

Drugs in the Drinking Water? Don't Ask and Officials Won't Tell

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The lead crisis in Flint, Mich. has drawn national attention to deadly and often underreported risks in the public water supply. Thanks to the chemical, agricultural and pharmaceutical industries, and antiquated water systems, Americans are imbibing a witch's brew of drugs and chemicals often without realizing it.

These contaminants get into the water through human drug waste in sewage, medicines flushed down toilets, agricultural runoff and the wide use of endocrine disruptors like pesticides, flame retardants and plastic-related compounds like phthalates and BPA. (BPA has ironically been used in bottled water that people drink to *avoid* tap water risks!)

When it comes to pharmaceuticals in the water supply, both drug industry and water treatment professionals say traces are so small they probably pose no public health risk. Yet they *also* admit that testing has begun so recently that no one really knows the long-term effects.

"There's no doubt about it, pharmaceuticals are being detected in the environment and there is genuine concern that these compounds, in the small concentrations that they're at, could be causing impacts to human health or to aquatic organisms," noted Mary Buzby, director of environmental technology for Merck.

Free—and unwanted—drugs in the drinking water

The sheer number of Americans taking drugs is one reason drugs in the water are a problem—60 percent of Americans now take prescription drugs. Direct-to-consumer drug (DTC) advertising has convinced millions of Americans to take statins, acid reflux medicines and assorted psychoactive medicines. Before DTC ads, the drugs were not nearly as popular. CNN reports that an astounding one fourth of U.S. women are now on antidepressants.

As early as 1999, a U.S. Geological Survey found “antibiotics, antidepressants, blood thinners, heart medications (ACE inhibitors, calcium-channel blockers, digoxin), hormones (estrogen, progesterone, testosterone), and painkillers,” in the waterways reported Harvard researchers. Other studies found caffeine and the fragrance chemicals galaxolide and tonalide, they write.

The problem has only grown worse. By 2008, the Associated Press reported that 46 million Americans were drinking water containing psychiatric, cholesterol, asthma, epilepsy, heart and pain drugs as well as antibiotics.

Among the AP’s findings:

- Epilepsy and anxiety drugs in Southern California water used by 18.5 million people
- Heart and epilepsy drugs in Northern New Jersey water used by 850,000 people
- An antibiotic in Tucson drinking water
- A sex hormone in San Francisco drinking water.

In 2013, an EPA study confirmed the serious situation, finding that at least half of all water samples tested positive for some of 25 drugs.

The EPA found:

- Opioids, acid reflux and congestive heart failure drugs were common
- Over-the-counter drugs like Tylenol and ibuprofen were common
- The highest residues were high blood pressure drugs

Government appears clueless

It is not clear that decisive government action followed the reports. In fact, drugs in the drinking water system seem to be governed by a “don’t ask/don’t tell” policy.

For example, New Orleans water department officials reported that the city’s water had not been tested for drugs at the same time that Tulane University researchers in New Orleans found the pain reliever naproxen, the sex hormone estrone and a cholesterol drug byproduct in treated water.

Whom should we believe? According to journalist Dawn Fallik:

“No one seems to know which compounds need to be removed or how to remove them from the water safely. And no one seems to know which government agency should step forward and take action.”

The problem is compounded, Fallik says, by the fact that EPA monitors only about 10 drugs as “contaminant candidates” and no safety levels or required testing exist for other drugs. (The government does test for naturally occurring microorganisms like cryptosporidium and coliform

bacteria, barium, copper, lead and other metals and herbicides such as atrazine.)

As we saw in Flint, a water crisis endangers entire communities and provokes huge public distrust in municipal officials. "It's a hard topic to talk about without creating fear in the general public," admitted a Water Research Foundation spokesman to the Associated Press.

Aren't drugs filtered out?

According to the World Health Organization (WHO) drugs behave no differently than other organic chemicals with "removal rates depending on their physicochemical properties and the treatment technology being used." Chlorination, can remove approximately 50 of drugs, says WHO. Ozonation, advanced oxidation, activated carbon, nanofiltration and reverse osmosis achieve better clearance.

But other sources like Radio Canada and Michael Thomas, an associate professor of bioinformatics at Idaho State University, disagree. They say the drugs just fly through sewage treatment plants without being treated at all (perhaps like the micro plastic beads in personal care products).

