Chapter One ... Water

INTRODUCTION

Tens of thousands of Mormons beam with pride as they inventory their stockpile of sealed plastic buckets full of hard winter wheat, rice, oats, barley, rye, popcorn, dried legumes [Anasazi, kidney, lima, split pea, and other beans], pasta, sugar, powdered milk, flour, salt, etc. Forget the fact that three items on this list are not meant for long-term storage. We'll ignore two other items (sugar and salt) that are hygroscopic (adsorb water vapor from the air), turning what are normally small granules into a solid crystalline "brick" if not sealed against moisture. And yet, these concerns are the least of our problems. What are people going to do with all this dry food — gum it to death? Dried items such as this need to be reconstituted; dissolved and/or cooked in water. This requirement for water also applies to commercially available, nitrogen-packed, plastic-lined #10 cans of dried food items that provide a varied and generous 2,000 calorie per day diet pre-packaged to feed one person (or more) for a week, a month, three months or a year — depending on how much you can afford to buy.

In this chapter we're going to talk extensively about the central role that water plays in a family storage plan. Without water a human will generally die within a week from the ravages of dehydration. All the dried food in the world cannot keep a human alive in the absence of water. But give a human being a very small, daily amount of water and he/she can live for a month or two with NO food.

What is it about water that makes it so essential to human life? The human body is more than 80% water. Water is an integral part of every cell, tissue and organ in the body. Body fluids such as blood and spinal fluid are a complex mixture of water containing dissolved and suspended "stuff." Water is merely an agent that keeps things in solution. The body tries to keep the concentration of dissolved and suspended "stuff' at just the right levels. If the concentration of "stuff' is too low, the body will attempt to "dump" water overboard via the kidneys to increase the concentration of these molecules in the body fluids. If the concentration is too high, the body will attempt to dilute it by retaining or acquiring additional water. The body expends considerable energy working to maintain this homeostatic, or "constant," environment that is required for cellular and total body survival.

> "Water is life's true and unique medium. Without water, life simply cannot be sustained. It is the fluid that lubricates the workings of the cell, transporting the materials and molecular machinery from one place to another and facilitating the chemical reactions that keep us going. Water is sustenance and cleansing fluid, bearing nutrients to where they are needed and taking away wastes. It is even a structural agent in plants, as we will see – it enables flowers to hold up their heads to the Sun. No wonder we would quickly die without it, for we need to consume at lease two pints a day for long-term health. Some [plant] cells can avoid death if their water is extracted, but they shut down utterly until re-hydrated."
>
> LIFE"S MATRIX by Philip Ball (1999)

When we consume adequate amounts of water and other liquids, the body extracts sufficient water to keep the body functioning properly. Excess water, on the other hand, is excreted through the kidneys. If and when the consumption of water stops, the concentration of dissolved and suspended atoms, ions, molecules, enzymes, hormones, particles, etc. increases. When the cellular concentration of certain molecules reaches unacceptable or toxic levels, the cells start dying. When cells start dying, the tissues composed of these dying cells also start to malfunction and die. And so does the body. Dehydration as low as 6-8 percent (%) of the body weight will result in decreased body efficiency. This means that if you normally weigh 100 pounds, and suddenly lose 6-8 lbs of weight due to water loss, your body will become adversely affected. Extreme diets can easily exceed this amount of water loss, and can be harmful.

The body carefully monitors its store of water. If the body starts to dehydrate, the brain informs us that we are thirsty, and we head for the sink or the refrigerator. If conditions prevent us from responding to this thirst signal, the body conserves the water it has. Unfortunately, such conservation methods are never adequate. No matter how stingy the body gets with its internal water supply, the body continues to lose water via evaporation (sweat), respiration (breathing), excretion and cellular metabolism. Eventually, we reach a state of dehydration in which all of the major organ systems are affected. The body's electrical system, which includes the brain, spinal column and nerves, starts to malfunction by sending the wrong signals or no signals at all. We become confused, delirious and eventually, unconscious. The respiratory (oxygen transfer) system starts to lose its capacity to move oxygen from lungs to the blood. The body's capacity to eliminate carbon dioxide by transferring it from the blood to the lungs also becomes compromised. The digestive system is unable to metabolism food properly and vomiting may occur. In short, things become a mess.

Water, then, truly is first among equals in a sound plan for family preparedness. The remainder of this chapter will address a number of topics of interest. How much water should you store? If you choose not to store water but suddenly need it in an emergency, what are some emergency sources of drinkable water in your home? If the only water available to you in an emergency is dirty, contaminated or of questionable quality, what can you do to make it potable, i.e. drinkable? What is the shelf life of clean, stored water? Must you rotate stored water? What do LDS leaders have to say about water storage, in particular? And lastly, would you like to buy something in which to store water? Consider the commercial 7-gallon water container mentioned at the end of this chapter.

HOW MUCH SHOULD YOU STORE?

Figuring out how much water to store can be a bit confusing. The LDS Church recommends a year's supply of many things, to include "...food and clothing, and, where possible, fuel also." If you didn't know better you might think it best to also store a year's supply of water. Great idea! But hard to do!

