

# City of Clovis Public Utilities

## Emergency Water: Home Storage and Emergency Disinfection Guide

### Why should I store water?

Our water supply is energy dependent, without electrical power we have a limited ability to pump water to your home. Something as common as an electrical storm or as unpredictable as an earthquake or another natural disaster could affect the power grid or our infrastructure and our ability to provide water. *"Luck favors the prepared."*

### How much water should I store?

The American Red Cross recommends *one gallon of water per person per day with a two-week supply for every person in your household*. This is based on 2 quarts per person per day for drinking water and food preparation, and another 2 quarts per person per day for other limited uses such as hand washing, teeth brushing and dishwashing. This is a total of 14 gallons per person for 2 weeks. For a family of four, that's 56 gallons of water.

### How do I start?

Start small, keeping a case or two of bottled water is an easy way to start your storage. You can add to this by purchasing larger containers or by following the directions in this guide. *It is important that you start now.*

### Effects of going without water

Although two thirds of the human body by weight is composed of water, this water is needed for circulation and other bodily processes including respiration and converting food to energy. If you are losing more water than you are taking in, dehydration will occur.

A normally active person needs to drink at least 2 quarts (1/2 gallon) of water each day. Hot environments and intense physical activity can double that amount. Children, nursing mothers and people suffering from disease or injury may need more water. Immune compromised people may want to take extra precautions to minimize their risk in an emergency.

It has been shown that if you lose just 2.5% of your body weight from water loss, you will lose 25% of your physical and mental abilities. For a 175 pound man that is only about two quarts of water. As you dehydrate, your blood becomes thicker and loses volume. This causes the heart to work harder and the

circulation of your blood to be less efficient. In an emergency situation, losing a full one quarter of your physical and mental abilities due to dehydration could mean the end of your life. *Bottom line: Store plenty of drinking water and drink plenty of fluids whether you feel thirsty or not so that you stay at peak efficiency.*

### How long can you survive without Water?

Poor health, exposure to the elements, shock, and panic can reduce your survival time in any emergency. An important additional consideration is whether or not to eat food when there is not an adequate supply of water. Certainly foods that contain a high proportion of water, such as fruits and berries may actually aid in providing water. Without adequate water, meat, dry and salty foods should be avoided. They require water from your body for processing and will serve to dehydrate you further. Most people can endure 2-3 weeks without food, but only a few days without water.

The following chart shows the approximate number of days that you could endure with little or no water. The chart does not account for any physical activity, which would increase your body's demand for water. The chances of not engaging in any physical activity during an emergence are remote indeed.

How Long Can You Live Without Water?						
Max Daily Temperature	Number of Days in the <u>Shade with no activity</u>					
	No Water	1 Quart .95 Liter	2 Quarts 1.90 Liters	4 Quarts 3.79 Liters	10 Quarts 9.46 Liters	20 Quarts 18.93 Liters
120 F / 48.9 C	2 days	2	2	2.5	3	4.5
110 F / 43.3 C	3	3	3.5	4	5	7
100 F / 37.8 C	5	5.5	6	7	9.5	13.5
90 F / 32.2 C	7	8	9	10.5	15	23
80 F / 26.7 C	9	10	11	13	19	29
70 F / 21.1 C	10	11	12	14	20.5	32

60 F / 15.6 C	10	11	12	14	21	32
50 F / 10.0 C	10	11	12	14.5	21	32

## Recovering From Dehydration

The good news is you can lose as much as 10% of your body weight through dehydration and suffer no long term ill effects. The bad news is that the short term effects are very disabling and unpleasant. Drinking several quarts of water can restore you. However, a person who has lost this much water from his/her body will be suffering from dehydration and probably not in a physical or mental condition to find water. *It would be preferable to have as adequate supply of water rather than suffer from dehydration.*