No one disputes that wastewater treatment plants were never built to treat drugs, and that a drug can be biologically active at low concentrations even if most of it is removed. Moreover, when drugs are removed from the water, they are not "gone;" they become biosolids and sludge on which food might be grown. Farm crops, for example, were found to contain antibiotics which had siphoned up from manure.

Meanwhile, neither bottled water or home filtration systems are the clear solution. In 2009, Food and Water Watch found almost half of bottled water came from municipal taps. And Shane Snyder, co-director at the Arizona Laboratory for Emerging Contaminants at the University of Arizona, warns that oxidizing chemicals in home filtration systems can actually "make water more toxic."

Fish on hormones

Like canaries in the coal mine, the first signs of drug effects from the water often manifest in the fish. As early as 2003, scientists began finding egg cell precursors on male smallmouth bass testes which they attributed to endocrine disrupters. By 2014, an astounding 100 percent of male smallmouth bass in some polluted sites were "intersex"—male fish that produce eggs. The same intersex phenomenon has been widely reported with amphibians.

Human drugs also contribute to the fish hormonal mutations. In 2011, after French anglers spotted abnormal fish, a study of wild gudgeon near a Sanofi plant making steroids found an average of 60 percent of tested fish had both male and female sexual characteristics. Fish near drug manufacturing plants in the U.S., United Kingdom, other European Union countries and India were also altered. "Many ecotoxicologists had assumed that water-quality standards, along with companies' desire to avoid wasting valuable pharmaceuticals, would minimize the extent of bioactive compounds released by factories into wastewater, and ultimately into rivers," lamented Nature about the high residues found. The diabetes Type II drug metformin is

also a culprit in fish mutations.

Fish on psychoactive drugs

Hormones are not the only drugs increasingly found in fish. In 2009, a study by Baylor researchers found traces of cholesterol, high blood pressure, allergy, bipolar and depression drugs in fish caught near wastewater treatment facilities in Chicago, Dallas, Phoenix, Orlando and West Chester, Pa., near Philadelphia. Some of the drugs actually change fish behavior.

When scientists at Clemson University, in South Carolina studied hybrid striped bass exposed to the antidepressant Prozac, they found fish stayed at the top of the water sometimes with their dorsal fin out of the water. Maintaining "a vertical position in the aquaria" could increase the bass' susceptibility to predators and decrease their survival, noted the researchers. They also found that Prozac-exposed bass did not eat as much as normal fish.

A similar loss in survival behaviors is seen in shrimp exposed to Prozac. They are five times more likely to swim toward light than away from it, making them also more susceptible to predators report researchers: "Crustaceans are crucial to the food chain and if shrimps' natural behaviour is being changed because of antidepressant levels in the sea this could seriously upset the natural balance of the ecosystem," says Dr. Alex Ford, from the University of Portsmouth's Institute of Marine Sciences.

Fathead minnows exposed to the amounts of antidepressants and anticonvulsants found in tap water at the University of Idaho also showed dramatic changes. After only 18 days they exhibited 324 genetic neurological alterations, some similar to the human disorder of autism said researchers. Perch fed anxiety drugs "socialized less but ate more zooplankton and swam further, behaviors with potential long-term consequences for local ecosystems," reported the New York Times.

Big ag contaminants

Livestock operations, and especially "factory farms," are also a big source of drugs in the water. Water taken near a Nebraska feedlot had four times the levels of trenbolone, a hormone used to add weight to cattle, as other water samples reported the Associated Press. Male fathead minnows nearby had low testosterone levels and small heads.

Agricultural runoff includes not only livestock drugs and hormones found in manure but also nitrate-tainted fertilizer. Recently, Des Moines Water Works sued three neighboring farming counties to limit their nitrate discharges only to receive pushback from Iowa's ag industry that claimed farmers were voluntarily controlling their limits. Right.

Farm runoff is known for massive and devastating fish kills. But damage to aquatic life is only part of their harm. According to the Natural Resources Defense Council (NRDC), the microbe *Pfiesteria piscicida* can cause skin irritation, short-term memory loss and other cognitive problems in humans and nitrate runoff is linked to the risk of methemoglobinemia or "blue-baby syndrome" and spontaneous abortions.

Clearly, drugs and chemicals in the drinking water are a huge, underreported problem which officials are barely addressing.

And, as we saw in Flint, what we don't know about water safety can indeed hurt us.

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