Staying Healthy with Nutrition

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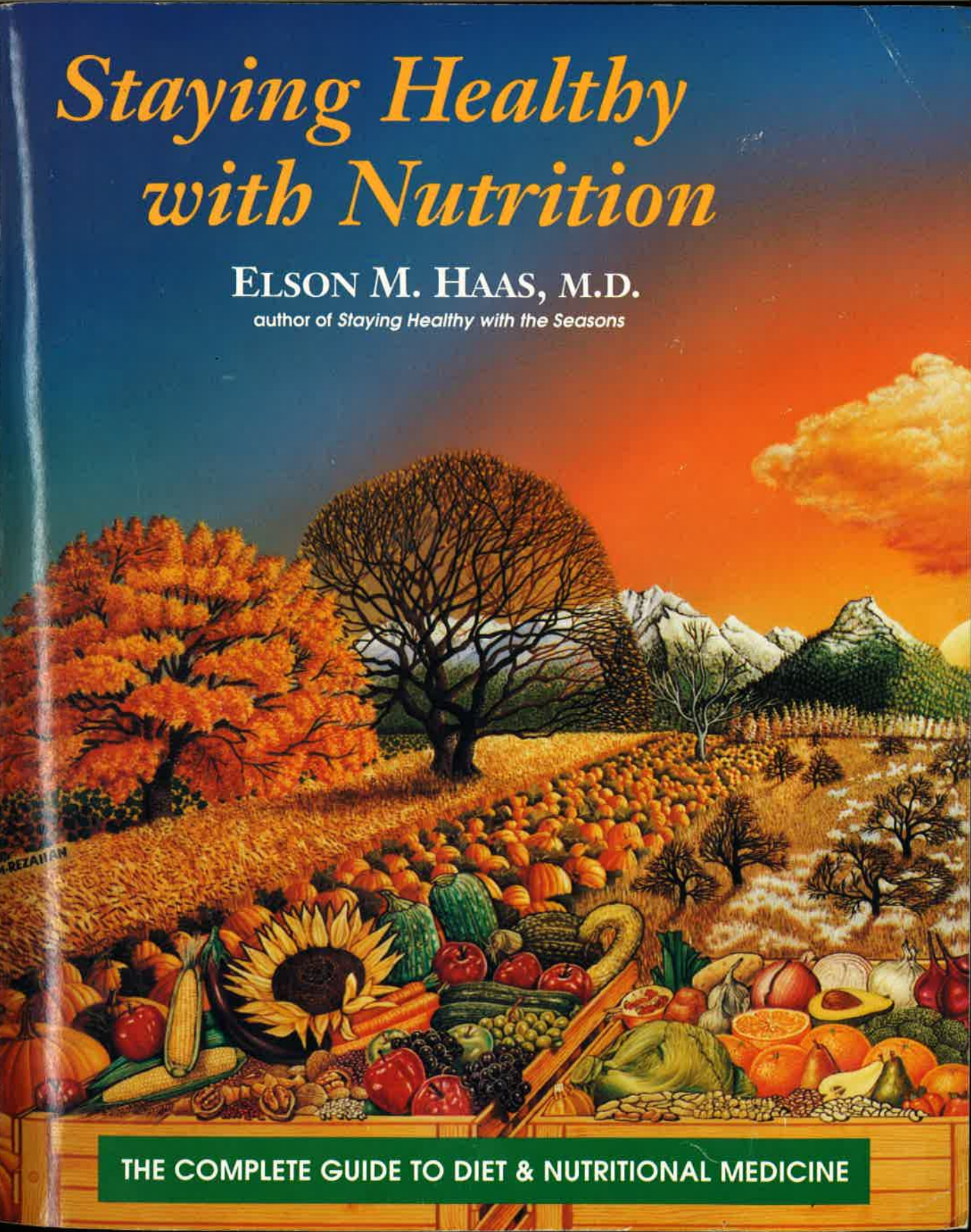


THE COMPLETE GUIDE TO DIET & NUTRITIONAL MEDICINE

Chapter 1

Water

Water is the medium in which all other nutrients are found. Three simple molecules, two hydrogen and one oxygen, bind together to form each molecule of water, the most abundant and important substance on Earth and in the human body. Pure water does not exist naturally on our planet; water is the universal solvent, and most other substances present on Earth dissolve in it to different degrees. The earth's natural water varies in mineral content, as does the water found within our bodies.

