

Is Pure Water Harmful to Your Health?

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This question is being asked with increasing frequency, as reports and news regarding contaminants in the water increase and become more prevalent. Not surprisingly, companies that sell filters that cannot remove dissolved substance in the water, including many contaminants, commonly support the view that pure water (i.e., water without excessive ions) is “bad” for your health. Conversely, companies that sell effective water treatment systems hold the opposite view—that pure water is “good” for your health. Yet, actual information concerning health effects on the human body is hard to come by, although there is a plethora of opinions on the subject including medical professionals who take strong positions on both sides of this issue. This document presents some facts and common sense, so consumers can make up their own minds.

What is Pure Water

First, we need to clarify terminology. By definition, pure water is made of two atoms of hydrogen bound to one atom of oxygen, or H₂O in chemical nomenclature. There is no pure water in nature because water is one of the best solvents¹ and tends to dissolve everything, although in minute quantities, even in the case of certain substances that are called “insoluble” for that reason. When things dissolve in water, they do so by forming ions.

Can One Remove Contaminants but Leave Beneficial Ions in Water?

Ideally, one would like to remove contaminants, but leave natural mineral ions in the water. This type of water is still found in a few pristine places, away from population centers. Few such places exist in the industrialized world because, since the advent of civilization, virtually all human activities have some impact on the environment. As a consequence, a number of technologies have been developed to remove contaminants from water. Municipalities, which handle very large volumes of water usually rely on filtration, biological oxidation, and either chlorine or chloramines for disinfection. Simple filtration is generally effective to reduce turbidity², but leaves salts, micro-organisms and many contaminants in the water. Bio-oxidation, a natural process in rivers and lakes, decomposes many organic contaminants but, as anything else in nature, it takes time and occasionally low levels of certain contaminants remain in municipal water systems, which by law must be reported to the EPA and to the public when they exceed EPA mandated limits. Chlorination and chloramines are effective germicides, although chlorine can chemically combine with other chemicals and lead to the formation of numerous other contaminants.

Reverse osmosis (RO) membranes are effective at removing many organic chemicals from water. However, some contaminants (e.g., TCE, THMs, odors) are not well removed by RO systems, and certain micro-organisms (e.g., viruses, some bacteria) may also pass through those

¹ A solvent is a liquid that dissolves other substances.

² Turbidity is the opposite of clarity. Sediment makes clear water increasingly opaque.

membranes. RO systems are also susceptible to fouling³, lose effectiveness over time and require periodic membrane replacement. Simple distillation, such as counter-top systems, are quite effective at sterilizing bacteria and viruses, and remove most soluble salts in solutions, but unless separate degassing is provided, can leave volatile organic compounds in the product water.

Thus, no single technology is effective at removing all types of contaminants. Also, no single technology is able to discriminate between natural minerals in solution and man-made contaminants. For that reason and also because new contaminants are continuously being added to the list of potential contaminants by the EPA, the safest solution is to significantly reduce as many contaminants as possible from drinking water.

Is Pure Water Harmful to Your Health?

Arguments against drinking purified water fall into two major types of categories. In the first category, the argument can be summarized as follows: "Essential minerals are removed from pure water—and that's bad." This is the nutritionist argument. The second type of argument typically states that "pure water leaches minerals from the body—and that is also bad." This is the pseudo-medical argument. We'll briefly examine the merits of each.

The nutritionist argument rests on the premise that minerals that are dissolved in natural water are essential for the body, and that is false. What is true is that humans require certain minimum nutrients (e.g., over 2,000 calories for the average adult) which include trace elements, such as calcium, magnesium, as well as certain vitamins that are not synthesized by the body, such as vitamin C, among others. These nutrients are normally ingested in our food through the process of digestion.

For example, the recommended daily requirements of calcium and magnesium are about 1,000 to 2,000 mg and 300 to 400 mg, respectively, although specific requirements vary by gender, age, and other factors. Water may provide a small fraction of these requirements. Thus, if one lives in areas with hard water (which is defined as having 48 to 72 mg/l of calcium) and one drinks eight (8) glasses per day, which is about 2 liters, one would absorb less than 144 mg of calcium, or less than 14% of the daily requirements. Drinking one glass of milk contains between 300 to 350 mg of calcium, which is more than twice as much as the 8 glasses of water, and a few slices of cheese could provide even more. The point is that the food we eat provides most, if not all of the daily requirements, and not the water we drink. In fact, since most water sources are not hard (the range goes from less than 7mg/l for soft water to more than 72 mg/l for very hard water), the amount of nutrients and essential elements provided by water is rather insignificant.

The second argument is more difficult to dismiss because it appears grounded on "scientific" principles, hence its pseudo-medical label. While it is true that relatively pure water (remember, there is no such a thing as totally pure water) dissolves practically everything, and that is why it is labeled "aggressive," it does so only in minute quantities. Yet, numerous opinions from medical doctors (who have forgotten their chemistry lessons) suggest that pure water can leach minerals from the body in the same way that pure water leaches various materials under laboratory conditions.

³ Fouling is the progressive degradation of membrane surfaces due to particle occlusion.

There are two ways of assessing the above opinions. One way is to point out that there is hardly any evidence in the scientific literature about such leaching of minerals from the body (i.e., no clinical data or peer-review articles in respected journals). The second, more effective way is to point out that the moment the water enters the mouth, human saliva renders it non-aggressive. Human saliva contains numerous organic compounds that are grouped into 9-10 different classes (e.g., histatins, statherins, lysozyme, amylases, etc.) all of which are highly soluble in water. The moment water enters the mouth, saliva dissolves and the mixture could not possibly qualify as pure water. Furthermore, the mechanism for leaching “essential” minerals from the body is most commonly stated to be through the small intestine, as water and nutrients are absorbed by the body. Again, this does not make any sense because prior to getting to the small intestine, any water would have to pass through the stomach, and the stomach adds substantial quantities of gastric acid and other chemicals as part of its digestive function. To consider that any water is pure or aggressive after passage through the stomach requires unbridled imagination, particularly if one considers the effect of mixing such water with pieces of hamburger or a banana.

Conclusions

Ultra-clean water contains ions, although few of them. The minerals that we need come mainly from the food we eat, not the water we drink. And pure water does not leach minerals from our body because as it enters the mouth it mixes with our natural fluids and ceases to be aggressive.

About the Author

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