

Storage Containers

Water should be stored in containers manufactured for food use. Never use a container that has held toxic substances.

A 5 gallon heavy duty plastic container with spigot to dispense water (weighs approximately 42 pounds when full).

A 6 gallon Mylar water storage bag, impermeable to odor, gas and light, contained in a cardboard box for easy stacking. Durable (weighs about 50 pounds).

A 2 liter plastic drink container with screw on lid.

A 55 gallon drum that has not stored toxic materials (weighs 460 pounds when full).

A thermo-type container.

A 1 gallon size glass jug (padded with newspaper).

Water "canned" in regular canning jars and processed for 20 minutes (repack in cardboard box and pad with newspapers).

Plastic bleach bottles and gallon milk containers are generally manufactured with non-durable plastic that promotes biodegradability and is undesirable for long term water storage. Water stored in non-durable plastic containers may become toxic over time from breakdown products from the plastic container walls.

The disposable, plastic milk bottle is thin-walled and tends to develop leaks easily. Liquid chlorine bleach bottles are made of thicker polyethylene plastic and may be used for water storage if the empty bottles are thoroughly rinsed with hot water and allowed to dry. However, the use of bleach bottles for water storage is not recommended, because of the potential danger of accidentally drinking bleach instead of water. If bleach bottles are used for water storage, remove the bleach label and write "WATER" indelibly across the bottle. Children may mistakenly associate the size and color of bleach bottles with acceptable sources for drinking water and mistakenly drink bleach. As such, bottles must be positively identified, and bleach must be kept out of the reach of children.

If plastic containers are used, care should be taken to assure that they are made of plastic approved for food contact by the Federal Food and Drug Administration (FDA). Polyethylene plastic is approved for food contact and is commonly used for containers of various sizes, including large 55 gallon drums. Certain types of plastic containers are not intended for food contact (such as vinyl plastic waterbeds or trash containers) and may leach undesirable chemicals into stored water. Leaching from approved plastics into water is negligible.

Preparing Drinking Water for Storage

Stored water must be clean water. Use the best quality available for water storage. Water must be from a system with a Division of Drinking Water "Approved" rating. Water stored in thoroughly clean plastic or glass containers can be chemically disinfected for long-term storage by treating each gallon with 4 to 5 drops of unscented liquid chlorine bleach (Clorox or Purex type bleaches, containing 4% to 6% sodium hypochlorite). **One teaspoon of bleach disinfects 5 gallons of water.** Allow 20 to 30 minutes before drinking. This level of treatment will prevent growth of microorganisms during storage. Most municipal water storage facilities are already disinfected so no additional treatment is necessary. Fill a clean food grade container with tap water and screw on lids.

Storage Conditions

Store water containers away from cleaning supplies, fertilizers and other products with strong odors. These odors could be absorbed by the storage containers and transferred to the water.

Water stored in plastic containers should be filled to the top so there is no air space and should be stored in a cool, dry location away from petroleum and insecticide products, and away from strong odor food or perfumed products.

Vapors from these substances could permeate the plastic and affect the water. Thick walled polyethylene containers are significantly less permeable to vapors than are thin-walled containers.

Use of Stored Water

Once the container is opened, use the water rather than putting it back into storage. If stored water has a flat taste, pour it back and forth between two containers several times. Rotate water every 1 to 2 years.

Store as much water as possible, more than the bare minimum (especially in desert and hot climates). Be certain to label each container so there will be no questions about its contents. Include the date and information on the method of disinfection used.

Emergency Outside Water Sources

Ponds and rivers.

Rain water.

Untested wells and springs.

Some emergencies may warrant obtaining water from sources outside the home. The hazards of using water, including ice and snow, of unknown quality needs to be carefully weighed against the obvious life-sustaining need for drinking water. Even crystal clear, mountain stream water can be contaminated with disease-causing parasites such as giardia. Sterilization or disinfection can reduce the microbiological hazard of water of unknown quality, but there is no safe method for reducing the chemical hazard (e.g., toxic chemicals and radioactive materials) of water of unknown quality. If water is cloudy, chemical disinfection must be supplemented by some kind of filtration or heat sterilization (20 to 30 minutes of boiling) to assure complete destruction of disease-causing organisms. (Note: If water is cloudy and/or from an unsafe origin, 16 drops of chlorine bleach is recommended.)

In addition to having a bad odor and taste, contaminated water can contain microorganisms that cause diseases such as dysentery, typhoid and hepatitis. You should disinfect all water of uncertain purity before using it for drinking, food preparation or hygiene.

There are many ways to disinfect drinking water. None of the listed methods are perfect. The methods described below will kill most microbes, but they will remove very few chemical contaminants. Before water is disinfected, let any suspended particles settle to the bottom of the container, or strain the water through layers of paper towels, filters such as coffee, clean cheesecloth, or clean cloth into a clean container.

Better clarification can be obtained by drawing cloudy water through a "capillary siphon".

A capillary siphon can be constructed by rolling a small, clean, terry cloth towel into a long roll. Place one end of the roll into a container of cloudy water. Drape the rest of the roll over the edge of the container so that it hangs free from the container's sidewall. Be sure the free hanging (dry) end of the towel extends below the water level by several inches. Place a clean container below the free hanging end. Soon water from the upper container will wet the whole towel as the capillary action draws water through the towel to the lower container. With cloudiness removed, chemical disinfection can be more effective in destroying disease-causing organisms.

