:** Dr. Hoover sees her science as a way to rebuild lost trust.

She and her co-investigator, Dr. Jason Unrine at the University of Kentucky, are co-leading a NIEHS-funded project that is designed to engage community members around informing and protecting people from disinfection byproducts in their drinking water.

It starts with a Stakeholder Consultation Core that brings together local folks and people from state agencies and water utilities...

**AH:** ...so we can see all the different sides of the problem, and then see all the different sides of the potential solution space. They are really helping guide the project as a whole, but with a laser focus on a lot of the communication pieces.

**AA:** Engaging citizens in the science is another key part of the project. That's where Nina McCoy with Martin County Concerned Citizens comes in. She and other community partners are helping Dr. Hoover and Dr. Unrine connect with and train local residents to collect water samples from their homes each month.

**NM:** I think this type of research is an excellent way of trying to build trust within a community. Because when the community is involved in this study, and not just someone dropping in from a university somewhere, but you actually have the community involved – I think that you're going to get more trust in what's going on. These different citizen scientists are going to be involved in getting the work done, and I think they'll pay more attention to the results that we get.

**AA:** The data will be helpful to Dr. Hoover and Dr. Unrine as they try to model the changing levels and locations of disinfection byproducts in the public water system. The goal is to share data that will help water utilities identify where pipes may be failing and allowing contamination from organic matter – like leaf debris, algae, or animal fecal matter – to get into the system and contribute to elevated levels of disinfection byproducts.

Their models could even help predict conditions that contribute to higher levels of disinfection byproducts in the drinking water – like changing weather patterns or water sources, for example – and that could help utilities change their chlorination practices accordingly.

Dr. Hoover has always been passionate about risk communication when it comes to her research. The project has prioritized finding the best way to communicate their results with the community in a way that informs people without causing unnecessary alarm.

**AH:** There are so many components that we have to be very deliberate in thinking through how to present this in a way that is accessible and understandable for each of the stakeholder groups.

**AA:** In the past, the researchers have done Facebook live events and Zoom presentations. They've also distributed pamphlets and flyers at community gathering spots.

They want people to know what they can do to protect themselves from disinfection byproducts. Dr. Hoover advises drinking filtered or bottled water if disinfection byproducts are frequently present at elevated levels in the water supply. She also says that steam from the shower can be a source of exposure to disinfection byproducts so it's a good idea to open a window in the bathroom and keep a ventilation fan running. She also advises people to check their utility bills and be on the lookout for frequent or recurring alerts about the presence of disinfection byproducts in their water supply.

**AH:** So, it really is a multi-level approach to help answer individuals' questions about the quality and safety of their water in relation to disinfection byproducts, where they might be getting exposed, and then to help solve it at both the individual and the system level.

**AA:** Dr. Hoover says this project gives her region the chance to be a leader in solving problems relating to disinfection byproducts. It's also a chance to rebuild trust between the community and governmental agencies and scientists.

At the end of the day, she wants her science to empower folks in Appalachia to build a safer future.

**AH:** I heard a saying that the tools needed to solve problems are in the communities themselves. But they need the information. They need the information to be able to implement those tools. So that's what I believe we have to do as environmental health scientists. We have to give back to the communities, we have to respect their competing risks that they face and respect the values that they are trying to balance as they work to solve real environmental challenges.

**[Music comes up]**

**AA:** I'm Ashley Ahearn. Thanks for listening to Environmental Health Chat.