

WATER STORAGE / PURIFICATION

Principles

Prophetic counsel

"We encourage members world-wide to prepare for adversity in life by having a basic supply of food and water and some money in savings." (<http://is.gd/2OKq>)

ProvidentLiving.org

Store drinking water for circumstances in which the water supply may be polluted or disrupted.

If water comes directly from a good, pretreated source, then no additional purification is needed; otherwise, pretreat water before use. Store water in sturdy, leak-proof, breakage-resistant containers. Consider using plastic bottles commonly used for juices and soft drinks.

Keep water containers away from heat sources and direct sunlight. (<http://is.gd/2OKJ>)

Water versus Food

You can last on average about **two to three weeks without food**, but only about **three days without water**. (This is a rough estimate; there are a lot of influencing factors that would increase or decrease these numbers.)

Often Neglected

In our recent stake communications drill, we estimated in our ward that no more than 5% of families have more than two weeks of water storage in their home. Water is one of the most important storage items, yet for whatever reason is often neglected.

Problems

Size

Water storage consumes a great deal of space. A typical 55 gallon drum is about two feet wide by three feet tall.

Not everybody has an unfinished basement or garage with sufficient space to store multiple barrels or other containers

Storage

Water may be stored in a variety of containers. Some containers and storage locations adversely affect the water supply by leeching chemicals into the water or affecting the taste. Additionally, some containers may degrade or disintegrate with time, leaking your water into the surrounding area.

Contaminants

It is hard to know with accuracy the history of the water you are drinking. Where has it been, what has it been treated with, and how long has it been sitting still? What temperatures has it been subjected to, how much sunlight exposure has it had, and for how long?

Poor conditions such as those listed above create opportunities for unwanted bacteria and organisms to grow in your water supply.

Purification

There are a variety of suggestions on how best to purify water, many of them conflicting with each other.

Practices

STORAGE

Water should *only* be stored in food-grade plastic or other material that is created specifically for long term storage of liquids intended for consumption. It is important that you be careful what you store your water in, as some containers can leech, crack, degrade, or otherwise cause problems with your water.

Before storing your water, it is usually a good idea to wash and sanitize the container. This can be done by mixing 1 teaspoon (5 ml) of liquid household chlorine bleach to one quart (1 liter) of water. Do not use bleach that has scents, additives, or thickeners.

It is not necessary to treat water that is already chlorinated before storing it. Many cities chlorinate their water supply, so if that's the case in your city, any water from your tap is safe and ready to be stored in an appropriate container without any extra action on your part.

Exposure to light plays a large part in the development of bacteria; where possible, it's best to store your water in a cool, dark place (same goes for your food).

The following are a few of the more popular methods for storing water.

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55 gallon water drums



55 gallon drums of water are a popular choice for home storage. For new drums, try the oft-recurring Maceys preparedness sales where you can find them for about \$40. You can buy used drums much cheaper, though these often have contained syrups and other things that need to be sufficiently washed out before usage. (For instructions on how to clean used ones, go to <http://is.gd/2Oiw>)

Water stored in barrels should ideally be rotated once yearly, but you can get away with storing it for a few years and purifying it before drinking.

Pros:

- Dark blue plastic restricts light, thus helping prevent bacteria and algae growth
- Some drums/barrels can be stacked to maximize space

Cons:

- Difficult to move once filled
- Siphon/pump must be used to retrieve water from top of the barrel (working against gravity)

(Cost per gallon: **\$0.73**)

(assuming \$40 for a new barrel)

5 gallon boxes



5 gallon water boxes are a good choice for putting water storage in random, small spaces. Boxes should not be stacked more than three high. Water is stored inside the box in a metallic bag. Emergency Essentials sells 5 boxes (so 25 gallons total) for \$33 - go to <http://is.gd/2OTJ>

Water kept in these boxes should last a few years; rotation once every three to four years is a good idea.

Pros:

- Easy to move once filled (each 5 gallon box weighs ~40 pounds when full)
- Box can be reused after water is consumed. (Emergency Essentials says you can use the box as a toilet - have fun!)
- Easy dispensing spout to retrieve water when desired

Cons:

- Material is not too durable

(Cost per gallon: **\$1.32**)

(assuming \$33 for 5 5-gallon boxes)

250+ gallon water tanks



For the ambitious, you can acquire industrial-type water tanks that store 250+ gallons. These food-grade plastic bladders are housed in a metal cage and can be stacked two or three high. Remember: water weighs eight pounds per gallon, so 250 gallons of water is 2,000 pounds, plus about 150 pounds for the cage. Make sure your flooring can support this weight! For an example, see: <http://is.gd/2OXX> or <http://incaseof.ca>

Rotate water stored in these tanks once yearly.