Our bodies are at least 60 percent water. It is the primary component of all the bodily fluids—blood, lymph, digestive juices, urine, tears, and sweat. Water is involved in almost every bodily function: circulation, digestion, absorption, and elimination of wastes, to name a few. Water carries the electrolytes, mineral salts that help convey electrical currents in the body; the major minerals that make up these salts are sodium, potassium, calcium, magnesium, and chloride. Water requirements vary greatly from person to person. The climate in which we live, our activity level, and our diet all influence our need for water.

Water is fundamental to all life on Earth. Without clean water we cannot experience optimum health. Awareness of the urgent need to address the issue of water pollution is growing. Subsequently, healing our waters and providing safe and tasty drinking water are becoming a major industry—filtered water systems, international spring waters, designer water, flavored waters, juice waters, and more.

Recognizing the importance of clean water, I wrote this chapter to offer you a synergistic collation of the most current, usable information; however, I am aware that it is not the final word. Much water information is purported as "fact" by business interests, yet scientific study is lacking. Surely this will change, so look for upcoming data on this crucial subject.

Since water is an essential part of our basic life needs—life force if you will—we could spend more energy and dollars researching how to keep it safe for human consumption. My concern is that our governments will wait too long to correct our current water problems, much like modern Western medicine focuses on end-stage disease over preventive medicine. Keeping people well and learning more about the factors that affect this goal, such as the chemicals in our environment, deserve a great deal more attention. Healing and maintaining Earth's environment, keeping our basic elements—water, air, and food—clean and wholesome, is a good place to start!

Drinking water has become an issue of concern. In all too many cases it has been shown that tap water is not totally safe. We need to ask what role drinking tap water plays in our health. What is its subtle effect on biochemical processes in our body, and what is its relationship to symptoms of illness or chronic disease? Not enough research has come out to date showing how tap water and its contents influence our health. Many cities' water has a high sodium level, which has been correlated with an increased likelihood of high blood pressure and subsequent cardiovascular disease. Soft water, in which a high level of sodium has replaced biologically important minerals such as calcium and magnesium, has also been implicated in reducing our resistance to heart disease.

With the trend toward using pure and natural products in personal health care, city tap water has come to be considered a processed, unnatural substance, containing potentially hazardous chemical additives. No wonder bottled water has become a huge industry in the last decade! For the most part, city water is heavily chlorinated to kill germs, fluoridated to prevent tooth decay, and some cities add calcium hydroxide or other alkaline substances to change the pH (acidity) of the water so it does not corrode pipes. Chlorine and other additives used to treat water can react with other organic chemicals to produce chlorinated hydrocarbons that may act as carcinogens. For example, the chloramines including chloroform and other trihalomethanes, are formed in water from chlorine and organic matter such as ammonia or decaying leaves. Water pipes may contribute chemicals or metals such as copper or lead.

○ CHOOSING YOUR DRINKING WATER

I have urged people for many years to use special purified drinking water and to avoid the faucet. I have not drunk tap water in more than a decade; instead, I have used well water or spring water collected from mountain or underground sources (unfortunately these waters can be contaminated also) or, more recently, home-filtered tap water. But lately there have even been questions regarding the purity of bottled waters and the effectiveness of filters. What is the right thing to do? Clearly, scientific research and the marketing information of companies selling water and the various water cleaners may differ. After all, advertising has a big influence on our nutrition in general

and certainly has and continues to be a hindrance that must be overcome to achieve a healthier diet and lifestyle. The government can only protect the consumer from gross misrepresentation and not subtle interpretation of "facts."

POSSIBLE CONTAMINANTS IN OUR DRINKING WATER (MUNICIPAL AND WELL WATER)

Lead	Bacteria	Asbestos
Mercury	Viruses	Radon
Aluminum	Parasites	Nitrates
Cadmium	esp. Giardia	Chlorine
Organic Solvents	Industrial Chemicals	Fluoride
	Pesticides	Sodium

Let's look at our drinking water choices before we decide. We don't want to worry or be fanatic, but since water is second in importance only to air for sustaining life, we do want to do the best we can with the current knowledge and inner guidance we have. Taste and smell can help us assess if our water is good for us. However, the presence of negative health factors may not alter taste or smell. If there is a question about water safety, we can have our drinking supply, whatever it is, analyzed for bacteria, minerals, or chemical pollutants.

My goal in this section on water, since there is much technical information I cannot include here, is to give you the basics about drinking water so you can at least ask yourself what is best. Water is an important component of nutrition. The first step of good nutrition is to know the origin, processing, and contents of anything we take into our bodies. Now let's talk about the many sources of water available to us.

Tap Water

Most tap water comes from surface reservoirs formed from rivers, streams, and lakes, or from groundwater. Groundwater refers to the subterranean reservoirs that hold much of the earth's water and supply nearly all the rural drinking water and about half of city water supplies. The water from these sources goes through local treatment plants, many of which use a very old process of settling tanks, filtration through sand and gravel, and then chemicals to clean up the water so it is fit for human consumption.

