

The Facts About Water

QUALITY & SAFETY

TAP WATER

Tap Water Source

In the U.S. about 30% of all people get their tap water from ground water sources, and about 70% of people get their tap water from surface water sources.

Ground water

People in rural areas frequently drink water that comes from ground water pumped from a well. These wells tap into aquifer's natural water reservoirs under the earth's surface. Aquifers can be located deep within the ground, or rather close to the surface; they can be large, spanning several states, or small, extending only a few miles. Aquifers are replenished through rain and surface water, with the water being filtered as it travels through the ground.

Surface water

Municipal drinking water, or tap water, is produced from either ground water sources or surface water sources. People in large cities frequently drink water that comes from surface water such as rivers, lakes and reservoirs. Considering the quality of the water, it is important to remember that rivers, lakes and reservoirs are fed through tributaries, which taken all together form a watershed, the total land area over which all water flows eventually into the lake, river or reservoir under consideration. Activities many miles away from the lake or reservoir that is used as a source can and will influence the quality of the drinking water if they occur in the same watershed.

BOTTLED WATER

Bottled Water Source

The sources for bottled water can be split in two categories:

1. **Natural bottled water**, which is ground water that is minimally processed and derives its distinct flavor and other characteristics from the unique composition of its ground water source.
2. **Processed bottled water**, which is ground water or municipal water that is further processed and purified, and hence does not derive any value out of the specific composition of the source water, but rather from its purity.

Natural bottled water can be derived from a multitude of different water sources. All of these sources need to be naturally clean and well-protected, since none of these waters can be processed in any significant way in order to maintain their original purity. The various types of natural bottled water include:

- **Natural mineral water** originates from ground water sources that are naturally rich in minerals and where the original mineral composition found in this ground water is not altered at all.
- **Spring water** is from ground water springs whose mineral composition must be the same as that found at that found at the natural spring orifice.
- **Artesian water or artesian well water** is from a sealed aquifer from which the water naturally rises above the level of the ground water table due to the hydraulic pressure up-gradient to the water source.
- **Well water** is water taken from a well or borehole that taps into an aquifer.

Processed bottled water can be sourced from either tap water or ground water. However, in either case, the water is processed to further improve and purify it. Purification processes include distillation and reverse osmosis.

FILTERED WATER

Filtered Water Source

Filtered water is tap water that has been treated with a device that removes impurities.

Water may be filtered for preventative health reasons to eliminate harmful substances, or to improve the taste, color or odor of drinking water.

In some instances, water is filtered to remove or reduce contaminants and impurities such as lead and chlorine.

TREATMENT COMPARISON

Treatment Comparison

Treating Raw Water

The amount and type of treatment applied by a public water system (PWS) varies with the source type and quality. Many ground water systems can satisfy all federal requirements without applying any treatment, while others need to add chlorine or additional treatment. The U.S. Environmental Protection Agency (EPA) is developing a ground water rule that will specify the appropriate use of disinfection and will address other components of ground water systems to assure public health protection. Because surface water systems are exposed to and fed by direct land runoff and to the atmosphere, they are therefore more easily subjected to contamination. Federal and state regulations require that these systems treat this water to meet health-based standards.

Disinfection of drinking water is one of the major public health advances of the 20th century. However, the disinfectants themselves can react with naturally occurring materials in the water to form unintended byproducts which may pose health risks. A major challenge for water suppliers is balancing the risks from microbial pathogens and disinfection byproducts. The EPA's Stage 1 Disinfectants and Disinfection Byproducts Rule and the Interim Enhanced Surface Water Treatment Rule together address these risks.

Water suppliers use a variety of treatment processes to remove contaminants from drinking water. These individual processes may be arranged in a "treatment train" (a series of processes applied in sequence).

The most commonly used treatment processes include filtration, flocculation and sedimentation, and disinfection for surface water. Some treatment trains also include ion exchange and adsorption. Water utilities select a combination of treatment processes most appropriate to treat the contaminants found in the raw water used by the public water system.

Types of Treatment

Flocculation/Sedimentation

Flocculation refers to water treatment processes that combine or coagulates small particles into larger particles which settle out of the water as sediment. Alum and iron salts, or synthetic organic polymers (used alone or in combination with metal salts), are generally used to promote

coagulation. Settling or sedimentation occurs naturally as flocculated particles settle out of the water.

Filtration

Many water treatment facilities use filtration to remove or reduce suspended solids and particles from the water. Those particles include clays and silts, natural organic matter, precipitates from other treatment processes in the facility, iron and manganese, and microorganisms. Filtration clarifies water and enhances the effectiveness of disinfection.

Ion Exchange

Ion exchange processes are used to remove inorganic contaminants if they cannot be removed adequately by filtration or sedimentation. Ion exchange can be used to treat hard water. It can also be used to remove arsenic, chromium, excess fluoride, nitrates, radium and uranium.

Absorption

Organic contaminants, unwanted coloring, and taste and-odor-causing compounds can stick to the surface of granular or powder activated carbon and are thus removed or reduced from the drinking water.

