

# Water Treatment NOTES

Cornell Cooperative Extension, College of Human Ecology

## Water for Emergency Use

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Natural disasters or technological problems can interrupt access to water, food, and electricity. Water is the human body's most important need. By planning in advance and storing water, you can ease the problems that might develop during an emergency and/or a "boil water" order. This publication explains how to make water safe to use in an emergency and how to store water ahead of time.

### Knowing How Much Water Is Enough

Store at least one gallon of water per person per day. Keep in mind that although this is a good estimate, everyone's needs differ depending on age, physical condition, activity, size, diet, and weather. A normally active person needs to drink at least two quarts of water per day. In hot environments twice that amount may be needed. Therefore, store more water for children, pregnant women, nursing mothers, and ill people. Additional water is needed for food preparation and hygiene. You can reduce the amount of water your body needs by decreasing activity and staying cool.

### Choosing a Water Container

Thoroughly washed, rinsed, and sanitized plastic, glass, fiberglass, or enamel-lined metal food-grade containers are appropriate for storing water. Plastic containers such as soft drink bottles or purchased food-grade plastic drums (intended for water or food) are best.

Never use a container that has held toxic (poisonous) substances. Tiny amounts of the toxic substance can remain in the pores of a plastic container, regardless of how well you clean it. Do not use plastic milk jugs because they are impossible to clean

properly, the lids do not seal well, and they are usually made from biodegradable plastics that will break down over time, causing leaks and possibly allowing contaminated air to enter. Finally, do not store water in unlined steel, stainless steel, aluminum, or iron containers because undesirable substances from the containers may leach into the water.

### Sanitizing a Water Container

Before bottling any water, you will need to wash, rinse, and sanitize the container. This process should take only a few minutes. Add 1 tablespoon of common household bleach, which contains 5.25 percent sodium hypochlorite, to one gallon of water. Pour a little of the solution into the container that will store water. Cap the container and shake it up and down thoroughly. Let it stand for about a minute. Empty out the sanitizing solution. The container is now ready to store water.

### Storing Tap and Purchased Water

Under ordinary conditions, if you receive water from a public supply and not from a private well, you do not need to treat your water before bottling it. In an emergency, however, when public supplies may be contaminated and a "boil water" order is issued, you need to disinfect water from all sources. All storage containers need to be thoroughly washed, rinsed, and sanitized before they are filled with water. (See previous section for how to sanitize a container.)

Before storing tap water, disinfect it to prevent the growth of microorganisms (see following section for directions). Fill containers so that little air remains inside them. If you are going to put containers in the freezer, fill them so that enough air space remains to

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handle the ice, which expands as it freezes. Label each container "disinfected drinking water" and date each one. Replace the water every three to six months with new, disinfected water. Always keep commercially purchased water in its original sealed container. Generally, the shelf life is one year. Do not store larger containers, such as five-gallon jugs, for more than six months.

Light can cause plastic containers to degrade, so store water in cool, dark places, away from sunlight and fluorescent lighting. Closets are good storage spaces. Store water away from items that have a scent or perfume (such as laundry soap or air fresheners) and away from gasoline, kerosene, pesticides, and other chemicals. Vapors from these chemicals can permeate the plastic and contaminate the water. To extend the shelf life of water stored in transparent containers, place the containers together in dark plastic bags to keep out the light.

You can also store water in the freezer. Being frozen keeps water at an acceptable quality for a longer time, and the presence of this ice in the freezer will help keep food from thawing in the event of a power outage. Keep in mind that when you store water by freezing it, you should not fill the container all the way because water expands as it freezes. For this reason, it is best to use a plastic container instead of a glass one.

### Disinfecting Water

Because contaminated water may taste or smell fine, disinfect all water of uncertain purity before using it for drinking, food preparation, or hygiene. Although there are many ways to disinfect water, none is perfect. The best solution is often a combination of methods. Before disinfecting any water, let suspended particles settle to the bottom or strain the water through layers of paper towel, a clean cloth, or a coffee filter.

Water can be disinfected by boiling and by chemical treatment. The disinfection methods listed below will kill most microorganisms in the water but will not necessarily remove chemicals, heavy metals, or salt. Boiling is generally the best method for disinfecting cloudy water.

### Boiling

Boiling is the cheapest, safest, and least technical way to disinfect water and it is the only effective way to kill the parasites *Cryptosporidium* and *Giardia*. Vigorous boiling for 10 minutes will kill any disease-causing microorganisms that are present. To improve the flat taste of boiled water, pour it back and forth from one clean container to another (aeration) or add a pinch of salt for each quart of water boiled.

### Chemical Treatment

Chlorine compounds such as bleach readily combine with chemicals dissolved in water, microorganisms, small animals, plant material, tastes, odors, and colors. These components "use up" chlorine, so it is important to use enough chlorine to disinfect water. Because amounts of possible contaminants in water can vary, the amount of chlorine necessary to disinfect also varies. For the disinfection process to be effective, chlorine needs to be present for a long enough time to interact with the microorganisms. Use the following rule of thumb: If water does not slightly smell and taste of bleach after you've added it and allowed it to stand, then you need to treat the water again. Because some people have a heightened sense of smell or taste, have a few people check the water to get a consensus.

*Bleach.* Common household bleach, which contains 5.25 percent sodium hypochlorite (or available chlorine), can be used to disinfect water. When the necessary procedure is not given on the package, find the percentage of available chlorine on the label and use the information in the following table as a guide.