Many minerals and chemicals are used for "purification," including chlorine, alum or sodium aluminum salts, soda, ash, phosphates, calcium hydroxide, and activated carbon. Yet this process may not clear all of the many environmental pollutants that

can contaminate our water supplies, including animal wastes, local fertilizers, and insecticides; chemicals and wastes from industry; and air pollutants such as lead or radon. Toxic organic chemicals and petroleum spills can also pollute large amounts of water. Since much of this pollution affects groundwater as well as surface waters, most municipal or artesian well drinking waters are at risk and deserve our concern.

The January 1990 *Consumer Reports* analysis suggests that the three drinking water pollutants of most concern are lead, radon, and nitrates.

Lead may contaminate the water of more than 40 million Americans. It occurs mainly from corrosion of water pipes, from lead solder in plumbing, and from lead in brass faucets. The possibility of contamination is of greatest concern to people living in homes more than 30 years old whose pipes contain more lead, and for families with young children, who are more sensitive to lead toxicity (see Chapter 6, *Minerals*). Testing for lead is relatively easy and inexpensive. Reverse osmosis will remove lead; solid carbon filters may also remove it to some degree.

Radon is a radioactive gas by-product of uranium and is found in the earth's crust. High radon gas levels are associated with an increased risk of lung cancer. This carcinogenic element can be present in any home in levels high enough to cause concern but is more likely to be found in the northeast United States, North Carolina, and Arizona. Water that comes from wells and groundwater have a higher incidence of contamination. Municipal waters that come from lakes, rivers, and reservoirs are usually low in radon. When present in the water, radon can be released into the air with showering, laundering, and dishwashing. Radon in the air at home can be tested with several new devices available on the market. If present in the water in high amounts, radon can be removed with carbon filtration, but this system must be attached to the entire water system of the home.

Nitrates are suggested to be the third main risk in water. They are present mostly in groundwater sources that have agricultural contamination; these waters may also then have higher amounts of toxic pesticides and herbicides. High nitrate levels are of greatest risk to infants and seriously ill people. Nitrates are converted to nitrites by certain intestinal bacteria; these nitrites may alter the hemoglobin molecule, converting it to methemoglobin, which cannot carry oxygen. Rural families, especially those with infants and pregnant women, should test their water for nitrates. If it is present in high amounts, either reverse osmosis or distillation systems will help to clear the nitrate molecules.

Other major concerns in drinking water are the chemicals that are released into our waters by industry and the agricultural chemical pesticides, herbicides, and fertilizers that run off into local waters. These organic chemicals are more toxic and carcinogenic at lower levels than many other contaminants. The trihalomethanes (THMs) formed in chlorinated water are also a carcinogenic concern.

However, with all these possible health threats, the government would like us to believe that we should have no concerns about our drinking water. Clearly, tap water

consumption usually does not cause immediate or significant health problems unless it is contaminated with infectious organisms. Millions of people drink water from this source every day, though many avoid drinking it straight because of the taste. However, more research studying the relationship of drinking water to chronic disease needs to be done. Until we know more about tap water (and even well water) and its long-range effects, it is better to be careful and not drink it. In some areas, chemical contamination from using tap water for cooking and bathing may even be a concern. It may be worthwhile to analyze questionable water for toxic chemicals and metals, as well as analyzing its mineral content, hardness, and pH. Several companies in the United States analyze water, including Water Test in New Hampshire, National Testing Labs in Ohio, and Suburban Water Testing Labs in Pennsylvania. They all have toll free 800-numbers.

In a television special, "The Poisoning of America," the danger that our water is now in, both in the earth and at the tap, was made very clear. Though some countries have concerns about infectious water, that problem is minimal for us in America. Our woes are problems of modern technology—toxic chemical wastes, farming wastes, and heavy metals. Yet, technology can also help us correct these difficulties. We have made some progress with filtration, purification, and distillation through more chemicals and water units, but we still have a ways to go. I believe we can do better. I also believe it is going to take a half century or more to clean up our waters and counteract the destruction we've done to our planet. The generation born now through the end of this century will need to be the "dismantlers," the "cleanup" generation. Let us hope this process is successful.

Well Water

Well water comes primarily from groundwater supplies and can vary greatly in its mineral content. Some is very low in most minerals while other well water is a rich source of beneficial nutritional minerals such as iron, zinc, selenium, magnesium, or calcium. Unfortunately, groundwater may also contain toxic heavy metals or agricultural and industrial chemical pollutants such as pesticides, herbicides, radon, asbestos, or hydrocarbons (gasoline by-products).

