

# Emergency Water

by Jeff Kowalski  
211 The Uplands  
Berkeley, CA 94705  
(510) 595-8261

Having an ample supply of water is a top priority in an emergency. Everyone's need will differ, depending upon age, physical condition, activity, diet and climate. Most people need to drink at least two quarts (64 ounces), which is equal to eight cups, of water each day. Hot environments can double the amount needed as the body uses water for cooling. The amount of water you need will also depend on the total amount of juices, soups, other drinks, and high moisture foods that are available. Children, nursing women, and ill people will need more. You can minimize the amount of water your body needs by reducing your activity level. Additional water will be needed for food preparation and hygiene. In general, store at least **one gallon of water per person, per day** of expected need. If you have pets, allow **1 quart per day for each dog or cat**. Storing at least **a three-day supply is recommended**, but you should **consider storing a two-week supply** if you have enough space for it. (For example, a family of four with one pet should store at least 13 gallons, but preferably 50 gallons). Generally, under serious disaster conditions, **no water can be presumed safe -- all drinking and cooking water should be purified**.

## • Sources of water

- ◇ **Professionally Bottled Purified Water** is the best source of stored water. It is inexpensive, has a shelf life of up to 2 years, and comes in a variety of sizes. Note that do-it-yourself water purifiers found in some food stores do not qualify, since the container you use or the device itself may be subtly contaminated. Choose water that is purified by reverse osmosis and is sealed at the factory. Safeway sells purified water at \$0.50 per gallon or \$4.99 for a 24-pack of more manageable 16.9 oz. bottles. Check the containers for expiration dates and rotate this water to keep it fresh and pure.



- ◇ **City Water** that arrives from your tap, or is extracted from hoses or hydrants may be contaminated after an emergency. Use caution, and if in doubt purify it using methods described below. If street water is suspected of contamination, turn off your water supply at the street to ensure the water remaining in your house does not become contaminated.
- ◇ **Hidden Home Sources** are often overlooked excellent sources of clean or nearly clean water.
  1. Ice is biologically pure. Check your icemaker, but remember

- that ice may also be useful for food preservation or first aid.
2. Water already in your plumbing pipes can be drained to the bottom-most sink in your house even if the street mains are off. This is greatly facilitated by opening the topmost tap in your house first, which will break the vacuum and allow the water to drain to the bottom-most tap more easily.
  3. Your water heater stores up to 50 gallons of water that is safe to drink. There is typically a drainage spigot at the bottom of the tank. Be sure to turn the tank off by shutting off the gas or electric supply to the unit. Tank drainage is greatly facilitated by opening the topmost tap in your house first, which will break the vacuum and allow the water to drain from the water heater spigot more easily. Be careful in the hours following an emergency since the contained water may still be scalding hot and burns will only compound the crisis.
  4. The tank of the toilet (not the bowl!) contains water that in most toilets does not contact the contaminated bowl and is therefore generally clean. Never use water from tanks that have ever been exposed to harsh chemicals, or cleaning agents like those "blue tablets". For safety, purifying water removed from the tank is recommended.

*Do not drink water from aquariums, swimming pools, or waterbeds, even if you purify it.*

◇ **Emergency liquids**

1. Some possible sources are: collected rainwater; streams and other moving bodies of water; ponds and lakes; and natural springs. Avoid water with floating material, an odor, or dark color.
2. Canned fruits or vegetables packed in juice or water. Be careful of canned vegetables and stocks that contain salt, since they'll only make you thirstier.

*Do not drink saltwater, floodwater, or groundwater (water traveling over the surface of the ground from rain or a leak somewhere else).*

● **Water Purification**

Many ill-health effects following an emergency are initiated by water borne diseases or contaminants. Purification is therefore required if your drinking water is suspect. To begin, let your water stand for 30 minutes undisturbed to allow particulates and biological cysts to settle to the bottom. Then, pour the water through a cloth into a separate container, leaving the lower dirtier portion behind. At this point, the source water is ready for purification using any of the methods described below. The final result will be water that is safe to drink.