Let's do some math. Water weighs 8.3 pounds per gallon. A human adult can survive nicely, but not extravagantly, on one gallon of water per day. Definitely do not plan on any less than that amount. That's half-a-gallon per day for drinking, and half-a-gallon per day for hygiene. To put this amount of water in perspective, we lose about a gallon of water per day in the heat of summer. This modest 8.3 pounds of water per day becomes over a ton and a half (3,021 pounds) of water per year for one person. A year's supply of water for a family of four would weigh in excess of six tons; a bit less if the children are young. Twelve thousand pounds of water is a bit much to store unless you are into industrial-sized, stainless steel, underground tanks. Don't forget the possible requirement of obtaining state and/or federal building permits while you're at it.

Fortunately, Civil Defense authorities in the United States recommend a two-week supply of water for emergencies. The LDS Church also recommends a two-week supply. A gallon of water per person per day, for two weeks (14 days), equates to 14 gallons per person for the two-week period. Small children require less, but it's easier to just remember the "14 gallons" and avoid working in fractions. This amount of water weighs slightly more than 116 pounds. Later in this chapter I will introduce, an easily lifted, 7-gallon, plastic container. Two of these are sufficient to store a two-week supply of water for one adult. These 7-gallon units also come with a plastic, adjustable, on-off valve that can be screwed into the top of the unit so that when you turn the unit on its side you have a gravity-fed source of water with an on-off switch, just like the spigot in your kitchen or bathroom sink.

OTHER WATER SOURCES IN THE HOME

> "The Ancient Mariner in the book by the same name declares, 'Water, water, everywhere, but not a drop to drink.' That's a pretty fair estimate when you consider that 1/100th of a percent of the world's water is drinkable: about one drop in every bucketful.
>
> The earth's supply of <u>fresh</u> water is quite large at 3.5% of the total water supply, but most of it is frozen in the ice caps and glaciers; thus leaving us with 1/100th percent.
>
> Around 30 trillion gallons of fresh water are recycled from the oceans to the land every day. Unfortunately, 2/3 of this amount returns to the salty, undrinkable seas and cannot be used by man. An additional 1200 cubic miles of fresh water is inaccessible.
>
> If water usage doubles over the next 35 years, the taps will certainly run dry.
>
> LIFE'S MATRIS by Philip Ball (1999)

In case an emergency hits and you've stored no water at all you have two basic alternative water sources. You either look outside the home for water, or look inside. We'll limit our discussion to emergency sources of water inside the home. Many types of emergency and catastrophe make it unsafe or unwise to traipse around outside during and/or after the event. If the emergency you are dealing with involves flooding, earthquake, tornado, nuclear war, civil disorder, etc., you may want or need to stay indoors for reasons of health and/or safety.

The three most accessible sources of emergency water inside the typical home include the water found in 1] toilet tanks, 2] water beds and 3] water heaters. In some cases this water can be consumed as is. In other cases it may need to be purified. We'll discuss a number of purification methods later in this chapter.

Toilet Tank. First, a word of caution! A toilet tank is not the same as a toilet bowl. The first (tank) is a relatively safe source of drinking water while the second (bowl) is questionable, at best. The "toilet tank" is the box shaped thing with a handle sticking out of it that you use to flush the toilet. In contrast, the "toilet bowl" is the oval thing sitting directly on the floor from which the family dog occasionally loves to take a drink. The "bowl" may have a dark ring on the inside of it where the water line is found. Would I drink water out of a toilet bowl? Possibly, if two conditions were <u>both</u> met. Yuck! First, if I was dying of thirst. Second, if I could purify the contaminated toilet bowl water with chemicals and/or heat. We'll talk more about water purification later.

The toilet tank should never be used as a source of drinking water if it contains any additives to sanitize, color or scent the water. For example, there are products that you put in the toilet tank to turn the water blue. There are other products you can put in the tank that don't change the water color at all, but still add invisible (and frequently odorous) chemicals such as bleach and/or lemon fragrance. Generally speaking, the water in a toilet tank is safe to drink without taking any additional steps to purify it. But avoid it if it contains any of the aforementioned "hazardous" materials.

Waterbeds. The water in waterbeds can yield a tremendous quantity of drinking water. It is also important to add a word of caution here as well. Most waterbed companies suggest you add a chemical to the water used in a waterbed. This chemical prevents algae from growing. Algae are the green stuff, plants — to be exact — that grow on the inside glass of fresh and saltwater aquaria. Algae tend to grow nicely in waterbeds because the heating element used to make the bed nice and toasty also promotes algae growth. And even though drinking "green" water with a slight odor might not kill you, some of the chemical additives used to control algae might. These chemicals certainly have the potential to make one sick. There are chemicals that retard algae growth in waterbeds that are not harmful if ingested. Read the label carefully before selecting any of these “algae killers” before using them in a waterbed in which you intend to store emergency drinking water. Drinking water from a waterbed containing these "safe" additives should be totally harmless, but let the buyer beware. A bit later in this chapter you will be told how to use chlorine bleach (without additives) to purify water placed in long-term storage. You should not conclude that since chlorine bleach can be used to purify drinking water that it should be used in your waterbed to kill the algae. Chlorine is a very reactive substance that will kill algae, but it may slowly dissolve the plastic waterbed material and/or weaken the seams over a period of weeks or months. Eventually, you'll spring a leak. Don't use bleach in a waterbed, even though it is strongly recommended for purifying water stored in other types of containers (even some plastic ones) resistant to chlorine.