If your water source is a well, have the water analyzed for bacteria, mineral content, and organic chemical pollutants. With a clean bill of health, go ahead and use this potentially nutritious water freely.

Spring Water

This is the "natural" water found in surface or underground springs. Some companies retrieve and bottle this water. Other than being disinfected (chlorine may be used), this water is not processed. The water tastes very different from tap water

and, to me, is a refreshing drink. The mineral content depends upon the region from which the water is taken and upon whether it is surface or underground water (surface spring water is relatively low in minerals). For example, the lakes, streams, and spring water from the southeastern and northwestern regions of our country are relatively low in minerals, and this "soft" water may increase the incidence of cardiovascular disease. The Midwest, in contrast, has high-mineral underground waters, and the farm people who drink this unchlorinated well water have a lower cardiovascular disease rate. Of course, there may be other lifestyle factors that contribute to this finding.

Just as groundwater can be polluted, spring water can also be contaminated. It is a good idea to have spring water checked out or to get full reports or summaries of tests from the company selling spring water. Ideally, these are independent lab reports performed yearly. Also, find out if the water is bottled at the source or transported and then treated and bottled. (Water bottled at the source is preferable.) Though spring water can be costly, it is high on the list of drinkable waters.

Martin Fox, in his book *Healthy Water for a Longer Life*, suggests that three ideal characteristics of drinking water are: (1) total dissolved solids of about 300 ppm. (parts per million), (2) hardness (containing at least 170 mg./l. of calcium carbonate), and (3) an alkaline pH (over 7.0), to reduce leeching of metals from pipes. Spring and well waters may fit into these categories.

Mineral Water

Really, most waters are mineral waters—that is, they contain minerals. In California, the standard for bottled mineral water is more than 500 ppm. of dissolved minerals. Underground bubbly water, called "natural sparkling water," usually contains lots of minerals, as well as carbon dioxide (CO_2). Many companies bottling this "mineral" water must inject CO_2 back into the water, since it is easily lost between the ground and bottle. Seltzer is any water that is carbonated with carbon dioxide; it is usually filtered tap water. Club soda is essentially the same, though it usually has more minerals added.

All of these types of waters can also be polluted, though any bottled carbonated water would be free of microorganisms, as they cannot live there. Generally though, they should be checked out for mineral levels and chemicals if you consume them in any quantity. I do not recommend, however, large amounts of these carbonated waters. The carbon dioxide can get into the blood and affect the acid-alkaline balance, although the body usually handles this easily through respiration or kidney filtration.

Filtered Water

Filtration, or purification, involves the removal of extraneous matter, be it chemicals, metals, or bacteria, from water. Legally, anything called a "purifier" must remove 99.75 percent of incoming bacteria. Americans are purchasing about two million

home filtering systems yearly, and there are a great many models from which to choose. There are several types of filtration systems that can be used, including carbon filters, both granulated and solid, and reverse osmosis. (Distillation will be discussed separately, next.) It is a good idea to educate yourself about water filtration before purchasing a home unit. In the long run, home filters/purifiers are the least expensive and safest way to obtain good drinking water.

Activated Carbon (AC) is the most common type of filter. The carbon, used for centuries as a filtering substance, is "activated" by exposing it to chemicals at high temperatures and steam in the absence of oxygen. That gives the carbon a large surface on which to attach and absorb contaminants. Most carbon filtration units mechanically and biomagnetically (ionically) filter the water and remove the unpleasant appearance, odor, and taste by cleaning it of bacteria, parasites, most viruses, chlorine, and the heavier minerals and particulate matter. However, carbon is best at removing organic chemicals and chlorine, not perfect for all microorganisms and metals. Basically, they will filter out any particles or organisms over 0.04 microns, or whatever the size of the filter pores. The filters can, however, collect bacteria and sediment; as a result, there is some concern that they may breed bacteria and dump them back into the water. Hot water should not be run through carbon filters because it can cause contaminant release. Carbon is excellent at trapping the larger molecules, chemicals, and larger microorganisms; it is not good at removing inorganic minerals including fluoride bound strongly to sodium or calcium, the way it is added to municipal waters. However, solid carbon filtration is believed to be relatively effective (this is still controversial) at removing many of the toxic minerals with higher molecular weights, such as lead or mercury.

The two main types of carbon filters are granulated carbon and solid carbon block filters. The granulated carbon filter has air spaces between the carbon particles to trap bacteria and remove it from the water; however, the bacteria can multiply within the air spaces. Silver is used in most granulated filters to assist in killing the bacteria. These "silver-impregnated" filters do help reduce the bacterial growth within the filter, but there are concerns about ineffectiveness and silver toxicity. Though granulated carbon filters are economical, their use is short-lived, and their safety is definitely questionable; I do not recommend them.