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Percentage Available Chlorine	Drops per Quart of Clear Water
1	10
4-6	2
7-10	1

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Note: 4 quarts = 1 gallon  
8 drops = approximately 1/8 teaspoon

To disinfect water with liquid bleach, fill a clean container with water and add the appropriate amount of bleach. If the water contains sediment, strain it out before putting the water in the container (see first paragraph under "Disinfecting Water" for directions). Mix the water and bleach thoroughly and let stand (covered) for 30 minutes. If the water does not slightly taste and smell of bleach, repeat the treatment and let stand another 15 minutes. Cap and store water as explained above. If the chlorine taste is too strong, pour it from one thoroughly washed, rinsed, and sanitized container to another several times. If you do not know the strength of the bleach, add 10 drops per quart of water.

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*Dry bleach (calcium hypochlorite).* To disinfect water with dry bleach, you must first make a solution of the bleach and water because dry bleach is in a concentrated form. Add and dissolve one heaping teaspoon of high-test granular calcium hypochlorite (approximately 1/4 ounce) for each two gallons of water. The mixture will produce a stock chlorine solution. Add 1 part chlorine solution to each 100 parts of water to be disinfected. This is roughly equal to adding 1/2 cup of stock chlorine to approximately three gallons of water to be disinfected. Let stand for 30 minutes.

*Chlorine tablets.* Chlorine tablets containing the necessary dosage to disinfect drinking water can be purchased at drug and sporting goods stores and should be used as stated in the instructions. If instructions are not available, use one tablet for each quart of water to be purified.

### **Iodine**

Household iodine that is 2 percent United States Pharmacopia (U.S.P.), such as from a first aid kit, may be used to disinfect water. Add five drops of iodine to each quart of clear water (or 20 drops to each gallon). If you don't have a dropper, consider that eight drops equal approximately 1/8 teaspoon. Double the dose for cloudy water. Allow treated water to stand for at least 30 minutes. Iodine may not be effective in guarding against *Cryptosporidium* or *Giardia*.

Drugstores or stores catering to hikers and campers usually carry iodine in tablet or drop form. Follow the product directions carefully. Outdoor sporting goods stores also sell water filters, some of which are very effective. You may want to consider purchasing one to have on hand during an emergency. Follow the directions because they include important information regarding filter maintenance.

### **For what uses should water be disinfected?**

In all of the following cases water should be disinfected before use.

- Water used in beverages such as coffee, tea or lemonade
- Water used as an ingredient in food products (i.e. sauces, desserts, dressings, etc)
- Water used for making ice
- Water used for hand washing
- Water used for washing and sanitizing of food surfaces (i.e. dishes, counter tops, etc)
- Water used for washing produce

It is not necessary to boil tap water used for other household purposes, such as showering, laundry, or bathing. Adults, teens, and older children can wash, bathe, or shower; however, they should avoid swallowing the water. If the dishes are washed by a dishwasher, make sure the water temperature reaches 180° F. This temperature, combined with the dishwasher detergent, will give sufficient disinfection. When washing dishes by hand, the water should be disinfected. Use the methods mentioned above.

### **Water treatment devices**

Water that is treated by devices that improve water taste and odor, such as carbon filters and water softeners, still must be disinfected before use. Devices designed to disinfect water, such as UV light, may be used as an alternative to boiling if the electricity is working. When using UV light is used as a disinfectant treatment, be sure that the water is clear, because UV light cannot penetrate cloudy water and it will not be disinfected. Also make sure to clean the lamp, and replace it when needed (usually once a year).

### **Finding Other Sources of Drinking Water**

If you haven't stored water for emergency use, you do have some other options. Most homes contain sources of water you might not think to use. Remember, however, that during an emergency, water from wells, cisterns, and other delivery systems may be unsafe and should be disinfected. Other home sources of water are the following:

- Water heater
- Plumbing system
- Melted ice cubes
- Toilet tank (not bowl)
- Snow (melt; disinfect the water)

To obtain water from your water heater, turn off the power supply to the heater. For example, turn off the gas at the intake valve or turn off the electric circuit breaker or unplug the unit. If you have lost water because of a water main break, take extreme care when removing water from the heater or your house's plumbing. Open a faucet or two on an upper level of the house and drain the water from the water heater or from a faucet on a lower level. Draining water without opening the extra faucets can create a suction in the broken main and possibly draw contaminated water into the plumbing system. Opening the faucets, even if a line is not broken, will make it easier to get

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water from your plumbing or water heater.

As a last resort, you can use water in the reservoir tank of your toilet (not the bowl), but disinfect it first by boiling it. Do not use this water if it contains a disinfectant or bowl cleaning tablets or solutions.

If an emergency arises quickly, you can fill containers and bathtubs with water. This water can be disinfected immediately before use.

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## Useful websites:

- <http://www.metrokc.gov/health/disaster/watersafety.htm>
- <http://www.dhs.ca.gov/epo/TimeSite/BoilWaterOrder.pdf>
- [http://www.fw-ac-deptofhealth.com/PDF/Food\\_Protection/BoilWaterOrderAdvisory.pdf](http://www.fw-ac-deptofhealth.com/PDF/Food_Protection/BoilWaterOrderAdvisory.pdf)
- [http://www.in.gov/isdh/regsvcs/foodprot/boil\\_water.htm](http://www.in.gov/isdh/regsvcs/foodprot/boil_water.htm)

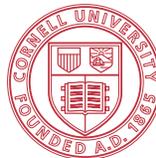
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