Water Heaters. The water stored in your home's water heater should be perfectly safe to drink without taking any additional action other than draining it out of the heater with a hose, or directly into a pail. The water held in your hot water heater is the same water that comes directly into your home from a metal or plastic pipe buried in your front yard. Instead of going directly to the water faucet, however, some of this incoming water is diverted into the hot water heater so that it can be heated and stored until needed for a bath, shower, washing the dishes, etc.

From the moment you turn on a water heater, be it gas or electric, dissolved minerals in the water will begin to precipitate out and settle to the bottom of the tank. Hot water cannot hold as much dissolved mineral as can cold water and that's why your hot water pipes clog and corrode much sooner than the cold water pipes. This sediment accumulates into a wet layer of gritty "goop" at the bottom of the water heater. There is a male "garden hose" connection located at the bottom of every water heater that can be used to drain the water from the heater. It is always found at the bottom of the heater for the obvious reason that water flows downhill; it's a gravity thing. It is really there more for the purpose of draining off the accumulated sediment every year or so in order to extend the life of your water heater. If you don't periodically drain your hot water heater to remove this sediment layer, and most people don't, this goop will be the first thing that comes out of the water heater when you try to drain it for drinking water. Either drain your hot water heater every year or two to avoid the accumulation of sediment, or use a handkerchief or a pair of nylon stockings to strain the sediment that comes out of it before attempting to drink the water. The sediment isn't poisonous or dangerous. It is just an accumulation of minerals like calcium carbonate. If you've ever had a water-softening company sales representative visit your home to try and sell you a water softening unit, one of the tests they conduct is to use a small chemical testing kit to cause these minerals to precipitate out of the water before your very eyes. They use this tactic to explain, correctly so – I might add – that these minerals will get trapped in your washed clothing making them "stiffer" rather than "softer", and will also eventually clog your water pipes. In many parts of the country "water softening" units are virtually essential in order to prevent the clogging of water pipes in a matter of years.

Water Lines. There is one more cleverly hidden source of emergency water in your home although I'm pushing the "creativity envelope" by including it. But it is a source that you can tap under certain conditions.

The water lines in your home are always full of water waiting for you to open the tap thus allowing it to flow <u>under pressure</u>. These water lines hidden in the walls of your home generally hold two or three gallons of water.

First, let's identify when this approach makes sense. If the water lines leading to your home or neighborhood break (due to an earthquake, for example) there will be <u>no water pressure</u> between the water-line break and your home. You won't be able to get water to flow from your faucets into the sink or tub, nor to flow into the toilet tank after a flush. The water lines in your home still contain water, and gravity would normally cause the water to flow out of the pipes through the break in the water line, but it cannot. Why not? For the same reason a straw "works." Let me explain. The next time you're drinking soda through a straw, put your finger over the drinking end of the straw, and withdraw the straw from the glass of soda. Nothing comes out; the soda is trapped in the straw. The soda wants to respond to gravity, but when the smallest amount of soda tries to flow out of the end of the straw, the "soda" in the straw next to your finger creates a partial vacuum in the straw as it attempts to flow. And this partial vacuum in the "finger" end of the straw is stronger than the influence of gravity on the soda "in" the straw trying to flow out the other end. So nothing happens until you take your finger off the drinking end of the straw and get soda all over your pants. It's a gravity/vacuum thing.

The easiest way to access this trapped water is to place a large, clean container beneath any single faucet located at the lowest point inside or outside your home. Most of the time the water faucets on the outside of a home are a couple of feet **lower** than the water faucets on the first floor inside a home. Homeowners with basements, make a note. Make sure the container you use to catch these three or more gallons of water is both clean and large enough, or you'll waste some of this valuable water source. Open this "lowest" faucet a couple of turns even though no water will flow; remember, there is no water pressure on the water line leading to your home. Then go inside the house and open every faucet, including those upstairs if you live in a two-story house. Opening these inside faucets will break the vacuum seal on your water lines and the 2-3 gallons of trapped water will flow in response to gravity, even without water pressure. Don't forget to open the faucets in the showers as well. This method works whether you open the hot or the cold water faucet, or both faucets; opening either one is sufficient by itself.

Since builders sometimes do funny things with the water pipes they install, it's best to open all the inside faucets in order to drain every possible water pipe in the house. Once you think you've drained all the water in your house pipes, don't forget to close all the water and shower faucets tightly, both inside and outside the house. If you don't you're in for a big surprise, and possibly an expensive flood inside your home when the water pressure returns, especially if you happen to leave the house unattended when water pressure is restored.