The Solid Carbon Block with its surrounding filter alleviates the concern of microorganism contamination. Not only can the filtering surface area of this denser carbon bed clean much more water but, because there is very little oxygen or supply nutrients within the filter, the germs will not thrive; however, to be safe, if the filter is not used for a day or longer, let the water run through it for 10–20 seconds before drinking. Research has demonstrated that these units also trap more chemicals, organic pollutants, radon, and asbestos than the looser granulated carbon filters. Some companies that sell solid carbon block water filters are Multi-Pure, NeoLife, and Amway.

Carbon filters are rated by volume of water treated, since they can hold only a limited amount of sediment. They should be changed regularly to avoid dumping more

bacteria and chemicals back into the drinking water and because the filtration slows down when they near the end of their effectiveness. The carbon filter may clean roughly 400–1,000 gallons, and each unit may vary depending on the amount of sediment in the incoming water. A unit should probably be changed at about 75 percent of its maximum capacity for best results. Figure your average daily usage and mark the time for change on your calendar. Activated carbon filters/purifiers, though more expensive than tap water, are usually less expensive than distillers or units that use reverse osmosis.

Reverse Osmosis (RO) is thought by some authorities to be the best way to purify water. Under pressure, usually from the tap, water flows through special membranes with microporous holes the size of the water molecule. These pores allow the water molecule to pass through while rejecting the larger inorganic and organic materials.

Reverse osmosis units usually have two or three filtering mechanisms. First is a sedimentation filter, which merely allows particulate matter to settle. Then comes the RO filter. It is followed by a carbon filter, which removes most any contaminants that may have passed through the RO membrane. With this system, virtually 100 percent of the organic material is removed, along with almost all the minerals.

Reverse osmosis units range from small home units to those of industrial size. Home units can make from three to ten gallons per day. They are energy efficient, as they require only tap water pressure, yet are not water efficient. Until recently, they were very expensive, but now there are good units available at competitive prices. Since the life of the RO filter is usually about five years, the price per gallon of water is approximately 20–30 cents. The carbon filter (and possibly the RO membrane) in this unit should be replaced every year or so, and this is relatively inexpensive. Disadvantages of RO units include their bulky size, the limitation of water production determined by the size of the holding tank (usually one to two gallons), and the time involved to prepare the water for drinking (often three to six hours per gallon). The units produce many gallons of "waste water" per gallon of drinking water because only 10–25 percent of the incoming water goes through the unit; waste can run between 2–30 gallons daily depending on the unit's efficiency. This is not ideal in droughts, though this waste water can be collected for other uses. RO units may not clear all bacteria and chemicals, though the addition of carbon filtration/purification makes them very efficient. Furthermore, RO units remove almost all minerals (high-calcium waters may clog their filters), which many authorities feel are an important component in our water. Concern over the same hazard of leaching body minerals from drinking distilled water exclusively is not yet well founded scientifically, though people drinking only these waters while fasting run the risk of depleting themselves more rapidly. Deionized water, though, different from RO or distilled, should not be used for drinking as it can deplete body minerals more readily.

Overall, reverse osmosis may be our key filtration system now and in the future, especially with more efficient and economical systems available. Reverse osmosis is best for removing dissolved solids, organic chemicals, and lead and other heavy metals.

Distilled Water

The distillation process involves vaporizing water (turning it into steam) in one chamber and then condensing it once again into liquid in a separate chamber. This removes all the minerals, organisms, and chemicals from the water. Distilled water should be pure H_2O. However, there is some concern that certain volatile organic chemicals will vaporize and recondense into the second chamber's water; therefore, distillation should be preceded by solid carbon filtration. There is also concern that heating water to 212 degrees Fahrenheit before drinking it changes the water so it has a different biochemical effect in the body. Home distillers are fairly expensive and require electrical energy to process a few gallons; furthermore, it takes significant time, usually five hours or more per gallon, for the water to be distilled, so this limits the amount available for use.

Distilled water contains no minerals (as mentioned, distillation takes out everything except volatile chemicals). Therefore, when consumed, it tends to attract minerals (and toxins) to balance with the other body fluids. The regular consumption of distilled water, especially by someone who may already be slightly deficient, can cause mineral deficiencies. Fasting for long periods exclusively on distilled water "to pull out toxins" is not recommended because of the potential mineral depletions it can create. However, when doing extractions, as in making herbal teas, distilled water may help bring out the most in the medicinal properties of the herbs. Also, during detoxification diets, distilled water may be suggested because it may be more effective for this process, having a stronger "magnetic" charge to pull out toxins.