Disinfection (chlorination/ozonation)

Tap water is often disinfected before it enters the distribution system to ensure that potentially dangerous microbes are killed. Chlorine, chloramines, or chlorine dioxide are most often used because they are a cost-effective approach to disinfection where public distribution pipelines provide water to our homes and businesses. Ozone is a powerful and very effective disinfectant, while ultraviolet radiation is an effective disinfectant and treatment for relatively clean source or processed waters that are typical in bottled water processing. Neither of these is effective in controlling biological contaminants in the distribution pipes of public water systems.

Source: <http://www.epa.gov/safewater/sdwa/30th/factsheets/treatment.html>

Bottled Water Treatment

Natural water (bottled water derived from protected ground water sources) is minimally treated via filtration and sanitization (ozonation or UV) only, if necessary. The addition of any chemicals or the application of any other techniques that would alter the natural balance of minerals is not allowed.

For processed or purified waters, a purification process is applied, in addition to the filtration and sanitation. This purification process typically consists of distillation or reverse osmosis. Both techniques are designed to further purify the water in order to provide the desired high-value beverage.

DISTRIBUTION COMPARISON

Distribution Comparison

Distribution of Tap Water

Tap water is distributed to all households through a complex infrastructure network of pipes, pumps, valves, holding tanks and more. Materials within this infrastructure include stainless steel, steel, concrete, wood, plastic, and other metals, including lead. Larger tap water systems can contain of hundreds, if not thousands, of miles of pipes connecting all households to a single, or series, of plants. Leaks are common in such a complex system, which not only leads to losses of drinking water, but also exposes the drinking water to contamination risks from typical negative pressure spikes in the pipeline. Buried trenches that hold public water pipelines may also contain sewage pipes that leak. Breaches in buried public water pipelines pose significant health risks from external contamination.

Distribution of Bottled Water

Bottled water is distributed to the consumer in individual, hygienically sealed bottles. From the time of production to the time of consumption, bottled water is hermetically sealed and protected from the environment, keeping the water inside the bottle safe. These individually sealed bottles are transported by truck, rail or ship from the manufacturer to the retailer, or directly to the consumer.

It is only at the point and time of consumption that the bottle's seal is broken and the water is exposed to its immediate environment. Hence, bottled water is a safe and healthful alternative to other beverages. This is especially relevant in cases where other drinking water alternatives are not available, such as when public drinking water is not available or safe to drink following natural disasters, or contamination or failure of public drinking water systems.

Furthermore, bottled water is also a safe and healthful choice for hydration where access to public drinking water is simply not possible, unsafe, difficult or inconvenient.

SOURCE AND PROCESS RESULTS

Water Overview

Below we provide an overview of the types of water that we described from their source and the results of the various processes they undergo.

Tap Water

The whole process through source (ground water for smaller systems, surface water for larger systems), treatment and distribution delivers drinking water to the consumer which in most cases includes a chlorine residual to enhance the safety of the tap water. This, however, often creates an off-flavor noticeable to most consumers. The quality of the tap water depends mainly on factors outside the consumer's control, such as rainfall, treatment techniques, status, and material of the distribution system.

However, tap water does provide in most cases a safe source of drinking water, even if occasional system failures make it necessary for consumers to search for alternatives during these times.

Bottled Water

Bottled water is a safe and healthful alternative to other beverages and is delivered in individually sealed bottles to the consumer. At the time of consumption, the consumer can easily determine that the seal is still intact, thus being ensured that the safety of the bottled water is uncompromised. Due to the individual package size, consumers can choose between different package sizes and different products to select the product that best fits their needs. Bottled water is clearly labeled when it is fluoridated, thereby allowing consumers to make their optimal choice. Bottled water is available from a variety of different sources, all with their distinct characteristics. This means that the consumer can choose the product that most closely matches his or her lifestyle and tastes.

Filtered Water

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People can filter their tap water at home with a several types of domestic water filters. These filters can be attached directly to a tap, attached to the domestic water supply before the tap, or used as a portable unit.

The different filter types that can be used in the home include granular activated carbon filters (GAC), metallic alloy filters, microporous ceramic filters, carbon block resin (CBR) and ultrafiltration membranes. Some filter units may be composite systems comprising several of these filter technologies. Jug filters can be used for small quantities of water for drinking and some kettles have these filters built in, predominantly to reduce the effects of limescale.

The basic domestic options include:

- Pour thru pitchers
- Faucet mounts
- Refrigerator or faucets with filters
- Under-the-counter
- Faucets with built-in filters
- Whole house

Whatever type of household filter you use, it's important to keep your drinking water fresh and clean.

You can avoid drinking unwanted chemicals, particles and bacteria by changing your refrigerator water filter on a regular basis. Most filter manufacturers recommend that you change your filter every 6 months. The life of your water filter depends on the amount of water you use and the quantity of contaminants in your water. If you and your family drink a lot of water or if you are on a well, you will need to change your filter more often.