PURIFICATION OF WATER

> "The challenge of securing safe and plentiful water for all regions of the world will prove to be one of our most daunting tasks. Water stress is already a grim fact in many regions, and climate change will disrupt the water cycle on a global scale. The impacts on global society, and especially the poor, can be devastating. Without drinking water there is no survival beyond a few days. Without water for crops, there is no food. Without clean water, there is pervasive disease, especially killer infectious diseases that claim millions of children's lives each year. Without readily accessible water, available in convenient locations, if not pumped directly to the household, there is drudgery in the world's impoverished villages for women and girls, who often spend hours each day walking many miles to fetch the household's water supply. And without secure water — for crops, livestock, and human use — there is conflict."
>
> COMMON WEALTH by Jeffrey D. Sachs (2008)

To be safe, drinking water must be devoid of harmful chemical or biological contaminants. Commercial units are available that claim to remove some of the following potentially harmful substances from water: bacteria, protozoa, amoeba, fiber, dirt, radioactive elements, chlorine, etc. The author is not aware of any single device or method that can single-handedly purify a water source containing all of the above contaminants. In some cases, a number of separate treatments may be required to make impure drinking water safe.

Water purification usually involves one or both of the following two processes: filtering and chemical treatment. Filtering agents like charcoal or spun fibers are used to trap or adsorb visible or invisible particles; in some cases dissolved gases. Eventually these filters will clog or become saturated such that they are unable to filter out additional materials; they must be replaced. Chemical treatment often involves the use of heat, silver, chlorine or iodine to kill or inactivate any "living" or biological contaminants in the water such as bacteria or viruses.

Water and Radioactive Fallout. Water contaminated with radioactive material, either from detonation of a nuclear weapon or the explosion of a “dirty” bomb, poses a unique problem. Fallout from a nuclear weapon contains large numbers of radioactive elements that include hydrogen, iodine, cesium, plutonium, carbon, strontium, uranium, etc.

Radioactivity associated with a dirty bomb generally refers to the explosion of some modest quantity of a single radioactive substance, so that only a single radioactive element is dispersed in the environment.

In and of themselves, these chemical elements are not harmful in reasonable quantities. The fact that they are radioactive, however, poses a problem. Radioactive materials emit energy either in the form of particles (electrons, alpha particles) or gamma rays (similar to X-rays). If these radioactive elements collect on your skin they can lead to severe burns. If these radioactive elements enter your body through the lungs (via breathing) or the intestines (ingestion) they often migrate to areas of the body that tend to naturally absorb or store these elements.

For example, iodine is accumulated in the thyroid gland in the throat area. This accumulated radioactive iodine then emits radiation from a highly localized area in the body (the thyroid gland) that can damage "nearby" cells and tissue. It also causes serious damage to the thyroid gland itself. Radioactive cesium-137, a calcium-like substance, is stored in bone and can lead to bone cancer. Radioactive hydrogen (known as tritium) tends to be dispersed throughout the body. The best advice concerning sources of drinking water during or after a nuclear attack or dirty bomb explosion is to avoid water that could in any way come in contact with these radioactive elements dropping out of the sky, or contaminating surface or subsurface water. Hence, you would avoid water taken from outdoor swimming pools, lakes, rivers, dams, etc. Generally speaking, water that is pumped out of deep reservoirs like the aquifer lying beneath San Antonio, Texas does not pose a problem. The radioactive particles tend to be trapped in the soil, clay, limestone, etc. through which the water has to percolate on its way down to the aquifer. Kearny (1987) explains how to build an inexpensive filter to remove dissolved and particulate radioactive matter from water. See the references at the end of this Chapter.

> "… evidently water is different [from other liquids], because rivers, lakes, and ponds freeze from the top down…water is densest not when it is coldest, at 32° F (0° C), but at four degrees above this. As the temperature increases from [the] freezing point, at first the density behaves 'normally,' declining with increasing temperature. So water close to [the] freezing point happily rides on top of water a few degrees warmer, because it is less dense.
>
> This might seem a trivial matter…Wrong. This minor deviance is a vital clue that true strangeness lies deep in water's character."
>
> LIFE'S MATRIX by Philip Ball (1999)

Liquid Chlorine Bleach. Chlorine in one form or another (solid or liquid) is regarded as one of the most dependable agents for purifying water. Standard liquid household bleach containing about 5.25% chlorine hypochlorite (standard strength) will kill harmful organisms and stop algae growth if added to water at the rate of <u>one-half teaspoon per five gallons of water, if the water is clear</u>; one teaspoon per five gallons if the water is cloudy. If the water is cloudy, the water and bleach should be well mixed and allowed to sit for half an hour before drinking the water. Household bleach does have a limited shelf life, so use fresh bleach.