## Before an Emergency

### How to store your own water

#### Supplies Needed Before an Emergency

- ✓ Food grade containers for storage of water
- ✓ Funnel
- ✓ Filters: coffee filters, clean cheesecloth, tea towel, or pillowcases
- ✓ Eyedropper
- ✓ Unscented chlorine bleach (5.25% sodium hypochlorite)
- ✓ Large clean pan with lid for boiling water
- ✓ If storing water in a 55 gallon drum, a pump will be needed
- ✓ Purification device, back packer filters
- ✓ Camping stove to boil water

### Storage Containers

Water should be stored in containers manufactured for food use. Some examples are:

## Emergency Water

- 5 gallon heavy duty plastic container with spigot to dispense water (weighs approximately 42 pounds when full).
- 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).
- 2 liter plastic drink container with screw on lid.
- Cleaned polyethylene containers (plastic juice bottles, liquid bleach bottles)
- 55 gallon plastic drum that has not stored toxic materials (weighs 460 pounds when full).
- Thermos type container.
- 1 gallon size glass jug (padded with newspaper). Plastic containers are preferred as they are less prone to breakage.
- Water “canned” in regular canning jars and processed for 20 minutes. Repack in cardboard box and pad with newspapers. Again, plastic containers are preferred as they are less prone to breakage.

### ***Never use any containers that have held toxic substances.***

Gallon milk containers are undesirable for long term water storage because they are generally manufactured with non-durable plastic that promotes biodegradability. The bottle is also thin-walled and tends to develop leaks easily. Water stored in non-durable plastic containers may become toxic over time from breakdown products from the plastic container walls.

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 cautioned, 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 Water for Storage**

Stored water must be clean water. Use the best quality available for water storage. The water should be from a system with a California Department of Health Services permit. *The water served by the City of Clovis is already disinfected and meets the above standards so no additional treatment is necessary.* Fill clean food grade containers with tap water and screw on the lids.

If the water to be stored is from an un-chlorinated system it can be stored in thoroughly clean plastic or glass containers and chemically disinfected for long term storage by treating each gallon with 4 to 5 drops of liquid chlorine bleach (Clorox or Purex type bleaches, containing 4% to 6% sodium hypochlorite). *This should be the only active ingredient.* Do not use scented bleaches, color safe bleaches or bleaches with added cleaners. One teaspoon of bleach disinfects 5 gallons of water. Allow 20 to 30 minutes before drinking. The addition of chlorine will prevent the growth of microorganisms during storage.

## **Storage Conditions**

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 cleaning supplies, fertilizers, 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 re-storing it. If stored water has a flat taste, pour it back and forth between two clean containers several times to add oxygen to the water. Rotate water every 1 to 2 years.

*Store as much water as possible, more than the bare minimum (especially in desert and hot climates like ours). 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. Encourage your friends, family and neighbors to store water!*

## During an Emergency

Know the location of your house's water shut off valve. In a disaster in which your water to your house has been interrupted (e.g., broken water mains in the streets), shut off the water supply into your house to prevent backflow of contaminated water.

If a disaster catches you without a stored supply of clean water, you can use the water in your house piping system, your hot water heater and even ice cubes.

To use the water in your piping, let air into the plumbing by turning on the faucet in your house at the highest level. A small amount of water will trickle out. Then, leaving the highest faucet on, obtain water from the lowest faucet in the house.

To use water in your hot water heater, first turn off the electricity or gas supply, and then close off the cold water supply line to the water heater. Open the drain at the bottom of the tank and start the water flowing by turning on a hot water faucet somewhere else in the house.

You can also use water in the tank of your toilet (not the bowl) provided that no chemical sanitizers have been used.

Some water sources may have chemical contamination that makes them unacceptable for drinking. For example, waterbed mattresses usually contain organic chemicals in the wall plastic and biocidal chemicals in the water to prevent algal, fungal and bacterial growth. These various chemicals can make the water unsafe to drink. During an emergency such water may be used for hand washing, laundering, and sanitation (toilet flushing).

Please note: If the water supply system to your home is not working, the waste collection system (sewer) may also be impaired.