Note on Demineralized Water. Many nutritional advocates, mostly the elders, recommend drinking demineralized water because they believe that the inorganic minerals contained naturally in some waters are not usable by the human body, that these naturally dissolved inorganic minerals may even cause problems. This is simply not true; many of the minerals we acquire are in the inorganic or salt state and are not part of organic tissues. They can still be assimilated and used by the body. The mineral levels in water, however, are not anywhere near sufficient to satisify body needs. Cooking foods in demineralized water pulls more minerals from them, whereas using water containing natural minerals will lessen this loss and possibly even improve food values. Furthermore, many of the dissolved solids, such as the trace minerals selenium, zinc, or silica, found in natural waters are associated with lower cancer rates in the people who consume them than in people who consume treated or demineralized water. Many of the cultures in which people live long healthy lives are located in regions with mineral-rich mountain waters. These waters have always tasted the best and felt the best to me when I have had the opportunity to drink them. Overall, I believe that the naturally occurring earth minerals contained in our water are beneficial to our health.

○ SO, WHAT DO WE DRINK?

Water is the substance we need most, and since good drinking water is so important to health we should know about the water we use and what it contains. Water contamination is inescapable, so we need help. If there is any question about the water we drink, we can have it checked for bacteria count, mineral content, and the presence of a wide number of chemical pollutants. Should there be concern over what it contains, we should then find a filtration and/or purification system that makes it safe and healthy or find another source of drinking water.

In the past I believed that the prime choice of drinking water was the uncontaminated (these may be extinct) natural springs or wells of the earth. Especially if this water comes from the area where we live, it puts us in harmony with our environment and often provides important minerals (though it should be checked for abnormally high mineral content). However, because of our current pollution problems, it may be essential for all of us to purify our drinking water adequately now or in the near future.

Most of us who live in cities provided with tap water from treatment plants must take appropriate steps to make our water the best it can be. Bottled water is expensive and may come in polyethylene containers, which raise their own health questions. Besides, the water is often chlorinated and may have been in the containers for months, if not longer.

I now believe that we need to create a cost-effective and water-efficient system to protect us from water pollution. Current technology is advancing, and it seems that the combination of solid carbon and reverse osmosis will be the wave of the future and are currently the best ways we have to obtain clean water. Solid carbon alone can help clear most bacteria, chlorine, and most of the chemical pollutants that infiltrate our water. I personally have a Multi-Pure stainless-steel unit hooked up to our kitchen faucet so that my family can have purified water to use for drinking, cooking, and washing food (including our sprouts). This type of system is the most economical for the quality of water it delivers. Of course, it is more expensive than drinking tap water, so we must decide that it is worth the five to ten dollars a month it costs over time to know that our water is free of bacteria, chlorine, toxic chemicals, and most heavy metals. Solid carbon may actually be the best system for removing chemicals, one of our biggest concerns in drinking water. An added advantage of solid carbon block filters over reverse osmosis and distillation, besides lower cost-per-gallon of water and easier accessibility, is that they leave the natural trace minerals that our bodies can use. However, if nitrate levels are high or if we want fluoride removed, reverse osmosis is necessary. We should remember that solid carbon filters are very different from carbon granule filters (often silver impregnated), which can harbor bacteria and then release them, and chemicals, back into the water in even greater concentrations.

To review, the three common, effective home treatment systems are solid carbon block filters, reverse osmosis, and distillation. Purchasing prebottled water is an

WATER SYSTEMS ANALYSIS

	Source		Purification		
Contents	*Tap Water*	*Well or Spring*	*Solid Carbon*	*Reverse Osmosis*	*Distillation*
Chlorine	yes	not unless treated	removed	not removed unless carbon used also	removed
Fluoride	if added	natural or if treated	not removed	removed	removed
Bacteria	unlikely	possibly removed	most likely	removed	removed
Parasites	possibly	possibly	removed	removed	removed
Chemicals	likely	likely	removed	removed	possibly*
Basic Minerals	some	likely	not removed	removed	removed
Heavy Metals	possibly	possibly	some removed	removed	removed
Energy Factors					
Electricity Used	no	probably	no	no	yes
Wastes Water	no	no	no	yes	some

