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Guest Blog

Commentary invited by editors of Scientific American

Emerging Contaminants Taint Drinking Water Supply

By [Rob Herman](#) | May 7, 2014 | 3

The views expressed are those of the author and are not necessarily those of Scientific American.

This week is [Drinking Water Week](#); a week where water professionals like myself and communities throughout the country recognize the vital role water plays. As I work with other drinking water professionals to develop new drinking water test methods, we are finding that many folks are aware of traditional water contaminants, such as lead and arsenic, but there are questions around emerging contaminants.

[Emerging contaminants](#) are chemicals that have been detected in global drinking water supplies at trace levels and for which the risk to human health is not yet known. They include pharmaceuticals,

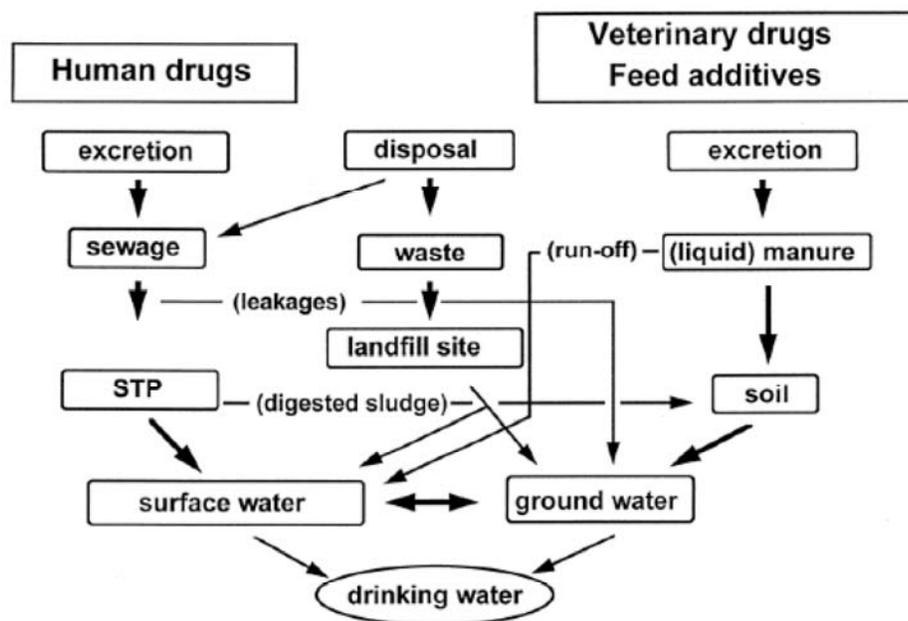


personal care products,
pesticides, herbicides
and endocrine
disrupting compounds.

While these contaminants have been present in our drinking water for as long as people have been using them, advances in analytical technology and instrumentation have only recently made it possible to detect them. More recently the presence of these contaminants, even at trace levels, has [raised questions](#) among drinking water regulators, governments and suppliers, and this has affected the public's acceptance and perception of drinking water quality.

How pharmaceuticals and other contaminants enter the water supply

A Mayo Clinic [study](#) from last year found that 70 percent of Americans now take prescription drugs compared to 48 percent five years ago. According to the [World Health Organization](#), pharmaceuticals can enter the environment in multiple ways (see figure below) most commonly from household septic systems or wastewater treatment plants.



Source: World Health Organization

The pharmaceuticals we take are not completely absorbed by our bodies and enter wastewater during excretion. They can also [accidentally enter the water supply](#) during manufacturing, handling, storage or use or be purposefully discarded, either unused or as a residual in packaging.

The Office of National Drug Control Policy [recommends](#) not flushing prescription drugs down the toilet, as wastewater treatment plants do not currently treat for many pharmaceuticals and anything flushed down the toilet or dumped into a sewer could

make its way into drinking water sources. By [maintaining home wastewater systems](#) and not using the toilet as a disposal method, we can reduce the chance that these impurities will end up our drinking water supplies.

Personal care products such as soaps and detergents enter the water supply as a result of bathing and washing clothing and dishes. Pesticides and herbicides [enter the waste stream](#) as run-off from agriculture production and home use.