Methods of Disinfection

Boiling

Boiling is the safest method of disinfecting water. It is preferred over any method of chemical disinfection because most disease-causing microorganisms cannot survive the heat of the sterilizing boil. Water must be heated to boiling and held in a vigorous rolling boil for 5 minutes minimum (preferably 10 to 20 minutes). Let the water cool before drinking. Boiled water will taste better if you put oxygen back into it by pouring the water back and forth between two clean containers. This will also improve the taste of stored water.

Chemical Disinfection

Chemical disinfection of water is an acceptable alternative to heat sterilizing, but only if the water is clear. Disease-causing organisms, such as viruses, can "hide" inside the microscopic dirt particles that cause cloudiness in water. They can thereby escape the action of the disinfecting chemical and remain capable of producing disease.

Chemical disinfection is less reliable than disinfection via boiling for several reasons. For example, the more organic matter there is in the water, the more chemicals are required. The colder the water is, the longer the "contact time" (the length of time between addition of disinfecting chemicals to the water and use of the water) should be. Additional factors affecting the success of disinfection include the amount and type of chemicals used, water pH (how acidic or basic the water is), and types of disease-causing organisms in the water.

Liquid Bleach

You can use household liquid bleach to kill microorganisms. Use only regular household liquid bleach that contains 5.25% sodium hypochlorite. **Do not use scented bleaches, color safe bleaches or bleaches with added cleaners.** Each gallon of water should be treated with 4 - 5 drops of liquid chlorine bleach or 16 drops of liquid chlorine bleach if the water is cloudy. This is just under ¼ of a teaspoon per gallon. One teaspoon of bleach disinfects 5 gallons of water. Treated water should be

thoroughly mixed and allowed to stand for 30 minutes before using. A slight chlorine odor should be detectable in the water. If it is not, repeat the dosage and let it stand another 15 minutes before using. Treated water may have a slight chlorine taste, but this is additional evidence of safety. Since liquid chlorine bleach loses strength over time, only fresh bleach should be used for water disinfection. For bleach that is 1 to 2 years old, the dosage should be doubled. Bleach older than two years should not be used unless absolutely necessary because of uncertainty as to how much the active ingredients have deteriorated.

Iodine Tablets

Iodine tablets have the advantage of being more effective against amoebic dysentery cysts and certain other intestinal parasite cysts than chlorine-based disinfectants such as sodium hypochlorite or Halazone tablets. Sporting good stores commonly carry iodine tablets. Be certain iodine tablets are fresh, since they lose effectiveness with age. Fresh tablets have a gray color. They have a shelf life of approximately 3–5 years unopened. The label should show an EPA registration number. Often iodine tablet containers carry labels recommending restrictions on use by pregnant or lactating women. Check the label before purchasing the tablets. Follow instructions on the label, mixing thoroughly and allowing adequate “contact time”. The iodine tablet should impart a light yellow to tan color to the water and a slight odor.

Halazone Tablets

Halazone tablets (4 dichlorosulfamyl benzoic acid) for emergency water disinfection are commonly carried by pharmacies and drug stores. The label should show an EPA registration number. Be certain to note the expiration date since the shelf life is only about 2 years. According to the manufacturer: “It is important that the containers are tightly closed to prevent the absorption of moisture from the air. If decomposition of the tablets should occur, they take on a yellowish appearance, have a strong objectionable odor, and of course, should not be used”.

NOTE: Chemical disinfection, liquid bleach, iodine tablets, and Halazone tablets will not remove cryptosporidium.

Cryptosporidium is a microscopic parasite that causes the diarrheal disease cryptosporidiosis. Both the parasite and the disease are commonly known as “Crypto.” There are many species of Cryptosporidium that infect animals, some of which also infect humans. The parasite is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it very tolerant to chlorine disinfection. While this parasite can be spread in several different ways, water (drinking water and recreational water) is the most common way to spread the parasite. Cryptosporidium is a leading cause of waterborne disease among humans in the United States. Source: Centers for Disease Control (CDC)

How to Safely Disinfect With Bleach - NOT FOR DRINKING WATER

First, clean visibly dirty surfaces with household cleaners containing soap or detergent before disinfecting with household bleach.

Follow these important safety guidelines when using bleach products:

Follow the label directions on the bleach product. Check to see if you need to wear any protective equipment, such as gloves or eye protection.

Never mix household bleach (or any disinfectants) with any other cleaners or disinfectants. This can release vapors that may be very dangerous to breathe in.

Make sure you have good ventilation while using bleach products indoors (for example, open windows and doors to allow fresh air to enter).

Use regular unscented household bleach. Most household bleach contains 5%–9% sodium hypochlorite. Do not use a bleach product if the percentage is not in this range or is not specified. This includes some types of laundry bleach or splashless bleach, which are not appropriate for disinfection. Follow the directions on the bleach bottle for preparing a diluted bleach solution. If your bottle does not have directions, you can make a bleach solution by mixing:

5 tablespoons (1/3 cup) of bleach per gallon of room temperature water or

4 teaspoons of bleach per quart of room temperature water

Always follow the manufacturer’s instructions for applying the bleach solution to surfaces. If instructions are not available, leave the diluted bleach solution on the surface for at least 1 minute before removing or wiping. This is known as the “contact time” for disinfection. The surface should remain visibly wet during the contact time.

Wash hands after cleaning or disinfecting.

Make a new diluted bleach solution daily. Bleach solutions will not be as effective after being mixed with water for over 24 hours.