* *Potential volatilization of chlorinated hydrocarbons and other toxic chemicals.*

unnecessary expense, and in many cases, the water is not as good and definitely not as fresh as water purified at home. All three systems will remove chlorine (not RO alone), bacteria, metals, and chemicals, though I have some concern about volatile chemicals left after distillation. (Distilled water should be prefiltered by solid carbon.) Because solid carbon filtration is more economical in time, water use, and dollars and very good at removing chemicals, this may be the best process for city folk unless you want the added fluoride taken out. Solid carbon will not remove the fluoride ions, which are strongly bonded to sodium or calcium. Natural spring or well water that is tested and clean may be the best choice for people living in the country. (See more on water quality and contamination in Chapter 11, *Environmental Aspects of Nutrition.*)

Traveler's Water

In the United States and much of the Westernized world, the greatest concern is contamination of water by pesticides and herbicides used in agriculture; by chemicals, such as hydrocarbons, from industry; and by the chlorine and other agents added to kill existing and potential germs in the water. When traveling to Third World countries and other areas that do not "treat" their water, or when hiking or camping in nature areas of this country, we may need to take measures to make the water safe from microorganisms.

There are always potential dangers from microbial contamination in water or food. Awareness and safety measures are important. Untreated water may harbor bacteria or parasites most commonly, or viruses on occasion. Our mountain rivers and streams or lake waters may contain giardia or parasitic amoeba, campylobacter or other bacteria, metals, chemicals, or radioactivity. Common organisms that may cause intestinal infection in Third World countries (or in contaminated food or water in this country) include salmonella, shigella, E. coli, giardia, amoebas, and cryptosporidium. Contracting hepatitis from water may also be a slight concern, but foods are a more common transmitter of infectious hepatitis.

We have a few options concerning drinking water when we travel. First, we may carry our own water, although this is limited to short trips or when camping with a vehicle. We may also avoid drinking water totally as some try, for example, when traveling to Mexico or South America. Drinking bottled carbonated beverages such as waters, sodas, or beer usually keeps us safe from germs, as they cannot exist in the high carbon dioxide levels. But food might be washed or ice cubes made with contaminated water.

Overall, when traveling (or anytime for that matter), there are three ways to clean water to make it safer. These treatments are heat, chemicals, and filtration. At sea level, boiling water for one minute will kill bacteria and parasites; boil ten minutes to destroy viruses. For every 1,000 feet of elevation, add one minute to the boiling time to clean the water of possible germs. So in the mountains, at 10,000 feet, water must be boiled for 10–20 minutes, dependent upon your concerns. Little heating coils or stoves may be used, but overall this process may be cumbersome, especially when larger amounts of water are needed.

Chemical treatment may be simplest and the least expensive, yet it has drawbacks—most people do not like the taste and for some there might be side effects or reactions. Both chlorine and iodine have been used effectively for this purpose. Halazone tablets release chlorine into the water. Five tablets per quart will effectively kill almost all microorganisms, but the taste is not very exciting. In my opinion iodine is preferable, used as 2 percent liquid—ten drops per quart and let it sit for 30 minutes to kill the germs. Globaline is a crystaline iodine. One tablet can be added to a quart of water and will work in ten minutes. Overall, I believe that chemical treatment is a last resort for water purification.

Our goal at home or when traveling is to have germ-free water without chemicals or chlorine. Filtration is the best way to do this. I have discussed home filters. There are also filters designed for travel and camping. These are small units that have pumps so lake or river waters can be used. Since the recent outbreaks of giardiasis contracted by drinking the crystal clear, good-tasting mountain stream waters in our country, even wilderness packers need to carry some type of water purification. With the difficulty of boiling at higher altitudes and the distaste of chemical purification, filtration is the best way to go for backpacking, especially if large amounts of water are needed.

Most hand filters are granulated carbon, often with silver added. Though these are not ideal for home use, they are simplest for travel. They will take out some chemicals, but our biggest concern is microorganisms. Here the pore size of the filter, which should be clearly stated in the product information, is the crucial factor in determining what germs will be removed. The following chart shows micron sizes of relevant organisms.

Organism	**Size in microns**
Giardia lamblia	10–20
Amoebas	10–50
Cryptosporidium	2–5
Campylobacter bacteria	.2–.3
CMV and Herpes virus	.15–.2
Retro virus (AIDS)	.1–.12
Hepatitis viruses	.025–.04

The pore size of available filters ranges from 0.2—2.0 microns. They all will remove parasites, some will remove bacteria, but most will not take out viruses. In drinking water our biggest concerns are from parasites and bacteria; viruses, more unlikely to survive in water, are really a lesser concern. The Katadyn unit, claiming a pore size of .2 microns, may remove some viruses as well. It is the most expensive of the travel-pump units. Most of the available travel filters can clean about one to two pints per minute. If the water is dirty or turbid, use a prefilter such as a coffee filter or clean cotton bandana, for example, and pour the water through one of these before pumping. Prefiltering extends the life of the carbon filter.