- ◇ **Boiling** is the most effective common means of purifying water. It will kill mostly all biologic organisms. Boiling is simple, but requires fuel and stove, both of which may be difficult to acquire or dangerous to operate in an emergency. Like all non-filtration methods, boiling does nothing to remove sediment or cloudiness in water.
1. Bring water to a rolling boil and keep it simmering for at least

ten minutes.

2. Add one minute of boiling to the initial 10 minutes for every 1,000 feet above sea level. (Grizzly Peak is 1300 feet, so this really doesn't apply to us, but is useful if you're somewhere higher. Note that boiling loses its effectiveness at significantly higher mountain elevations since the boiling temperature is reduced.)
3. Remember to cover the pot to shorten boiling time, conserve fuel, and reduce loss due to steam.
4. Boiled water tastes "flat". To improve the taste, pour the water once cooled between two sanitized containers several times to re-aerate it.

- ◇ **Filtration.** Use of a high-quality hand-pump filter is a very effective method of purifying water. It will separate clear, clean water from source water that may be contaminated with particulates or microorganisms. Filters are not miraculous, however: they cannot remove toxic dissolved chemicals, so be careful of your water source. Filters have the advantage of being available, human-powered, portable, and long-lasting. Their primary disadvantage is that they are slow to operate (or impossible for people with limited dexterity or strength). They also require a somewhat larger initial investment than other means. Most camping or wilderness stores such as REI or Wilderness Exchange (see references) carry excellent, affordable filters from \$35-\$250. The staff there can also help you in choosing a device and demonstrating its use. (The MSR Waterworks EX filter is an excellent choice, for \$139.95, but there are also less expensive models that primarily trade speed for price). Used alone, filtering is effective in removing most microorganisms (with the exception of some viruses). Best results are obtained when the source water is pre-purified with one of the other methods described here. The combination of chemical and mechanical filtering (in either order) will result in water that is virtually free of both biological and sediment contamination.



- ◇ **Saturated Iodine (iodine crystal prepared in solution)** is highly effective, portable, stable, and inexpensive. Iodine kills most microbes (except cysts) and is more potent than chlorine. Iodine

treatments should not be used by pregnant women, those affected by thyroid conditions, or by anyone for more than 14 days. It is somewhat difficult to find, recently, since illegal drug makers use it as an ingredient in their formulas. Consequently, most stores in CA no longer carry it. I was able to find Polar Pure at Wilderness Exchange in Berkeley (see references) for \$12.50.

1. Polar Pure comes as permanently bottled crystals which must be partially dissolved in water before use. Fill the bottle with clear (not necessarily pure) water, shake, and let stand for 1 hour before use. Crystals will not dissolve completely, but enough iodine will be present in the saturated solution. *Do not drink the saturated iodine solution in the brown bottle. It is the purifying additive to water, not the end product!*
2. Pour the clear source water into an uncontaminated container. Add iodine solution as indicated on the bottle. (Iodine use is temperature dependent. Read the thermometer on the side of the bottle which indicates the number of capfuls of solution to add to a quart of source water. Typically this is 2 capfuls of the saturated solution.) Double the dosage for cloudy water.
3. Cover container slightly and shake well. Let some water leak across bottle cap since bottle cap threads may be contaminated.
4. Wait 20 minutes.
5. To mask iodine odor and taste, resulting water may be mixed with any of your favorite powdered drink mixes *after purification is complete.*



**Tincture of Iodine**, the liquid that is typically sold in small brown or opaque bottles in the pharmacy for treating cuts, has been reported to act on microorganisms, but *I strongly advise against its use*. It typically contains isopropyl alcohol, and perhaps other such poisonous additives. Do not confuse "Tincture of Iodine" for the other iodine purifiers specially created for treating water.



Do not use this!

