WATER FILTRATION & PURIFICATION

For most preparedness individuals, water filtration is the preferred method to purify water. However, what if you run out of filters, or your filter becomes damaged, or you lose your water filtration device? In the preparedness community, there is a saying; two is one, one is none. The moral here is to have a secondary plan for everything, and have multiple ways to accomplish any given task. On the survival pyramid, water is second only to shelter. What if you need to sanitize a large amount of water? Your water filter would take hours, if not days to process several hundred gallons of water. Luckily, there are several different ways to purify water, some even capable of doing it in bulk.

Boiling Water

If you don't have bottled water or filtered water, you should boil water to make it safe. Boiling water will kill most types of disease-causing organisms that may be present (Source: Environmental Protection Agency). However, if boiling water is your only means to purify water, it requires large amounts of dry materials. Additionally, boiling water will not remove any chemicals or metals in your water.

1. If the water is cloudy, filter it through clean cloths or allow it to settle, and draw off the clear water for boiling.
2. Boil the water for one minute, let it cool, and store it in clean containers with covers.

Having a means to boil water in your Survival Bag is important. **We recommend a stainless steel water bottle, or at a minimum a stainless steel cup. For larger groups on the move, we recommend a Kelly Kettle.**

Please read our **Stainless Steel Water Bottle** article to learn why you should have one in your Survival Bag.

Water Pasteurization

In addition to boiling, water can be heated to temperatures that kill harmful microbes, making water safe to drink. This procedure is called water pasteurization. In a survival situation, a solar oven can be used to heat the water. Ensure the water is heated to a minimum of 160°F, for a minimum of five minutes (Source: **Solar Cooking World Network**).

Microbe	Temp
Worms, Protozoa cysts (Giardia, Cryptosporidium, Entamoeba)	131°F (55°C)
Bacteria (V. cholerae, E. coli, Shigella, Salmonella typhi), Rotavirus	140°F (60°C)
Hepatitis A virus	149°F (65°C)

Using Bleach to Disinfect Water

Bleach will kill some, but not all, types of disease-causing organisms that may be in the water.

1. If the water is cloudy, filter it through clean cloths or allow it to settle, and draw off the clear water for disinfection.
2. Add 1/8 teaspoon (or 8 drops) of regular, unscented, liquid household bleach for each gallon of water, stir it well and let it stand for 30 minutes before you use it.
3. Store disinfected water in clean containers with covers.

Note: Unopened bottles of household bleach have a shelf life of approximately 9 - 12 months, if stored under normal home temperatures (limited exposure to cold and heat) (Source: www.clorox.com).

After the container is opened, it is recommended to use the contents within 3-6 months. Therefore, it is recommended to use Calcium Hypochlorite instead. Bleach has an expiration date.

Chlorine Percentage	Drops Per Quart/Liter	Drops Per Gallon
1%	10	40
4 – 6%	2	8 (1/8 tsp.)
7 – 10%	1	4

Calcium Hypochlorite (Pool Shock, 68-78%)

Calcium Hypochlorite is one of the best chemical disinfectants for water. For long term water disinfection, ensure you store the powder / granular form of Calcium Hypochlorite, which is commercially known as Pool Shock; Yes the stuff that keeps your swimming pool clear. Do not use Pool Shock that has additives, such chemicals that will kill Algae , as they are unsafe to consume.

1. Add and dissolve one heaping teaspoon of high-test granular calcium hypochlorite (approximately ¼ ounce) in two gallons of water.
2. The mixture will produce a stock chlorine solution of approximately 500 milligrams per liter, since the calcium hypochlorite has available chlorine equal to 70 percent of its weight.
3. To disinfect water, add the chlorine solution in the ratio of one part of chlorine solution to each 100 parts of water to be treated. This is roughly equal to adding 2 cups (16 ounces) of stock chlorine to each 12.5 gallons of water to be disinfected.
4. To remove any objectionable chlorine odor, aerate the disinfected water by pouring it back and forth from one clean container to another.

Note: Do not add the entire 2 gallons of stock chlorine to 12.5 gallons of water. The 2 gallons of stock chlorine will treat 200 gallons of water. 1lb of calcium hypochlorite will treat 12,800 gallons. **Product we Recommend: In the Swim Chlorine Pool Shock.**

Store Bought Chlorine / Iodine Tablets

Chlorine / Iodine tablets containing the necessary dosage for drinking water disinfection can be purchased in a commercially prepared form. These tablets are available from drug and sporting goods stores and should be used as stated in the instructions. When instructions are not available, use one tablet for each quart or liter of water to be purified. **Products we Recommend: Katadyn MicroPur Tablets, Potable Aqua Water Tablets, and Aquamira Water Drops.**

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Purify ANY Water Even Urine?

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RECOMMENDED PRODUCTS

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Conversion Guide

128 fl oz - 1 Gallon

34 fl oz - 1 Liter

32 fl oz - 1 Quart

8 fl oz - 1 Cup

1 fl oz - 2 Tablespoons

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16 Tablespoon - 1 Cup

1 Pint - 2 Cups

4 Cups - 1 Quart

4 Quarts - 1 Gallon

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1 Gallon - 8.35lbs.

