HOWARD WEINBERG

PHOTO BY LINDA KASTLEMAN

IDENTIFYING PRACTICES TO KEEP NC'S DRINKING WATER SAFE

Even in a country as developed as the U.S., the purity of drinking water is vulnerable to climate changes, major storm systems and the consequences of human behavior. Now, a new trend has fueled national and local discussions about the best ways to protect this vital resource – the introduction of industrial, agricultural and pharmaceutical chemicals into our water supply.

Weinberg, left, meets with students in his lab.

"We are talking about trace levels of pollutants – barely detectable, using current methods – but there can be fluctuations in these levels, for example, when we have heavy rains," says Howard Weinberg, PhD, associate professor in the Gillings School's Department of Environmental Sciences and Engineering.

While health effects of these contaminants are still unknown, Weinberg says their very presence underscores a need to identify which chemicals are in our water and what steps can be taken to keep drinking water safe.

Water resources and treatment managers in North Carolina seem to agree. Trying to stay ahead of the curve, a consortium of utilities across the state contacted Weinberg for his expertise in tracking the source and fate of pollutants in surface water.

In a recent study, he and his research team tested the effectiveness of four different treatment processes in removing a wide range of human-made chemicals from surface waters. They found that treatments most often used to keep particles, bacteria and color out of drinking water are ineffective in removing chemicals found in pharmaceutical drugs, personal care products, pesticides, flame retardants and other substances.

Most municipal treatment plants prepare drinking water using a combination of chemicals, mixing and filtration. When researchers used a specially formulated carbon, they were able to determine whether most pollutants were removed or decreased to undetectable levels. In some cases, they found that the disinfectant chemicals reacted with pollutants, converting them into forms that previously had avoided detection.

"Clearly, watershed protection is the first barrier," Weinberg says, "but at

> It's an inglorious reflection of our lifestyle that our waterways shine back upon us – pharmaceutical products, caffeine, detergents, sunscreen, insect repellents and who-knows-what from fracking and other industrial processes.
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> —HOWARD WEINBERG, PHD

WEINBERG AND NC'S ENVIRONMENTAL HEALTH SUMMIT

Weinberg has collaborated with researchers at The University of North Carolina at Chapel Hill, Duke University, N.C. State University, RTI International and many utility partners to study environmental issues in the state, including how to protect the safety of North Carolina's drinking water.

In November 2008, Weinberg was one of the group leaders of North Carolina's Environmental Health Summit, which explored issues associated with the presence of pharmaceuticals in water. More than 150 attendees from government organizations, academia, industry, water utilities and public interest groups discussed how to evaluate current knowledge on the topic and identify research gaps and innovative recommendations.

A report on the meeting, published in *Environmental Health Perspectives* in 2010, is available online at *tinyurl.com/NC-envr-health-summit.*

least treatment plants now have an option for protecting consumers. Activated carbon can be used to filter water at the plant."

The carbon treatment is costly, possibly prohibitively so, both for smaller municipalities – which often are downstream from larger cities' treated effluent discharges – and for communities whose members rely on wells, which might be contaminated by failed septic systems. Many small towns in North Carolina might be affected.

"We have the technology to protect consumers from exposure to many pollutant chemicals in drinking water," Weinberg says. "But it comes at a cost – either at the front end, from manufacturing, use and disposal, or at the last barrier, in the treatment plant and at the consumer's tap."

The good news, according to Weinberg, is that by working collaboratively and leveraging resources available at the Gillings School, many of the challenges can be addressed holistically now.

THE WATER INSTITUTE AT UNC

Led by Dr. Jamie Bartram, the Institute draws 500 participants from 47 countries to its annual fall conference.

waterinstitute.unc.edu

WHAT'S IN THE WATER, EXACTLY?

Detergents and soaps – some of which have ingredients that disrupt the endocrine system – often are found in domestic waste waters and septic tanks. If a septic tank leaks, these ingredients may reach groundwater, a source for drinking water. Other chemicals found in surface waters that are taken into drinking water plants include atrazine (herbicide), DEET (insecticide), caffeine (stimulant), flame retardants, pharmaceuticals and more.

At one time, people were directed to flush unused medications to prevent misuse by others, especially children. That advice has changed. It may help protect water supplies to have designated days during which people return unneeded drugs to a central authority for safe disposal. This may be only part of the solution, however, since most of the trace amounts of pharmaceuticals in the water are introduced through human or animal waste.

Gregory Characklis, PhD, professor of environmental sciences and engineering at the Gillings School and director of UNC's Center for Watershed Science and Management, says Weinberg's research is important if we are to identify ways to treat water sources once contaminants are detected. The larger question is whether we should invest in keeping these contaminants out of the environment in the first place.

"As a rule of thumb, it is usually less costly to prevent problems," Characklis says, "but this is a complicated question. One of the first steps is to figure out what exactly is in the water."

Experts at UNC and beyond agree that many measures are needed. These may include improved watershed protection measures, indicators of wastewater pollution in the source water, effective treatment technology, stricter regulations, consumer education and/or changes in manufacturing processes.

—Amanda Crowe