For safety reasons do not purify water using household bleach that contains other additives, such as fragrances, soap additives or phosphates. The label should show sodium hypochlorite and sodium hydroxide as the only ingredients. And even then, the labeling can be misleading although not intentionally so. The last time I read the label on a household bleach bottle (2002) the only active ingredients were the two noted above. The "ingredients" listing did not reveal the presence of "fresh wildflowers" scent that was prominently displayed on the front of the label. Since the fragrance is not an “active” ingredient it was not listed on the ingredients list. So be careful; it looks as if non-active ingredients such as fragrances are not in the ingredients list even though they are in the product. Read the entire label carefully.

It was noted previously that both the LDS Church and the United States Civil Defense authorities recommend storing a two-week supply of water; 14-gallons. Later in this chapter a 7-gallon container will be mentioned for storage, for two main reasons: its convenient size, light weight when full, and local availability. How much bleach would you need to add to the 7-gallons of water in this container in order to retard algae growth and maintain the initial water purity directly out of the tap (clean water)? Try to figure it out.

Below is the answer.

$$\frac{7 \ gallons \ water \times 0.5 \ tsp \ Bleach}{5 \ gallons \ water} = 0.7 \ tsp \ Bleach$$

The recommended dosage of bleach to add to clean water for purposes of long-term storage is one-half (½) teaspoon of bleach per five gallons of water. Seven (7) gallons of clean water would require more bleach than what is required for 5 gallons of clean water. But how much more bleach is needed? The answer is $_7$7/5-ths as much bleach! Seven-fifths times 0.5 teaspoons of bleach equals 0.7 teaspoons of bleach. Rather than messing with fractions, I recommend using a <u>single teaspoon</u>

of bleach per seven gallons of water. The small amount of extra bleach does not have any negative impact on the stored water, the storage container or the person drinking it (see the end of this paragraph). It is best to err moderately on the high side when purifying water because different chemical and biological contaminants react differently to the same dose of a given disinfectant. If you don't like the taste or smell of chlorine in the water you are going to drink it's easy to remove the taste and odor. Simply pour out the amount of water you expect to drink the following day, and leave it overnight in an open, preferably wide-mouth container. The chlorine will "evaporate'' out of the liquid into the atmosphere, leaving no noticeable traces of chlorine.

You should write (on the storage container) the date when you added the bleach to the water, and check it annually. If you can still smell the presence of chlorine a year later, there is no need to add additional bleach to the water. If you can't smell the presence of chlorine then add an additional teaspoon of bleach, put the cap back on the container, shake the container a little in order to mix the bleach and water together, and put it back in storage. You're done!

Calcium Hypochlorite. Solid, granular calcium hypochlorite can also be used to purify water. It has the same purifying ability as the sodium hypochlorite found in liquid household bleach. The formula for using solid calcium hypochlorite is to dissolve one-half (½) teaspoon of the granules in one gallon of water, and then add one pint of this solution to 10 gallons of clean or tap water. If the water to be stored is cloudy or dirty, double the dose to two pints of solution and add it to the 10 gallons of dirty water.

Chloride of Lime. If you have access to the granular or powdered form of chloride of lime, simply dissolve one heaping tablespoon of chloride of lime in eight (8) quarts of clean or tap water. Then add one part of this solution to 100 parts of the clean water to be disinfected. Wait 30 minutes after mixing before drinking.

Tincture of Iodine. Iodine is an excellent water purifying agent. A 2% tincture of iodine solution can be added to clear water at the rate of 3-4 drops per quart; use approximately 8 drops per quart of cloudy water. The water must then be agitated thoroughly and allowed to stand for 30 minutes before drinking. A negative side effect of using iodine for water purification is the taste and smell resulting from the iodine. This is both a positive and negative result of using iodine. On the positive side the odor and taste is an indication (although not proof) that the water is safe because iodine is noticeably present. Unfortunately, the taste and odor is not a guarantee that sufficient iodine was added to purify the water. The negative aspect of iodine is that it tastes nasty and some people cannot tolerate it. CAUTION: iodine treated water should not be consumed by pregnant or nursing women, or people of either sex with thyroid problems. Tincture of iodine should only be used to treat small quantities of water.

Crystalline Iodine. Pure iodine exists in nature in crystalline form. It has a long shelf life that makes it ideal as a storage item for water purification purposes; you can store it until you need it. However, the taste and odor issues noted above are still present. Most providers of crystalline iodine direct that you should use about 10-milligrams of a saturation solution of iodine to a quart of water, allowing a contact time of 20 minutes at room temperature before drinking the purified water. A saturated solution of iodine is a mixture of iodine crystals and water that still has undissolved iodine crystals remaining at the bottom of the glass after an hour or more of contact time and mixing.