Pros:

- Water spigot is at the bottom, so you can use gravity to get the water out
- Stackable, so you can fit a year supply of water in your garage or basement
- With an adapter you can connect a garden hose

Cons:

- Pretty much impossible to move once full

(Cost per gallon: **\$1.64**)

(assuming \$450 for 275 gallon tank)

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1 gallon jug



You can buy one gallon jugs at any supermarket. These are usually very cheap (~\$0.70 per jug) and an affordable way to get some basic water storage going.

These bottles are *not* a good solution for long term storage, as they *will* degrade within a year and leak all of their contents. Harder plastic (like 2 liter soda bottles) is a better solution.

Pros:

- Inexpensive and easy to buy a few at a time with your normal grocery purchases
- Small container is easy to store under furniture, on closet shelves, and other small places

Cons:

- Plastic container degrades after about a year and *will* leak
- For long term storage, chemicals from the plastic may leech into water

(Cost per gallon: **\$0.70**)

(assuming \$0.70 for 1 gallon jug)

Hard plastic water jugs



There are several types of water jugs that have harder plastic, making them more durable for longer term storage. Some water companies sell pre-bottled jugs that you can simply buy and store. Another option is to buy empty, hard plastic jugs (such as the one pictured above) and fill it yourself.

Either way, these jugs will last a lot longer than the ones in the previous column, making them a smarter (though costlier) option for small amounts of water storage.

Water stored in these jugs can be easily rotated (use them to water plants, for example), so try to cycle them every six months.

Pros:

- Durable, heavier plastic will last longer than other types of jugs
- Easy to move, rotate, or stack on top of one another

Cons:

- Expensive option for small amounts of water storage

(Cost per gallon: **\$2.20**)

(assuming \$11 for 5 gallon jug)

4.2 ounce water pouch



Emergency water pouches are a good item for your 72 hour kits, but should not be used for home storage.

Pros:

- Lasts up to five years
- Easy way to store small amounts of water in 72 hour kits, backpacks, cars, and other locations

Cons:

- Inefficient method of storing a large amount of water

(Cost per gallon: **\$9.45**)

(assuming \$0.31 for 4.2 oz. pouch)

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PURIFICATION

Depending on how you have stored your water and how long it's been sitting in its container, it will be necessary to purify it before it is used.

There are a variety of methods out there, and lots of information that is difficult at times to sift through. It is important that you review the possible purification methods, and decide what works for you.

Please note that water storage, like any emergency preparedness, should have various contingency plans in place. Your desired method of purification might be to boil the water, but if you have no fuel, you'll need a Plan B.

Thus, it's usually a good idea to prioritize the three methods you would like to use, and then acquire the necessary supplies or skills that will allow you to purify in each method.

It's also not a bad idea to double up on purification, just to be sure. For example, you may sift your water through a particle filter (such as a coffee filter) to remove any debris, add some iodine drops to the water, and then pass it through a carbon filter. Better safe than sorry!

The following are a few of the more popular purification methods.

Bleach



Disinfecting with household bleach kills some, but not all, types of disease-causing organisms. The bleach must contain chlorine in order to work. Do not use scented bleaches, color-safe bleaches, or bleaches with added cleaners. Most household chlorine bleaches have 4-6% available chlorine, in which case you should add 1/8 teaspoon (8 drops) of regular, unscented, liquid household bleach for each gallon of water (2 drops per quart/liter), stir it well, cover, and let it stand for 30 minutes before you use it. Double the amount of chlorine if the water is cloudy, murky, or colored, or if the water is extremely cold. If after sitting covered for 30 minutes the water doesn't have a slight chlorine odor, repeat the dosage and let sit for another 15 minutes. Most of the chlorine content in bleach will evaporate within a year, so this is not a good long-term storage item.

