

WATER PURIFICATION

If you must use streams and lakes as water sources, be sure to purify the water before drinking it or using it in food preparation. One of the most serious diseases caused by contaminated water is giardiasis, brought on by the microorganism *Giardia lamblia*. Symptoms of the disease include nausea, abdominal cramps,, lethargy, diarrhea, and weight loss. The symptoms do not develop until six to fifteen days after you drink the contaminated water. The disease is often transmitted through the feces of infected animals that contaminate water sources. Use the following methods to purify water.

Chlorine Bleach

Water can be purified quickly and cheaply by adding chlorine bleach to it. to purify a liter of water, do the following.

1. Get a large clean container and label it “drinking water”
2. Fill it with one liter of water. Add four drops of chlorine bleach. Bleach used for this purpose should contain 4 to 6 percent sodium hypochlorite. If you can only get bleach with 1 percent sodium hypochlorite, you must add twenty drops of bleach to a litter of water.
3. Cover the container with a clean lid or cloth. Let the water stand for thirty minutes.
4. Taste the water and notice the faint chlorine taste. If there is no chlorine taste, add two more drops of bleach. If the chlorine taste is too strong, pour the water back and forth from on clean container to another to improve the flavor.

Boiling

Water can also be purified by boiling it. Bring the water to a rolling boil, and let it continue to boil for thee to seven minutes.

Iodine

You may be able to purchase iodine tablets or other chemical purifiers to purify small amounts of water for use while hiking or backpacking. Follow the instructions on the label carefully, and make sure that the tablets are not outdated.

Filters

Camping suppliers offer water purification filters for use with small amounts of water. Carefully follow the instructions that come with the filter. Once you have purified some water, make sure that no germs or parasite eggs get in it before you use it. Keep it in a clean container covered with a lid. Use the purified water when preparing meals. You cannot kill germs by adding chlorine bleach to fruit drink after it is made. Broths and drinks that are boiled are purified by the boiling.

Boiling: Boiling has been the traditional way to treat water. It does a good job of killing parasites, bacteria, and viruses but it does not neutralize any chemicals or improve the taste. The drawback is that this method requires a LOT of time and fuel. To use this method, boil water 5-10 minutes plus one minute for every thousand feet over sea level.

Sodium Dichloro-s-triazinetrione- 99% and 1% inert ingredients powdered bleach.

2 lb container of sodium dichloro-s-triazinetrione costs \$15-20.00 and will clean up to 160,000 gallons of water, enough for your family and you will have sufficient to share with extended family, friends and neighbors.

- Its advantages, only 1/4 teaspoon is used to treat a 55 gallon drum of water and the shelf life of a container of this concentrate is 15 to 25 years if kept dry and stored in a cool location.
- Two oz treats 10,000 gallons.
- Dissolves instantly with no residue.
- Clears up water fast and keeps it clear.

Instructions for Use: Add 1/4 teaspoon of the chlorinating concentrate to your 50 or 55-gallon drum. Place the cap on the container and seal it, and allow the water to sit for 24 hours. After 24 hours, remove the lid and test for the presence of free chlorine in the water. This can be done by smelling, or by using test strips for free chlorine, available at pool and spa stores. These test strips cost about \$10.00 for 50 strips. If the chlorine can be detected after 24 hours, then the water has been purified. At the point, remove the lid from the water container and allow it to sit open for another 24 hours. The free chlorine will come out of the water, and the water is then fit for drinking. If no chlorine is present after the first 24 hours with the container closed, repeat the process, as organic matter (bacteria, cysts, etc.) are still present. Until free chlorine can be detected after 24 hours, there are probably organisms still present.

Solar Purification: <http://www.solarcooking.org/pasteurization/metcalf.htm>
<http://www.solarcooking.org/pasteurization/default.htm#WAPIS>

When water is heated to 165 degrees for 10 minutes it kills all bacteria, parasites and viruses. Water is pasteurized most quickly (@ 2 hours in mid-day) when put in black bottles or thin black pots w/ lids in a solar oven (funnel, CookIt, or other solar oven). If NOT using a solar cooker, then it could take 4-6 hours to pasteurize. Let cool before drinking.

WAPI's are used to monitor water pasteurization. These are small tubes with soy wax in them that act as a kind of thermometer. When the wax melts and goes to the bottom you know it is safe to drink.

To make WAPI: <http://makewapis.blogspot.com/>

3/8" outside diameter x 1/4" inside diameter poly carbonate tubing.

4 lb test mono-filament fish line cut into 15" lengths.

2 washer (#8 washer) 1- flat washer, 18-8ss, 3/8" Id x 1" OD.

Myverol 18-06 K wax (Mitsubishi International Food Ingredients, 1-800-287-9989)

Cut tubing into lengths of 2 1/2". Use PVC pipe cutters (easiest). Using a small propane torch, heat one tube end and crimp closed with a pair of pliers and let cool. Put wax inside tube (about 3/8" of wax) and add large washer over non-crimped end. Using the propane torch, heat opposite end of tube and crimp using pliers. Let cool. Drill 1/32" diameter hole in each flattened end of

tube. Cut fish line to 15" lengths. Tie one small washer (3/8" OD) to one end of fish line. Thread this line through one end of the tube, up along side of tube, under and through the large washer, and through the hole at the opposite end of the tube. Tie a small washer (3/8" OD) at opposite end of fish line.