Water Purification Tablets. The Armed Services of the United States use an iodine-based tablet as their standard for water purification. The active ingredient in these tablets is tetraglycine hydroperiodide. That weird term "hydroperiodide" indicates this compound contains iodine. If you go into a store that carries camping equipment or supplies you will generally find these tablets on the shelf. In the past I have found this product at Wal-Mart and Kmart, for example. For purposes of writing this chapter I bought a water purification tablet sold under the name of Portable Aqua by WPC Brands Inc. The bottle contained 50 tablets. The instructions on the label specify that 1] the user should add two (2) tablets to one quart or liter of water, 2] apply the threaded cap loosely to the quart jar to allow a small amount of leakage, 3] wait 5 minutes, 4] followed by a shaking of the container to allow the screw threads on the closure to become moistened, and finally, 5] tighten the cap and wait 30 minutes before drinking

The product I purchased also contained a second small bottle. This additional product was designed to work with the water purification tablets. They were labeled "neutralizing tablets" and were designed to remove the iodine taste and color from the iodine-based purification tablets. The active ingredient in the "neutralizer" was listed as ascorbic acid. The instructions said to add two (2) neutralizing tablets to a quart or liter of purified water, shake well, and wait three minutes before drinking. It seems someone found a way to remove the iodine taste and color from iodine-purified water.

Boiling Contaminated Water. Lastly, "boiling" is a very effective way of purifying water contaminated by germs or viruses. Boiling may not get rid of radioactive fallout, dirt, arsenic or other toxic chemicals, but it can certainly kill living cells, and inactivate viruses. Before boiling water, it is best to filter out any silt or debris in the contaminated water, or let the heavier material settle to the bottom. Then decant the clear water and boil it, discarding the silt and other solid contaminants.

The amount of time water must be boiled to make it biologically safe depends on 1] the kind of germ(s), 2] the altitude at which boiling will take place and 3] a number of other factors we don't have time to get into. If you live at high altitude longer boiling times will be required to purify contaminated water. Remember, as you go up in altitude there is less air above you. With less air above you the weight of that air pushing down on you is less; hence, lower air pressure. This reduced air pressure makes it easier to bring water to a boil. This means that water can boil at temperatures below 100° C at higher altitudes; as in the case of mile-high Denver. Germs exposed to boiling water that is only at a temperature of 95° C are not as readily killed as those exposed to 100° C water. This phenomenon also explains why the baking instructions on cake-mix boxes tell you to adjust the baking time upward if you live at higher altitudes.

One source suggests boiling water for a minimum of five minutes. Another author suggests bringing water to a full rolling boil to purify it; but to be on the safe side he suggests continuing the boil for a total of five minutes, plus another minute for each thousand feet you are above sea level. Stevens (1997) recommends that water be boiled at a rolling boil for at least 10 minutes at sea level to make it potable.

Boiled water tastes flat (stale) because in the process of boiling a lot of dissolved air has been driven out of the water by the heat. To restore the normal taste to boiled water, simply restore the air. This is done by pouring the cooled water back-and-forth between two containers, or by vigorously shaking the cooled water in a half-filled container. Water that has been in storage for a long time may also exhibit this “stale” taste which can be readily removed as described above.

THE SHELF LIFE OF STORED WATER

When chemically and biologically "clean" water is stored in clean containers it will remain pure unless contaminants are allowed to get into the water. In this day and age, access to clean drinking water is a given, at least in America. The point to be made here is to keep your water stored in containers with tight-fitting lids in order to keep contaminants out.

Most disease organisms in clean water (tap water) tend to die during long storage for lack of food. Generally, the longer the water is stored, the safer it will become-bacteriologically. Because water quality varies greatly throughout the nation, no set rule can be given for the shelf life of stored water. Experience shows, however, that clean water taken directly from a tap and <u>stored several years</u> in clean glass or plastic containers cannot be distinguished by appearance, taste, or odor from <u>freshly drawn water</u> from the same tap except for “staleness” which is easy to remedy.

If this is true, why waste the time and money adding chlorine to clean water placed in storage? Good question! The addition of chlorine bleach to stored water is primarily an extra precaution. If you happen to store water in glass containers, and if small amounts of algae are found in the water, the chlorine will kill the algae. Fortunately, most commercial water storage containers are made of opaque (non-clear) plastic that prevents light from reaching the algae. Without sunlight, algae die.

The fundamental principle of "rotating" one's emergency supplies is still an important one, and should be applied to water as well. I store my water in opaque, plastic 15-gallon barrels. I use one (1) Tablespoon (i.e.-3 teaspoons) of household bleach per 15 gallons of stored water. This dosage is on the high side but I prefer the safety margin for the following reason. Once a year I open one of the two threaded plastic spouts located on the top of each barrel and smell the water to check for the presence of residual chlorine. If I can still smell the chlorine, I replace the spout and leave the water in storage. If I can't smell the chlorine I dump the stored water, replace it with new, clean tap water, and add the 1 Tablespoon of household bleach before sealing the drum. Do I really need to replace the water when I can no longer detect the presence of chlorine? Probably not! I could just as easily add another dose (1 Tablespoon) of bleach to the year-old water and put the barrels back in storage. So why go to the extra trouble of replacing originally clean water? Let's just say I'm extremely conservative (i.e.-careful) when it comes to family preparedness. Ultimately, the decision is yours.

GUIDANCE FROM CHURCH LEADERS

" … Moroni informed me of great judgments which were coming upon the earth, with great desolations by famine, sword, and pestilence; and that these grievous judgments would come on the earth in this generation."