Iodine (drops/tablets)

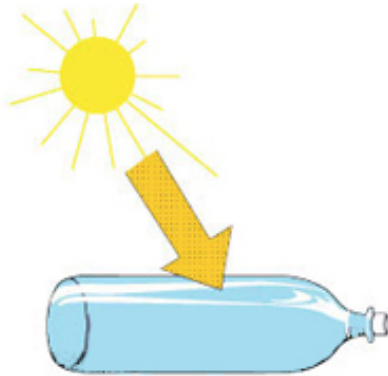


Disinfecting with iodine is generally less effective than chlorine in controlling the parasite Giardia, but it's better than no treatment at all. Add 5 drops of 2% iodine (from the medicine chest or first aid kit) to every quart/liter of clear water; add 10 drops if the water is cloudy. Let the solution stand for at least 30 minutes.

For commercially prepared chlorine or iodine tablets, follow the instructions that come with them. If you don't have instructions, use one tablet for each quart/liter of water to be purified.

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SODIS (Solar Disinfection)



Inactivation of microorganisms by UV-A-radiation and thermal treatment

Solar water disinfection is a simple method to improve the quality of drinking water by using sunlight to inactivate pathogens causing diarrhea.

Contaminated water is filled into transparent plastic bottles and exposed to the full sunlight for 6 hours. During the exposure, the UV-A radiation of the sunlight destroys the pathogens.

SODIS does not change the chemical water quality. It requires relatively clear water to work, and is ineffective with large amounts of water.

More information on this technique is available at <http://is.gd/2P4C>

Gravity carbon filters



Gravity-based systems are very effective in removing contaminants from water because of the extremely long “contact period.” Some of the other filtration systems rely on water pressure that forces water molecules through the filters at 60-90 PSI.

In such systems, individual water molecules come in contact with the filter media for a mere fraction of a second. Water molecules passing through the ceramic purification elements in these filters are drawn gently by gravity and stay in contact with the media for several minutes.

You can filter water in these units for around **two cents per gallon**, and they are great and removing dangerous organisms such as protozoan cysts (Cryptosporidium, Giardia, etc.) and microscopic bacteria (E. coli, Salmonella, etc.).

The two leading brands of these types of filters are the Aquarain (<http://is.gd/2P7c>) and Berkey (<http://is.gd/2PyB>) units.

Chlorine



Chlorinating concentrate can be found at your local pool/spa store, and can be used to purify your water. This product is a granulated powder. The powder can last a lot longer than its corresponding (and diluted) liquid form, so you should store the powder until you are ready to use it.

You must be sure that the active ingredient of the product you're purchasing is 97-99% Sodium dichloro-s-triazinetrione dihydrate. Several chlorine products have other additives that should not be used, so make sure that you check the label.

To use, mix 1/4 of a teaspoon into 55 gallons of water. Close the lid, wait 24 hours. Open lid - if you don't smell chlorine, repeat the previous step. When you smell chlorine, leave lid off and let chlorine gas escape until there is no smell. It is ready for use when the smell is gone.

Be careful how you store the powder; where possible, it's best to keep it in its sealed container so prevent fumes from escaping and damaging surrounding items.

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Boiling



Boiling kills most types of disease-causing organisms and is the most recommended purification technique.

Bring the water to a rolling boil for at least one minute, then let it cool. If you are more than one mile above sea level, boil for three minutes.

Though it is important to conserve fuel, the longer you boil your water, the better chance you have at eliminating any possible organisms or bacteria.

As the water cools, you can stir it once a minute to mix air into the water, which will help reduce any bad taste the water may have.

Sports bottle with filter



A recently popular preparedness item is a sports bottle with a carbon-based filter included.

These bottles would allow you to filter water “on the go” in an emergency, such as from a lake, stream, or other body of water.

If using a source of water that might contain extreme bacteriological or viral contamination, it is recommended that two drops of plain chlorine or iodine be added to each refill before filtering. This will kill minute pathogens such as viruses. The disinfectant will then be filtered from the water entirely, removing its odor, color and taste.

For more information, go to <http://is.gd/2Pwc> or <http://is.gd/2Pw2>

Related Links

- LDS Church water storage guidelines (<http://is.gd/2Pxp>)
- CDC information on water storage (<http://is.gd/2Poj>)
- FEMA information on water storage (<http://is.gd/2Pxr>)
- Red Cross information on water storage (<http://is.gd/2Xwg>)
- Emergency Essentials article on water storage (<http://is.gd/2Xwi>)
- Wikipedia page on water purification (<http://is.gd/2Pxy>)

*Please do not consider this information to be comprehensive;
you should still do your own homework!*

To download a PDF copy of this handout, go to <http://connorboyack.com/drop/water.pdf>