Aerobic Stabilized Oxygen : (oxygenforlife.net) Aerobic Oxygen is safe, non-toxic, and destroys harmful bacteria without the need to boil the water. Unlike chlorine or iodine, Stabilized Oxygen acts selectively and DOES NOT harm beneficial aerobic bacteria which is needed for good health. It kills any infectious disease such as: Salmonella, Cholera, E.Coli, Streptococcus, Pseudomonas, and Staphylococcus A and Giardia-Lambliia.

Directions: *Immediate Drinking* 20 drops per gal. for potable water purification; 20 drops per 8 oz. Of questionable water; 20 drops per gal. for water storage. ½ bottle per 55-gallon barrel. Bacterial contamination on food: 60 drops to a gal. of water, spray or dip food for 30 seconds or more. It can be used as a "natural" antibiotic and to disinfect scratches, cuts and minor wounds. It has an unlimited shelf life. (WaltonFeed.com \$18)

Ozone: Ozone, aka O₃ is made with oxygen and electricity. It is many times more powerful as a purifier than bleach. The down side is it needs electricity and has a short life span. Ozone is used to purify all bottled water we buy. Ozone machines cost as little as \$150 or a house unit for about \$1,500.

Micropur Tablets: the only purification tablets that re EPA registered on the market. They are effective against viruses, bacteria, cryptosporidium, and Giardia. Unlike iodine tablets, these tablets leave you with only the taste of fresh water. Each tablet treats up to one liter of water, eliminating all micro-organisms. Tablets come in a bottle of 30. (Beprepared.com \$13)

Polar Pure Water Disinfectant: It uses pure crystallized iodine in a unique delivery system to destroy water-borne pathogens including giardia cysts and micro-organisms (viruses) that pass through filters. Iodine creates health problems for some people, including: thyroid problems, allergic, pregnant women, but is safe for others for 3 months if no filtering after treating. Works well in extreme temperatures, will treat 2000 liters of water, stores indefinitely. (Thestuffoutlet.com \$10)

Bleach: (unscented Clorox) Let sit, covered 1 hour before drinking. 3-6 month shelf life

<u>Amount of water</u>	<u>Clear</u>	<u>Water</u>	<u>Cloudy</u>	<u>Water</u>
1 quart	2 drops		4 drops	
1 gallon	8 drops		1/4 t.	
5 gallons	½ t.		1 t.	
55 gallons	5 ½ t.		½ c.	

Distillation: It is a process of boiling the water and collecting the evaporated of water. This method does not remove all chemicals but it does give you clean water from polluted or salt water. The easiest form of distillation is solar but you can also boil it. This method does not make much water nor does it taste very good. 1.2 hours to distill 1 gallon of water. (That is a lot of fuel) Cost: about \$300 for non-electric.

Emergency Water Preparedness (after warmth and shelter, then safe water) 3 minutes without air, three days without water and 30 days without food.

Three types of water needed in an emergency situation; (if possible sanitize all)

Hydration- Safe water to drink, cook food, brush teeth, wash hands, face. 2 quarts for non stressed idle adults per day. 1-2 gallons per working adult per day.

Sanitation- Sanitize water for washing dishes followed by a sanitation rinse (2 minute soak in 1 tablespoon 5.75% bleach per gallon water solution follow with 4 hour air dry. 1-2 gallons per adult per day.

Hygiene- Water for bathing (not the face), washing clothes and bedding, which may be contaminated with human waste. Sanitize contaminated clothing and bedding. 3 plus gallons per person per day.

Hydration water should be stored in safe long term water containers. Food grade containers, plastic, non rusting metal/enamel or fiberglass containers. Must be kept safe (freezing, breaking, sealed from contamination) cool, out of sun light. This water can be obtained from your culinary (city system) normally. Know current alerts for city system. Store 7 day supply. This water must be rotated, drain and refill containers with clean treated water every six months. **Boil or Chlorine treat this water before use.**

In an emergency after securing shelter and clothing, replace this hydration water. Water from non secure sources (wells, boil alert city systems, spring water, surface water) should be treated. Allow water to stand and settle, drain off clearest water possible (filter through available filter material, clean, sterile, paper coffee filters, cloth etc) treat as possible. **None of these treatments will clean chemically contaminated water.**

Boil for at least one minute if you have fuel.

Treat with Clorox bleach (plain not scented) permanent mark purchase date on containers. (6 months = full strength, 12 months half strength, longer ???) Keep a laminated copy of *How to use Clorox bleach* for **Emergency water purification** and a bleach only eye dropper with your bleach. With fresh bleach; clean, clear, warm 70 degree water, ph of 6-8; the amounts are;

2 drops of Regular Clorox bleach per quart (4-6% chlorine)

8 drops of Regular Clorox per gallon

½ teaspoon Regular Clorox per five gallons

double the bleach if water is cloudy, the time if cold. Allow to stand sealed for 30 minutes. PH of water must be between 6-8. Pool/spa 5 way test strips will test chlorine, PH etc..

(<http://www.engr.uga.edu/service/extension/publications/c819=10c.htm>).