

Cloudy water linked to gastrointestinal illnesses: Suspended particles give germs a place to hide

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Credit: George Hodan/public domain

Cloudy drinking water, even if it's within the limits allowed by some cities, was linked to increased cases of gastrointestinal illness, according

to new Drexel University analysis.

In reviewing past studies from cities across North America and Europe, Anneclaire De Roos, PhD, associate professor in the Dornsife School of Public Health, found associations between acute gastrointestinal illness (AGI) and [water](#) turbidity, a term meaning cloudiness or opacity.

"More than 10 studies found a link between water turbidity and AGI incidence," De Roos said. "These results suggest that exposures through [drinking water](#) caused a low but detectable number of AGI cases in the regions and time periods studied. There is no clear, alternative explanation for the patterns of associations—particularly when a similar pattern was seen multiple times."

Acute gastrointestinal illness could be caused by waterborne pathogens like norovirus, *Giardia*, or *Cryptosporidium* and carry symptoms like diarrhea and vomiting. Cases linked to water systems have been estimated at between 12 and 16.4 million annually in the United States alone.

Since cloudiness in water is caused by material floating in it, the thought is that undissolved particles may actually provide some protection for harmful pathogens against disinfectants. Additionally, cloudiness could be evidence of runoff into water sources, which could contain not just sediment but also harmful pathogens.

To get a better idea of whether turbidity could be a good indicator of issues with pathogens in drinking water supplies, De Roos and her collaborators looked into a collection of studies that had been done on the topic. These studies were designed to evaluate risks from contamination of source waters (usually rivers in the cities studied), before the water entered cities' distribution systems. The basic strategy of the studies was to correlate turbidity levels with the number of people

coming down with AGI, on a day-by-day basis.

De Roos found that turbidity of drinking water was linked to increased AGI in multiple studies, and not just when there was increased cloudiness.

"As expected, the association between turbidity and AGI was found in cities with relatively high turbidity levels, often in unfiltered drinking water supplies," De Roos said. "The findings that go against the conventional wisdom are the associations between turbidity and AGI that were seen at very low levels of turbidity—levels lower than the regulatory limits."

For example, one city that was studied was Philadelphia, where an association between drinking water turbidity and AGI in children and the elderly had been reported. Turbidity in these studies in the 1990s was actually fairly low, by standards both then and now.

Since there were some differences between the studies in the levels of turbidity that were linked with AGI, De Roos said it is "important to understand the reasons for those differences." That means future research should focus on the specific conditions under which turbidity leads to AGI.

"For example, given a similar range of turbidity, is the association with AGI restricted to a certain season or certain climatic conditions, such as periods of heavy rainfall?" De Roos said. "Furthermore, does the association disappear if a different treatment method is used—like UV disinfection versus chlorination alone?"

If links are found under specific conditions, then water utilities could better monitor their data to identify periods of vulnerability for contamination.

"While these types of epidemiologic studies can't give definitive answers, they offer a relatively inexpensive tool for screening water supplies in order to prioritize management strategies and further research," De Roos said.

The study is published in the *Environmental Health Perspectives*.

More information: *Environmental Health Perspectives*, [DOI: 10.1289/EHP1090](https://doi.org/10.1289/EHP1090)

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