How to filter out emerging compounds

Most municipal water treatment systems and home septic systems are not able to effectively remove emerging contaminants. In fact, while many water treatment products are certified to [American National Standards](#) that evaluate how well they reduce potential contaminants in drinking water, these standards did not address emerging compounds until recently.



Andrew Magill via Flickr

My [NSF International](#) colleagues are working with drinking water regulators and industry experts to finalize NSF Standard 401: *Drinking Water Treatment Units – Emerging Compounds/Incidental Contaminants*. The draft standard addresses the effectiveness of water filtration products in removing a variety of emerging compounds and contaminants, including BPA, meprobamate, phenytoin, atenolol,

carbamazepine, TCEP, TCPP, DEET, metolachlor, trimethoprim, ibuprofen, naproxen, estrone, linuron and nonylphenol. The ultimate goal is for consumers to be able to look at the water filter packaging to see if a water filtration product is certified against this standard once finalized.

In addition to the compounds above, the U.S. Environmental Protection Agency is [taking action](#) to address broader categories of pharmaceuticals and personal care products in water. It aims to improve scientific and public understanding of the issue, identify partnership and stewardship opportunities, and take regulatory action when appropriate. We are also working with the EPA to conduct more research to help understand whether the very low levels of pharmaceuticals detected in drinking water present a risk to human health.

Future research opportunities

Currently very limited information is available regarding exposures to and the health effects attributed to trace levels of emerging contaminants in global drinking water supplies. The general consensus in the scientific community is that the available data

on these emerging contaminants is not yet sufficient enough to adequately address potential health effects at the trace levels found in drinking water.

Scientists and regulators support ongoing research to better measure and document the occurrence of emerging contaminants in drinking water, as well as reducing opportunities for human exposure through education on the proper handling and disposal of many emerging contaminants. However, especially as it relates to pharmaceuticals, it is [the position of the World Health Organization](#) that concerns over and measures to address trace levels of these contaminants not divert the attention of regulators and water suppliers away from waterborne pathogens and other well-established chemicals of great public health significance, such as lead and arsenic.

Future research will help us better understand emerging contaminants and their ultimate impact on human health so we can celebrate even more progress during next year's Drinking Water Week.

Additional resources for consumers on drinking water

[Consumer Confidence Reports](#) (CCRs) are issued annually by water utilities in the United States. These reports provide the public with information about the quality of their drinking water, including the source and levels of any regulated contaminants, such as lead and arsenic, but they currently do not list many emerging compounds such as pharmaceuticals or personal care products, which are not currently regulated in drinking water.

[Home drinking water – quality and treatment](#): Because water quality can vary depending on where you live, it's important to know where your drinking water supply comes from and if it contains any impurities that could pose a health risk.

[How to treat for specific contaminants](#): All sources of drinking water can contain some contaminants. At low levels, most of these contaminants are not considered to be harmful by agencies such as the U.S. Environmental Protection Agency, Health Canada or World Health Organization. Some contaminants are naturally occurring in the environment, including radon, radium and arsenic. People, animals and industry can also add contaminants to our water supplies.



About the Author: Rob Herman, Director of NSF International's Headquarter Laboratories, has over 29 years of experience in laboratory testing protocols and the water treatment industry. NSF International has developed a draft standard which establishes requirements for drinking water treatment systems designed to reduce emerging compounds in public or private water supplies, such as pharmaceuticals, personal care products, and endocrine disrupting compounds. Requirements address material, design and construction, performance, product literature and labeling.

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3 Comments

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1. pabelmont

4:15 pm 05/7/2014

The picture of emerging contaminants doesn't seem to include industrial effluents, animal wastes from industrial animal husbandry (factory farming), or injectants used in fracking.

"People, animals and industry can also add contaminants to our water supplies." — doesn't quite cover it.

Are these also being looked t?

2. Lacota

8:53 pm 05/7/2014

I'm sure those that contaminate our ground water will be happy to sell us drinking water when there are no more pure aquifers left.

3. RobHerman

12:12 pm 05/8/2014

@Pabelmont: I think you bring up a good point. The exact source of the emerging contaminants is more difficult to identify than whether contaminants of concern are present in the finished drinking water. We could not cover all possible routes of contamination in the Scientific American article, but we focused on sources that readers could directly impact by their actions. Both aspects of emerging contaminants warrant further study: what is present in our water supplies as well as the source of those contaminants.