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Tincture of Iodine

Common household iodine from the medicine chest or first aid kit may be used to disinfect water. Add five drops of 2 percent U.S. or your country's approved Pharmacopeia tincture of iodine to each quart or liter of clear water. For cloudy water add ten drops and let the solution stand for at least 30 minutes (Source: EPA).

Using Ultraviolet Light (UV)

There are two methods of using Ultraviolet Light to disinfect water; using a battery or electric powered UV light commercial product, or using the sun's rays. Both methods work. A commercial product works faster, and can be more effective. However, if you are on a budget, you can use the Solar water Disinfection (SODIS) method.

Weather Conditions	Minimum Treatment Duration
Sunny (less than 50% cloud cover)	6 hours
Cloudy (50–100% cloudy, little to no rain)	2 days
Continuous rainfall	Unsatisfactory, use another method.

If using a commercial product, follow all commercial products manufacturer's recommendations and guidelines. This method is EPA approved. **Product we recommend:** SteriPEN.

The SODIS method is ideal for treating water for drinking in developing countries. All it requires is sunlight and PET bottles. How does it work? Clear PET bottles are filled with the water and set out in the sun for 6 hours (see chart). The UV-A rays in sunlight kill germs such as viruses, bacteria and parasites (giardia and cryptosporidia). The method also works when air and water temperatures are low.

1. Use PET bottles in the application of the SODIS method because they are light and do not break. The bottles must be transparent and colorless. PET bottles often have a bluish tinge. This is not a problem. Heavily scratched bottles must be replaced.
2. If the water is very turbid, the effectiveness of the method is reduced. If the water is not clear (cannot read a book/newspaper behind the bottle), it must be filtered.
3. Filled bottles are then exposed to the sun. Bottles will heat faster and to higher temperatures if they are placed on a sloped sun-facing corrugated metal roof as compared to thatched roofs.
4. The treated water can be consumed directly from the bottle.

Long Term Water Storage

If you are storing water from your municipal water supply (tap water), then you do not need to treat the water before storing, since it was likely chlorinated. Simply fill your container, and close it. The water can be consumed without any further treatment or filtration when you need it; unless it has developed algae or there is a possibility that it has become contaminated. However, it is recommended to rotate your tap water supply every 6 months.

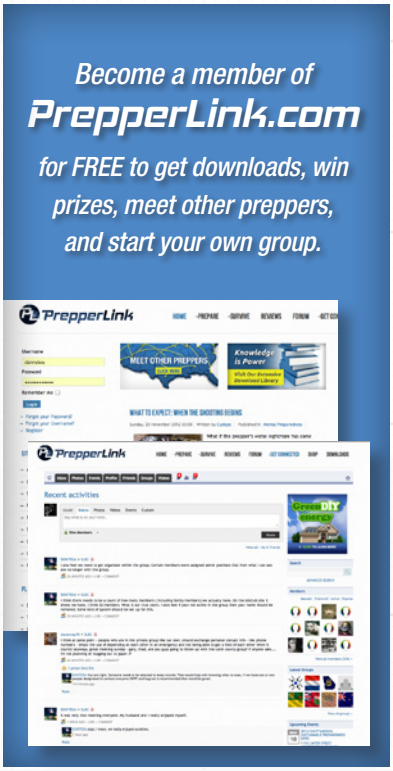
If you are unsure if your tap water is treated with chlorine, or you are using well water, it is recommended to treat with Calcium Hypochlorite (Pool Shock).

If you stored water smells like it is stale, simply aerate by pouring from one container to another. This will oxygenate your water, and should remove odors.

Recommended Videos

Below are two videos we recommend on the various kinds of filters and water storage purification.

RECOMMENDED PRODUCTS



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WATER STORAGE INVENTORY					
Location	**Container Type**	**Quantity**	**Total Gallons**	**Treatment Method**	**Date Inspected**
Basement	*5 Gallon Jug*	*5*	*25*	*None*	*11/01/2012*

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WATER FILTRATION TRACKER				
Model / System	**Filters**		**Maximum Gallons Per Filter**	**Max. Gallons All Filters**
	Installed	**Spare**		
Berkey, Royal	*2*	*4*	*3000*	*18,000*
Berkey Black - 3000 Gal | **Berkey PF-2 Fluoride** - 1000 Gal | **Katadyn Pocket** - 13,000 Gal | **Katadyn Vario** - 500 Gal | **MSR MiniWorks EX** - 264 Gal | **Doulton Super Sterasyl** - 2000 Gal or 6 months | **Sawyer** - 1,000,000 Gal (most filters)				

WATER TREATMENT / DISINFECTION SUPPLIES				
Type	**Location**	**Quantity**	**Estimated Gallons**	**Date Inspected**
Pool Shock	*Storage Bin 1*	*1 lb*	*12,800*	*11/01/2012*
Pool Shock (68 %, Calcium Hypochlorite) - 1lb = 12,800 Gal | **MicroPur Tablet** - 1 Tablet = 1 Liter | **Potable Aqua Water Treatment Tablets** - 2 Tablets = 1 Quart | **Aquamira Water Treatment Drops** - 1oz = 30 Gal				

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