



DRUGS IN DRINKING WATER

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ABSTRACT

This review focuses on the drugs of abuse in drinking water, as their presence is of increasing global concern and trace levels of these compounds have previously been detected. Even though these levels are not toxic with long term exposure via drinking water, they have the potential to bio accumulate and be in toxic to humans. In addition, transformation of these compounds during water treatment processes and their effect need further investigation as there are recent reports highlighting the increased toxicity to freshwater species. Currently there is limited information available on the detection of emerging drugs, therefore high resolution mass analyser could be a suitable alternative for non-target screening. Depending on the water treatment method used, the level of drugs of abuse detected can vary. Therefore, water regulatory bodies need to enforce more effective treatment methods for safe and sustainable drinking water.

KEYWORDS: This review focuses on the drugs of abuse in drinking water.

INTRODUCTION

Tiny amounts of pharmaceuticals -- including antibiotics, hormones, mood stabilizers, and other drugs -- are in our drinking water supplies, according to a media report. In an investigation by the Associated Press, drinking water supplies in 24 major metropolitan areas were found to include drugs. According to the investigation, the drugs get into the drinking water supply through several routes: some people flush unneeded medication down toilets; other medicine gets into the water supply after people take medication, absorb some, and pass the rest out in urine or feces. Some pharmaceuticals remain even after wastewater treatments and cleansing by water treatment plants, the investigation showed. Although levels are low -- reportedly measured in parts per billion or trillion -- and utility companies contend the water is safe, experts from private organizations and the government say they can't say for sure whether the levels of drugs in drinking water are low enough to discount harmful health effects.

Is this a new phenomenon, the finding of pharmaceuticals in public water supplies?

No. Low levels of pharmaceuticals in the water supply have been a concern for a decade or longer.

"Ever since the late 1990s, the science community has recognized that pharmaceuticals, especially oral

contraceptives, are found in sewage water and are potentially contaminating drinking water,".

Concern among scientists increased when fish in the Potomac River and elsewhere were found to have both male and female characteristics when exposed to estrogen-like substances.

Is there a health effect of drugs in drinking water?

All sides of the debate agree this is not known for sure. "At this point we don't have evidence of a health effect," "although it's an area of concern and one we will continue to look at."

It's true that the levels [of the medications found in drinking water] are very low. But especially when it comes to pharmaceuticals that are synthetic hormones, there is concern, because hormones work at very low concentrations in the human body."

EPA's ongoing research is focusing on the effect of pharmaceuticals in the water supply on aquatic life and human health.

Can boiling tap water get rid of the medicines, or would drinking bottled water solve the problem?

Boiling will not solve the problem, Janssen says. And forget bottled water as a way to escape the low levels of drugs found in some public water supplies. "Twenty five percent of bottled water comes from the tap," she says, citing an NRDC report.

Labels on bottled water, regulated by the FDA, help consumers know what they are getting, says Stephen Kay, a spokesman for the International Bottled Water Association. If bottled water companies use water from municipal sources and do not treat it further to purify it, the FDA views the source as legitimate but requires the label to state that it is from a municipal or community water system. Bottled water companies that use municipal source water, but then treat and purify it by using reverse osmosis, distillation, or other processes can label it as such using terms such as "purified water" or "reverse osmosis" water.

Home filtering systems such as reverse osmosis may reduce the medication levels, says Timothy Bartrand, PhD, a postdoctoral fellow at Drexel University, Philadelphia, who participated in a National Science Foundation workshop to develop a drinking water research agenda.

"An activated charcoal system will remove some pharmaceutical drugs but not all," Janssen says. "A reverse osmosis system can also remove some."

Are certain people -- say pregnant women, children, the elderly -- more sensitive to the potential effects of drugs in the drinking water supply?

Again, it's not known, Janssen says. "We know that kids, including babies, as well as fetuses, are more susceptible to environmental exposures because their bodies are still developing and their exposure on a pound-per-pound basis is higher. And they lack the detoxification system adults have. So it is not unreasonable to expect they would be at higher risk."

History of pharmaceutical drugs in drinking water

As we've discussed previously, there are somewhere around 3,000 pharmaceutical drugs in common use. These include:

- Cold medications
- Cholesterol drugs
- Antidepressants
- Birth control pills
- Heart medications
- Antibiotics
- And highly, highly toxic chemotherapy drugs

Residues of these drugs pass out into the sewage system from your urine, fecal matter, and even from your sink after you rinse out your dispensing cup. And of course, this list doesn't include non-pharmaceuticals such as all of the lotions and potions and cosmetics that wash off when you bathe or shower -- or an entire world of over-the-counter drugs or whatever. Quite simply it is impossible for sewage facilities to remove all trace of the drugs from the water they treat. In some districts the treated water, still containing traces of the pharmaceuticals, goes back immediately into the public water supply and into your home. In other communities it is dumped into rivers as "clean" water for the drugs to

be picked up downstream by the next community's municipal water supply. Or in some cases, the drug laden water makes its way down into aquifers to be pumped up later as somebody's well water.

What else can consumers do to find answers or improve the situation?

Contact your local public utilities and ask them what pollutants they test for in drinking water, Janssen says, as one way to raise awareness of the problem. Contacting your senator or congressman is another.

When disposing of expired or unneeded medications, don't flush them, Rudzinski says. Instead, mix unused or unwanted drugs with coffee grounds or kitty litter, something that will be unpalatable to pets. Put the mixture in a sealed container so it's not accessible to children or pets and put the mixture in the trash.



CONCLUSION

The presence of pharmaceutical drugs in the water is a very real issue. We don't have to deal in hypothetical fear mongering, at least for the present, about concerns that governments may be deliberately adding statin drugs or antidepressants to our water. There is a clear and present danger that we already face with all of these drugs, and a whole host of others, already present in our water supply as a result of them accidentally making their way into our drinking water. And we don't have to wait for clear, irrefutable evidence that these drugs may be harmful even in trace amounts. Such evidence is likely to be 10 to 20 years down the road. We already have enough red flags, canaries in the coal mine, to take all necessary precautions immediately. How many intersex fish do you need to see? How many studies statistically connecting prostate cancer to oral contraceptives in the water are required for you to act - especially when action is so simple?