### Emergency inside Water Sources

- ✓ Home plumbing
- ✓ Water heaters.
- ✓ Soft water tanks.
- ✓ Melted ice cubes.
- ✓ Toilet tank (not bowl) provided no chemical sanitizers are used.

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.*

## Emergency 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 per quart 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 cheese cloth, 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.

### **Emergency outside Water Sources**

- ✓ Rain water.
- ✓ Swimming pools.
- ✓ Ponds and rivers.
- ✓ Untested wells and springs.

## Methods of Disinfection

### 1. 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.

### 2. 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 because of several different factors. 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 the addition of disinfecting chemicals to the water and the use of the water) should be. Additional factors affecting the success of disinfection includes the amount and type of chemicals used, the water’s pH (how acidic or basic the water is), and types of disease causing organisms in the water. *Some organisms including Giardia and Cryptosporidium are Chlorine resistant and will not be affected by chlorine without prolonged contact time (several days).*

#### A) Liquid Bleach

You can use household liquid bleach to kill microorganisms. Use only regular household liquid bleach that contains 4% to 6% sodium hypochlorite. *This should be the only active ingredient*. Do not use scented bleaches, color safe bleaches or bleaches with added cleaners. Be sure that the water you are treating is clean and clear to begin with. Add the bleach according to the directions below, using a clean, and uncontaminated medicine dropper.

*4 Drops bleach per quart or liter of water*

*8 Drops bleach per ½ gallon of water.*

*16 Drops bleach per gallon or 4 liters of water*

When treating larger quantities of water, use the following conversions to convert drops to standard measuring units.

## Emergency Water

*8 Drops = 1/8 Teaspoon*

*16 Drops = 1/4 Teaspoon*

*32 Drops = 1/2 Teaspoon*

*192 Drops = 1 Tablespoon*

*384 drops = 1/8 cup this is equal to 2 Tablespoons*

Water stored in metal containers should not be treated with chlorine prior to storage since the chlorine compound is corrosive to most metals. Therefore, only very pure water should be stored in metal containers.

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.

### **B) Calcium Hypochlorite**

Powdered Pool Shock will have a much better shelf life than chlorine bleach. *It must list Calcium Hypochlorite as the only active ingredient.* Typically it has 45% available chlorine. Pool Shock is very potent; it only takes 0.025 of a gram to produce a 3 mg/l dose in one gallon of water. One 12 oz package will treat 13,600 gallons of clean water. One gram will treat 40 gallons of clean water. If you store Pool Shock follow the precautions on the package. A small gram scale would be useful for measuring the Calcium Hypochlorite. When treating water with Calcium Hypochlorite, thoroughly mix and allow 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.

### **C) 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".

## **D) 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 goods 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 and people with thyroid problems. 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.

## **3. Filtering and Chlorinating**

*Liquid bleach, Calcium Hypochlorite, Halazone tablets and Iodine tablets will not effectively remove Cryptosporidium or Giardia that may be present in surface water.* You can filter water if you have a commercial or backpack filter that filters to 1 micron. These are available in sporting goods stores and are recommended for use when back-packing. They are not recommended for treating large volumes of water. Filtering eliminates parasites such as Giardia and Cryptosporidium, but it may not eliminate all bacteria and viruses. Therefore, it's recommended that 5-7 drops (1/8 teaspoon) of chlorine bleach be added per gallon of filtered water (1/2 teaspoon for 5 gallons). Stir or shake the solution to mix it. Wait 30 minutes before using the water, or cap the containers and store them in a cool, dry place.

For more information see:

**American Red Cross**

**Federal Emergency Management Agency and Red Cross Brochure on  
Emergency Preparedness**

**American Red Cross On-Line Emergency Preparation Guide**

References:

[Http://www.drinkingwater.utah.gov/emergency\\_water\\_storage.htm](http://www.drinkingwater.utah.gov/emergency_water_storage.htm)

<http://www.survivaltopics.com/survival/how-long-can-you-survive-without-water/>