

How to Make Drinking Water Safer with Natural Disinfection Processes

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It's estimated that half of all hospital beds in the world are occupied by people who have become sick from drinking contaminated water. In fact, over 1 billion people (or about one-sixth of the world's population) do not have access to safe drinking water, and millions in developing countries die each year from water-related diseases.¹

In third-world countries, sunlight exposure is often used to help make water safer, but this natural disinfection process can take anywhere from six to 48 hours (depending on cloud cover and so on).

Now researchers from the Johns Hopkins Bloomberg School of Public Health and the Johns Hopkins School of Medicine have found a simple twist to make this disinfection method even more powerful, not to mention much faster ...

Lime Juice and Sunlight Can Help Make Water Safer

When researchers added lime juice or lime slurry to water that had been contaminated with various types of bacteria and viruses, then exposed it to sunlight, levels of both *E. coli* and MS2 bacteriophage virus were significantly lower than when compared to solar disinfection alone.² Kellogg Schwab, PhD, MS, senior author of the study, said:³

"The preliminary results of this study show solar disinfection of water combined with citrus could be effective at greatly reducing E. coli levels in just 30 minutes, a treatment time on par with boiling and other household water treatment methods. In addition, the 30 milliliters of juice per 2 liters of water amounts to about one-half Persian lime per bottle, a quantity that will likely not be prohibitively expensive or create an unpleasant flavor."

Noroviruses in the drinking water were not significantly reduced using the lime juice/sunlight technique, so unfortunately it is not a perfect solution. However, limes are readily available in most tropical countries, as is steady sunlight, so this finding could still have an extremely beneficial impact in countries that don't have ready access to clean drinking water.

You may be surprised to learn, however, that your drinking water may still be contaminated even if you live in the developed world. Further, many of the "modern" disinfection processes used in the United States and other developed countries create their own set of issues ...

Have You Heard of Disinfection Byproducts?

Part of the allure of natural disinfection processes like exposure to sunlight and lime juice is that they have no harmful side effects – unlike the chlorination process used by most U.S. municipalities.

If you receive municipal water, the main chemical used to disinfect the tap water in your house is chlorine. While your local government is quick to assure you that there is relatively no danger from drinking

chlorinated water, that simply is not the case, because the levels of chlorine disinfection byproducts (DBPs) that are produced by this process are both dangerous and alarming.

There is actually no safe level for many contaminants found in drinking water, including heavy metals, pesticides, herbicides, hormones *and* DBPs, but they persist nonetheless, in varying quantities.

The government is much more concerned with providing water that doesn't kill you by causing diarrhea (the way it does in many third-world countries) and it does a good job at that, although some [microorganisms \(cysts and parasites\) do survive](#) the chlorination process (cryptosporidium, Giardia, for instance) and can lead to isolated outbreaks of disease and even death to those with compromised immune systems.

If you have not heard of DBPs before, you need to pay close attention as it turns out that DBPs, not chlorine, are responsible for nearly all the toxic effects of chlorinated water. Chlorine by itself is relatively harmless, but its side effects, by producing DBPs, are what cause nearly all of the problems.

As it turns out, DBPs are over **10,000 times more toxic than chlorine**, and out of all the other toxins and contaminants present in your water, such as fluoride and miscellaneous pharmaceutical drugs, DBPs may be the absolute worst of the bunch.

The most common disinfectant byproducts formed when chlorine is used are:

- Trihalomethanes (THMs)
- Haloacetic acids (HAAs)

The U.S. Environmental Protection Agency (EPA) takes the dangers of THMs -- which are measured in parts per *billion* (ppb) -- very seriously and regulates these compounds. The maximum annual average of THMs in your local water supply cannot exceed 80 ppb, and the maximum annual average of HAAs permitted by EPA regulations is 60 ppb.

However even though these are allowed, ideally it would be best to have zero. These levels have been regularly adjusted downwards over the years as science progresses and gains a deeper appreciation of their true toxicity. What makes DBPs so toxic?

Disinfection Byproducts May Cause Cancer, Reproductive Problems and More

THMs are Cancer Group B carcinogens, meaning they've been shown to cause cancer in laboratory animals. DBPs have also been linked to reproductive problems in both animals and humans, and human studies suggest that lifetime consumption of chlorine-treated water can more than double the risk of bladder and rectal cancers in certain individuals.

One such study found that men who smoked and drank chlorinated tap water for more than 40 years faced double the risk of bladder cancer compared with smoking men who drank non-chlorinated water.⁴ A second study found that rates for rectal cancers for both sexes escalated with duration of consumption of chlorinated water.⁵ Individuals on low-fiber diets who also drank chlorinated water for over 40 years more than doubled their risk for rectal cancer, compared with lifetime drinkers of non-chlorinated water.

As the vast majority of the U.S. population continues to receive and consume disinfected or chlorinated drinking water, we can assume that Americans are consuming disinfection byproducts every single day, and the number of related cancer cases could be substantial. And, you're exposed not only when you *drink* chlorinated water but also, and even more significantly, when you shower or bathe, as well as when you breathe in the chemicals from the air.

