

Q&A: The critical need to address chemical contamination in drinking water

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A [Special Issue](#) of the *Journal of Exposure Science & Environmental Epidemiology* co-edited by Yale School of Public Health Associate Professor Dr. Nicole Deziel, Ph.D., presents the latest research on

exposure, health, and justice issues surrounding chemical contamination in drinking water. This Special Issue includes 17 articles authored by experts from around the globe and across multiple disciplines including environmental engineering, hydrology, exposure science, epidemiology, toxicology, and climate science.

Many of the papers emerged from an international symposium organized by Dr. Deziel and Associate Research Professor Dr. Cristina Villanueva, Ph.D., a [drinking](#) water expert with ISGlobal, and co-editor of the Special Issue. The symposium was held in Barcelona and virtually in September 2022 while Dr. Deziel was in residence on sabbatical. Dr. Deziel discussed the focus of the Special Issue in a recent online interview.

What are the specific concerns regarding human exposure to chemical contaminants in drinking water?

Populations worldwide are exposed to a myriad of chemicals via drinking water, yet only a handful of chemicals have been thoroughly evaluated with regard to human exposures and [health](#). Furthermore, there are only federal drinking water standards for approximately 100 different chemicals.

Some of the existing standards have not been updated for quite some time and there is concern that exposures to chemicals at concentrations below current standards could still be associated with an increased risk of health effects, such as birth defects and cancers. In addition, there are many emerging chemicals in drinking water (e.g., microplastics, 1,4-dioxane) that are unregulated.

Lastly, we must consider the issue of water scarcity and climate change.

As the world's temperature rises, we are already seeing available public water supplies starting to dry up, resulting in an increase in desalination efforts in some areas and the use of treated wastewater in others to meet demand. Overall, we have limited knowledge of how climate events will affect the quality of drinking water, and the need for more research is discussed in the Special Issue.

How is science responding to these concerns?

This Special Issue showcases some of the innovative new research and technologies scientists have come up with to improve chemical surveillance in drinking water and better evaluate the possible health effects attributable to contamination. This includes better methods for monitoring and evaluating [water supplies](#), improved biological assays, and novel methods for detecting harmful particulates in drinking water. We expect that these new studies will help inform regulations, encourage development of new methods and tools for assessing exposure to drinking water contaminants, and identify important issues pertaining to equity and environmental justice.

What are some of the challenges and opportunities in conducting research in this important area of public health?

Many chemicals are generally "invisible" in that they do not alter the color or odor of drinking water, and many of the associated effects are not observable for decades, making our ability to identify links between exposure and disease challenging. In addition, current tools and techniques for evaluating drinking water related exposures are limited and lag behind what is available for other environmental contaminants such as air pollution. So, there is definitely a need for additional and better data. Also, despite water contaminants often occurring in

mixtures, most of the existing evaluations and related policies and regulations focus on individual chemicals without consideration of potential interactions between chemicals.

There is also an equity issue. Approximately 15% of Americans rely on domestic (private) wells for home drinking water. These are not covered by federal regulation, and the responsibility for testing or treating the well water falls on the property owner. Because private wells are not subject to regular monitoring or testing, water quality data in more rural areas are limited.

Public drinking supplies also present risks. One study featured in this Special Issue found that 2.6 million people in the U.S. are relying on water systems where average fluoride concentrations exceed World Health Organization guidance limits. A separate study found that manganese in drinking water frequently exceeds U.S. guidelines, so there is lots to be concerned about, especially in regard to how these concentrations may impact vulnerable populations such as children.

As for the opportunities that lie before us, this Special Issue provides a framework for what needs to be done to address this critical public health concern. We need coordinated efforts to generate new health data for emerging contaminants. We need to strengthen drinking water standards and treatment technologies. We need to collect and disseminate more drinking water quality data, and we need to upgrade our drinking water infrastructure.

Provided by Yale University

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