Joseph Smith

WATER NEWS FROM VIENNA, AUSTRIA

The Associated Press released the following wire story from Vienna, Austria entitled "UN Puts the Focus On Water." The article appeared in one of the weekday issues of the San Antonio Express-News in the month of April 2002. It is reproduced below without modification.

> "Warning that 2.7 billion people face a critical shortage of drinkable water by 2025, the United Nations marked World Water Day on Friday with a call for a 'blue revolution' to conserve and tap the seas for new supplies. In fewer than 25 years, about 5 billion people will be living in areas where it will be difficult or impossible to meet all their needs for fresh water, creating a looming crisis that overshadows nearly two-thirds of the Earth's population," a U.N. report said.
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> "It was released in Vienna by the International Atomic Energy Agency (IAEA), a nuclear watchdog organization leading the United Nations' effort to draw attention to the world's water shortage and the need to save water whenever possible.
>
> "The simple fact is that there is a limited amount of water on the planet, and we cannot afford to be negligent in its use," said the IAEA's director; Mohamed El Baradei. 'We can't keep treating it as if it will never run out.'
>
> "Already, an estimated 1.1 billion people have no access to safe drinking water; 2.5 billion lack proper sanitation and more than 5 million people die from waterborne diseases each year — 10 times the number of casualties killed in wars around the globe," the report said.
>
> "Less than 3 percent of the world's water is fresh, and most of it is trapped in polar ice or buried underground in springs too deep to reach. Freshwater lakes, rivers and reservoirs may seem numerous but provide just a drop in the bucket," the report said.
>
> "Even where supplies are sufficient or plentiful, they are increasingly at risk from pollution and rising demand," U.N. Secretary-General Kofi Annan said in a statement, warning **'... fierce national competition over water resources has prompted fears that water issues contain the seeds of violent conflict.' "**

WATER STORAGE CONTAINER FOR SALE

There are plenty of inexpensive ways of storing water: glass canning jars, empty 1-gallon milk containers, 5-gallon plastic jugs you buy at military surplus stores, used 55-gallon plastic drums, etc. Everyone has to make his or her own decisions about how much water to store and how much to spend to do so. Within the next few weeks a sample of a locally available, plastic 7-gallon water storage container will be displayed in the foyer. Take a close look at it and decide if you want to make the investment, if you can afford it without going into debt, and if it is a solution that you like and want to embrace. There will be a separate handout explaining the water storage container being offered for sale this month, including its price.

RANTINGS, RAVINGS & REVELATIONS

Why does water rate so low among Mormons who are trying to decide what, and how much, to store? Why do we spend $400 on legumes (that's beans and peas to you and me) when water is free; and the water storage containers are cheaper than the cost of the dozen or so 5-gallon pails needed to store the beans? Why do we consider <u>last</u> that which should be <u>first</u>? And please don't haul out that verse that goes something like this: the first shall be last and the last shall be first. If you interpret that scripture correctly and apply it to water storage, it translates that those who value water the least will be the first to die.

If I had to guess why we discount water storage as much as we do, I would lean toward ignorance; a colossal, but blessed, lack of experience. Most of us were not born and raised in third-world, undeveloped nations. We did not watch our mothers haul 20-pound clay pots filled with 40 pounds of dirty water on their head or shoulders, from hut to river bed and back, each day. In our adolescence, we did not have to assume that burdensome task from our parents and make the repeated two mile round trip bare footed amongst thistles, thorns, ants and scorpions. We did not know that it was our germ-invested, parasite-ridden water that took the lives of many, if not most, of our siblings. And these siblings were often taken at an early age. Frequently, the parents joined the young in death when their "luck" ran out.

Instead of such lethal experience, the ubiquitous faucet has marked our recent American existence on this planet. By the age of four or five we know how to stretch our short arms the necessary length to turn on the tap and fill a cup. The water is clean and pure. It always flows. It is odorless and without "chunks." We don't have to filter it through our meager rags and soiled linens. And the source of our communal water is not commingled with the human waste flowing ever downhill toward exposed streams and aquifers. We never have to step outside our adorned homes for faucet or commode. And even though faucet and commode may be only a foot apart in an enclosed room, we are never at risk that the one will contaminate the other.

When the flow from the tap does stop abruptly once every decade, due to an unenlightened work crew armed with a $250,000 backhoe attacking a 48-inch water pipe, we are incensed. We are paralyzed. We flee our homes and head to Taco Cabana until the disaster is over; in a few hours or less. We write nasty "Letters to the Editor." We complain about our monthly $100-$150 water bills even though 97% of the water we purchase is used to color our lawns, not keep us alive. We assume "that" which has always been, will continue to always "be." We take for granted the blessings of this richly developed garden given to us by our Father because we are a covenant people. We forget these blessings are contingent upon obedience.

So how do we overcome our ignorance and arrogance concerning water? The answer is simple. We pay attention. We worry about the little things. We ponder and pray, maybe in that order. Paying attention to small things is a sign of respect, an opportunity to learn, a chance to grow. Let me demonstrate with an example.