- ◇ **Household Clorox Bleach** is an excellent disinfectant. Bleach is inexpensive and readily available, likely already in your home. A gallon of bleach will treat nearly 4,000 gallons of water. It degrades over time to salt, and is safe to drink in very small quantities. Unfortunately, this also means that bleach loses its strength over time, so be sure you're using fresh bleach (no older than 6 months).
  1. Use only plain, unscented, chlorine bleach with no additives. The bleach you use should contain only sodium hypochlorite (4-6%) in solution. Check the label and smell for scents first.
  2. Pour the clear source water into an uncontaminated container and add Regular Clorox Bleach according to this formula (Double the dosage for cloudy water):
    - a. 1 quart of water      2 drops
    - b. 1 gallon of water      8 drops
    - c. 5 gallons of water      1 teaspoon
  1. Cover container slightly and shake well. Let some water leak across bottle cap since bottle cap threads may be contaminated.
  2. Wait 20 minutes.
  3. Water should have a slight bleach odor. If not, repeat dose. Wait 15 min. Sniff again.
  4. To mask bleach odor and taste, resulting water may be mixed with any of your favorite powdered drink mixes *after purification is complete.*



- ◇ **Germicidal Tablets (hyperiodide tablets)** are easily found at most camping or wilderness supply stores, and are an excellent inexpensive alternative. One popular brand is Potable Aqua, is sold in small 50-tablet bottles that will treat 25 quarts. It is available with an optional iodine taste neutralizer. In combination, the package costs \$7.95 at REI. Iodine treatments should not be used by pregnant women, those affected by thyroid conditions, or by anyone for more than 14 days.
  1. Add two tablets of Potable Aqua to 1 quart of water.
  2. Cover container slightly and shake well. Let some water leak across bottle cap since bottle cap threads may be contaminated.
  3. Wait 30 minutes.
  4. Add two tablets of P.A. Plus Neutralizing tablets to 1 quart water *after purification*.
  5. Shake well.
  6. Wait 3 minutes before drinking.
  7. To further mask iodine odor and taste, resulting water may be mixed with any of your favorite powdered drink mixes *after purification is complete*.



- **Water Storage**

It is generally easier and safer to store professionally sealed purified water in quantity (as described above). Water that you purify, however, will need to be stored at least until it can be transported and used, so some words on water storage are appropriate.

1. Plastic, glass, fiberglass or enamel-lined metal containers are suitable for storing water supplies. Intact, durable plastic containers, such as soft drink bottles or those you purchase water in, are best. You can also purchase food-grade plastic buckets or larger containers. If you select one, be certain that it is intended for use with food, since many plastic containers will leach harmful chemicals into the water.
2. For ease of use, water containers for personal use should be no larger than 1 or 2 gallons. (If contamination or a leak occurs in a stored container, you also lose less of your supply by using smaller containers.) Two-liter (about  $\frac{1}{2}$  gallon) plastic soft drink bottles also work well.
3. Five- or ten-gallon storage drums (intended for water or food) will work well for larger supplies.
4. Thoroughly wash the container and lid immediately before filling it with treated water, preferably with detergent and hot water. Sanitize in a solution on  $\frac{1}{2}$  cup bleach to 1 gallon of water.
5. Be sure that lids do not contain paper components. If that is all that is available, add an insert or barrier of polyethylene or polyester plastic.

*Do not store water in old milk jugs or cartons (embedded milk proteins in the container will cause bacterial growth).*

*Do not store water in objects that were not specifically designed for food or that contained anything other than food.*

*Never use a container that has held toxic (poisonous) substances, because tiny amounts may remain in the container's pores.*

#### **References:**

- Emergency Drinking Water Supplies [ <http://www.bae.ncsu.edu/programs/extension/publicat/wqwm/emergwatersuppl.html> ]
- Emergency Water Supply [ <http://www.i4at.org/surv/watersup.htm> ]
- Tips for Emergency Water Supply and Storage [ <http://theepicenter.com/tow02236.html> ]
- Clorox Bleach for Emergency Water Purification [ <http://www.i4at.org/surv/bleach.htm> ]
- Storing Water Supplies [ <http://www.fcs.uga.edu/pubs/current/FDNS-E-34-3.html> ]
- Wilderness Exchange  
1407 San Pablo Avenue (near Gilman)  
Berkeley, California 94702  
(510) 525-1255
- REI [ <http://www.rei.com> ]  
1338 San Pablo Ave (near Gilman)  
Berkeley, CA 94702  
(510) 527-4140