The chlorine that enters your lungs is in the form of chloroform, a carcinogen, and chlorite, a byproduct of chlorine dioxide. These forms of chlorine hit your bloodstream instantly before they have a chance to be removed by your organs of detoxification. The DBPs that enter your body through your skin during showering or bathing also go directly into your bloodstream. And the warm or hot water maximizes absorption by your skin. So unless you are regularly taking one-minute long cold showers, your body is like a sponge for these airborne toxins every second you spend in a shower.

If you are like me and obtain your water from a private well, then DBPs are a non-issue as they are only produced when chlorine is added, and it's highly unusual to add chlorine to most private well water systems. However, well water has its own set of potential hazards as well.

Is Well Water Safe?

Unless you are getting your water from a well that is located 800 feet or more below the ground surface, chances are your well water has been contaminated by some if not many toxic substances that have been dumped into the ground soil over past decades. Some common toxins that are dumped by the millions of pounds into soil every year are:

- Herbicides
- Pesticides
- Estrogen-mimicking hormones
- Drug residues
- Heavy metals

Many private wells in the United States have been affected by these types of chemical or heavy metal runoff from the surrounding ground soil, and this is to say nothing of the microorganisms living in well water as well. No matter how clean or pure your natural ground water looks, this has nothing to do with potential bacterial contamination or toxic pollution in the water. Many of the offenders in well water are just much too small to be seen with the naked eye.

So if your home uses well water, you really need to test to see what unwanted contaminants you're piping into your house, and then filter it accordingly. And if you get municipal water, you should have that tested too, as Sen. Frank Lautenberg, D-N.J. told ABC News that there are more than 140 chemicals in U.S. drinking water supplies that are not regulated by the U.S. Environmental Protection Agency (EPA).⁶ This includes gasoline, pesticides, rocket fuel, prescription drugs and more. Furthermore, more than 20 percent of U.S. water treatment systems have [violated key provisions](#) of the Safe Drinking Water Act over the last six years!

You Can Get Chlorine (and Other Toxins) Out of Your Drinking Water

Most people in the United States are not going to take the time to expose their drinking water and bathwater to sunlight, then add lime juice, to help make it more pure – and this wouldn't do anything to eliminate the chlorine or [fluoride](#) it contains anyway.

Fortunately, there are other options at your disposal.

If you can only afford one filter there is no question in most experts' minds that the shower filter is the most important product to buy for water filtration, even more important than filtering your tap water. This is because the damage you incur through your skin and lungs far surpasses the damage done by drinking water (which at least gives your body a fighting chance to eliminate the toxins through your organs of elimination).

An even better solution to the problem of harsh chemicals and toxins in your home's water supply is to install a whole house water filtration system. This not only protects your body, but also your appliances as well. There's just one water line coming into your house. Putting a filter on this is the easiest and simplest strategy you can implement to take control of your health by ensuring the water and, subsequently, the air in your house is as clean as possible.

Remember, if you are getting your water from a municipal source your indoor air quality, especially in the winter when your windows are closed, is likely atrocious. This is related to the chlorine and other toxins evaporating from all your toilet bowls, showers, baths, dishwashers and washing machines.

My advice for whole house filtration systems is as follows: Find a system that uses at least 60 pounds of filter media and can produce eight or more gallons a minute. When you are running two different showers, the dishwasher and the kitchen sink at the same time, you'll find out why these minimum levels are so important. This recommendation covers a home or apartment up to 3200 sq./ft, or in other words, a residence with about three and a half bathrooms. For more than that you will probably require two whole house water filtration systems.

You also need to look for a whole house water filter that has three separate stages of contamination removal:

- Stage one removes sediment
- Stage two removes chlorine and heavy metals
- Stage three should be a heavy-duty carbon filter for removing hormones, drug residues, chemicals, pesticides, and herbicides

You want to look for granular carbon in the carbon filter, not a solid block of carbon. The granular carbon allows for better water flow, which translates to more water pressure and better filtering properties as well.

You also want to look for NSF certification, which ensures your water filter is meeting national standards. NSF certification is only granted when a product is proven to remove everything it claims to. It's also good to make sure all particles under .8 microns are being filtered out of the water. A lower number is actually better, but .8 microns is the standard I recommend because that covers most bacteria, viruses and VOCs.

Your body requires a constant daily supply of water to fuel all the various waste filtration systems nature has designed to keep you healthy and free of toxins. Your blood, your kidneys, and your liver all require a source of good clean water to detoxify your body from the toxic exposures you come into contact with every day.

When you give your body water that is filled with by-products from chlorination, or with volatile organic compounds, or water that is contaminated by pesticides or hormones, you are asking your body to work twice as hard at detoxification, because it must first detoxify the water you are drinking, before that water can be used to fuel your organs of detoxification! Clearly, one of the most efficient ways to help your body both avoid and eliminate toxins, and reach optimal health, is to provide it with the cleanest, purest water you can find.

Sources and References

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- [⁴ Epidemiology. 1998 Jan;9\(1\):21-8.](#)
- [⁵ Epidemiology. 1998 Jan;9\(1\):29-35.](#)
- [⁶ ABC News December 8, 2009](#)