A 50% Increase in Our Two-Week Supply of Drinking Water. It can't be done, you say. There is no way on earth you can turn 7 gallons of drinking water into 10-½ gallons — a 50% increase—by worrying; by paying attention. Remember, a two-week supply of water for one person consists of 14 gallons: 7 gallons for drinking, 7 gallons for hygiene. If you want the extra water you have to store it. It is blasphemous to assume every worthy member of the Church can call down a miracle akin to the loaves and fishes in the New Testament. I can hear the echoes in the foyer even now. "It's no wonder this 12-month program is not sponsored by the Church. This bozo is just another emergency preparedness quack whose elevator doesn't go all the way to the top floor." You may be right, but here's how it works; how little things do matter.

The 14 gallons of stored water recommended per person is a two week supply; a gallon per person (adult) per day. Of this supply, half (7 gallons) is for drinking and the other half (7 gallons) is for hygiene. Hygiene includes activities like brushing one's teeth, cleaning the body, and washing the dishes. Washing the dishes? Remember, if you have anything close to a respectable food storage plan, you're going to be eating at least 1,000 calories — hopefully 2,000 calories — of food a day from storage, if and when it's needed. You don’t want to die from food poisoning by eating using dirty utensils and dirty dishes.

Washing the dishes and utensils after each meal will probably consumes half of the ½-gallon of water per day used for hygiene. If you could eliminate this "dish washing" requirement you would have an extra ¼ gallon of drinking water each day; i.e., an extra 3-½ gallons of drinking water over-and-above our allocated 14-day (two-week) supply consisting of ½-gallon per day. In short, our drinking water allotment of ½-gallon per day for 14 days is increased to ¾-gallon per day for 14 days.

Better yet, if you stick to the plan of drinking only ½-gallon of water each day, this additional ¼-gallon of water per day provides an additional 3-½ gallons (7 days) of drinking water after the initial 14 days is over; assuming you consume this additional source of drinking water

If you consume these 3-½ gallons of drinking water at the rate of ½-gallon per day, it will last an additional 7 days, extending the supply from 14 to 21 days. Unfortunately, at the end of the original 14 days you've run out of water for the other hygiene items you probably shouldn't eliminate: brushing teeth and cleaning the body. But once again, you have your agency.

Option I: you can use the extra 3-½ gallons of water to provide drinking water for an additional 7 days at a rate of ½-gallon per day. The downside consequence will be a major problem with body odor and halitosis. Option 2: you can use the extra 3-½ gallons of water to provide both drinking water AND to attend to your personal hygiene needs for a period of 3-½ days. The upside consequence will be more, and closer, friends. All joking aside, since one will die of thirst before starvation, it would be better to pare back on the hygiene and keep your family alive by carefully allocating your increased water supply.

The problem with not thoroughly washing one's dishes and utensils after eating is the opportunity it provides for severe intestinal problems, infection, nausea, vomiting and/or food poisoning. I'm not sure of all the correct medical terms, but I know it isn't pleasant.

The answer to this dilemma is to save the water that would normally be used for washing the dishes and utensils by **throwing these dirty implements away** after every meal. That can be very expensive if you set your table with Noritake China and "silver"-ware three times a day. It's a steal if you eat off paper plates using plastic utensils. That's the solution. Include in your year's supply of food a year's supply of paper plates, plastic utensils and Styrofoam or paper drinking cups. The savings in water over a year's time is enormous.

The math for calculating a year's supply of these items isn't difficult. The following table indicates the cost of a "case" each of forks, spoons, knives, paper plates and 8-ounce cups at SAM'S. Adjustments need to be made to account for family size and number of meals eaten per day. My calculations do not provide for infants; parents must work that out on their own. I am also assuming that families will only require one knife per person per day; not one knife per person per meal. Most of us won't be carving much meat when the time comes to start using these eating implements. Those of you who plan on feeding each family member steak three time a day don't need my advice; just a very large walk-in freezer the size of a condo, and your very own hydroelectric plant. I can't wait to see the look on these people's faces when the Bishop invokes the Law of Consecration on day 15 of the 2-year drought and famine. If you're planning to splurge during the famine please save me a 12-ounce T-bone. My wife prefers the 6-ounce Filet Mignon. We'll bring our own plastic ware.

A Year's Supply of Paper & Plastic Ware

Although these prices (below) taken from SAMS' stores are a bit dated, these items are not prohibitively expensive for most of us. I priced the items based on the larger (and hence cheaper; per item) commercial sizes that SAMS sells. You will need to do the math: 364 days per year = 728 meals per person at 2 meals per day = 728 utensils, plates and cups per person! Five-hundred of anything is not enough for a year, but it makes a good dent in the goal. You might also be conservative and plan for only two meals per day per person; not three. Consider purchasing these items with another family so that you don't waste money on extra supplies that don't come in multiples of 365; split a case of "whatever".

ITEM	COST
500-count Dixie brand plastic forks	$5.29
500-count Dixie brand plastic spoons	5.39
500-count Dixie brand plastic knives	5.29
1,000-count Dart brand Styrofoam cups	10.99
500-count Bonanza brand, 9-inch paper plates	5.89

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