○ WATER REQUIREMENTS

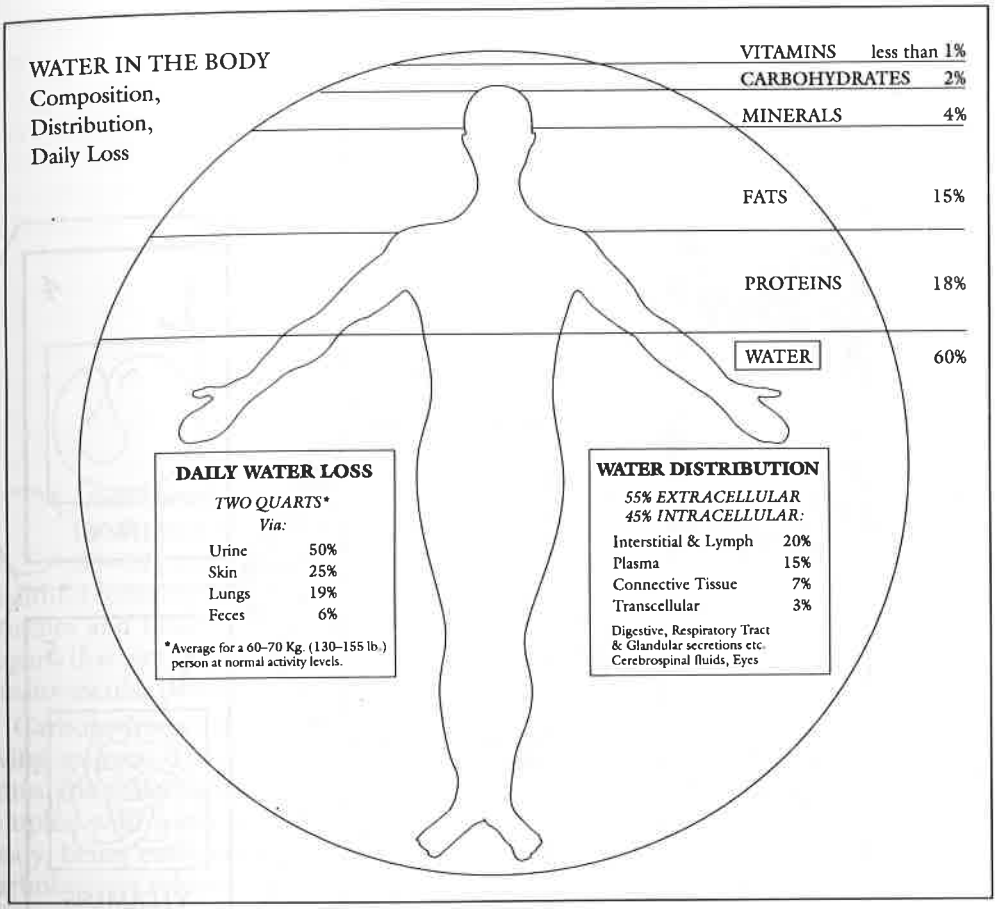
Water is essential for all life, and drinking the right amount is important to health. All the beverages we drink—teas, coffee, sodas, beer—are basically water that contains other ingredients as well. Drinking good water is still the best way, I believe, to obtain our fluid requirements.

The amount of water we need is based upon a number of factors—our size; our activity level, which influences the amount of fluid we lose through sweat; the climate or temperature (higher environmental temperatures increase our fluid losses); and our diet. A diet high in fruits and vegetables provides more total fluids through food than a diet high in fat, meat, and dairy products, for example. Special circumstances in which increased amounts of water may be needed include fever, diarrhea, kidney disease, or any situation where excessive fluid losses occur through normal body elimination processes.

We lose water daily through our skin, urine, bowels, and lungs (as water vapor in the air). About half of our water losses can be replaced with the water content in our food. The remaining half requires specific fluid intake, primarily from drinking good water. Caffeinated beverages, such as coffee, tea, cocoa, or colas, and alcoholic beverages do not count as the same volume of water because they act as diuretics in the body, increasing fluid losses from the kidneys.

The average human requirement is about three quarts of water per day, including food and beverages. An inactive person in a cool climate may need less, while an athlete training in the desert will need much more. People who eat a lot of fruits and vegetables, which are high in water content, will require less drinking water than people who consume proportionally more meats and fats, which are more concentrated and require additional water to help utilize them. In addition to a healthy diet containing fresh fruits and vegetables, I recommend that the average person consume at least one and a half to two quarts of water daily, because I also suggest a physically active lifestyle with daily exercise.

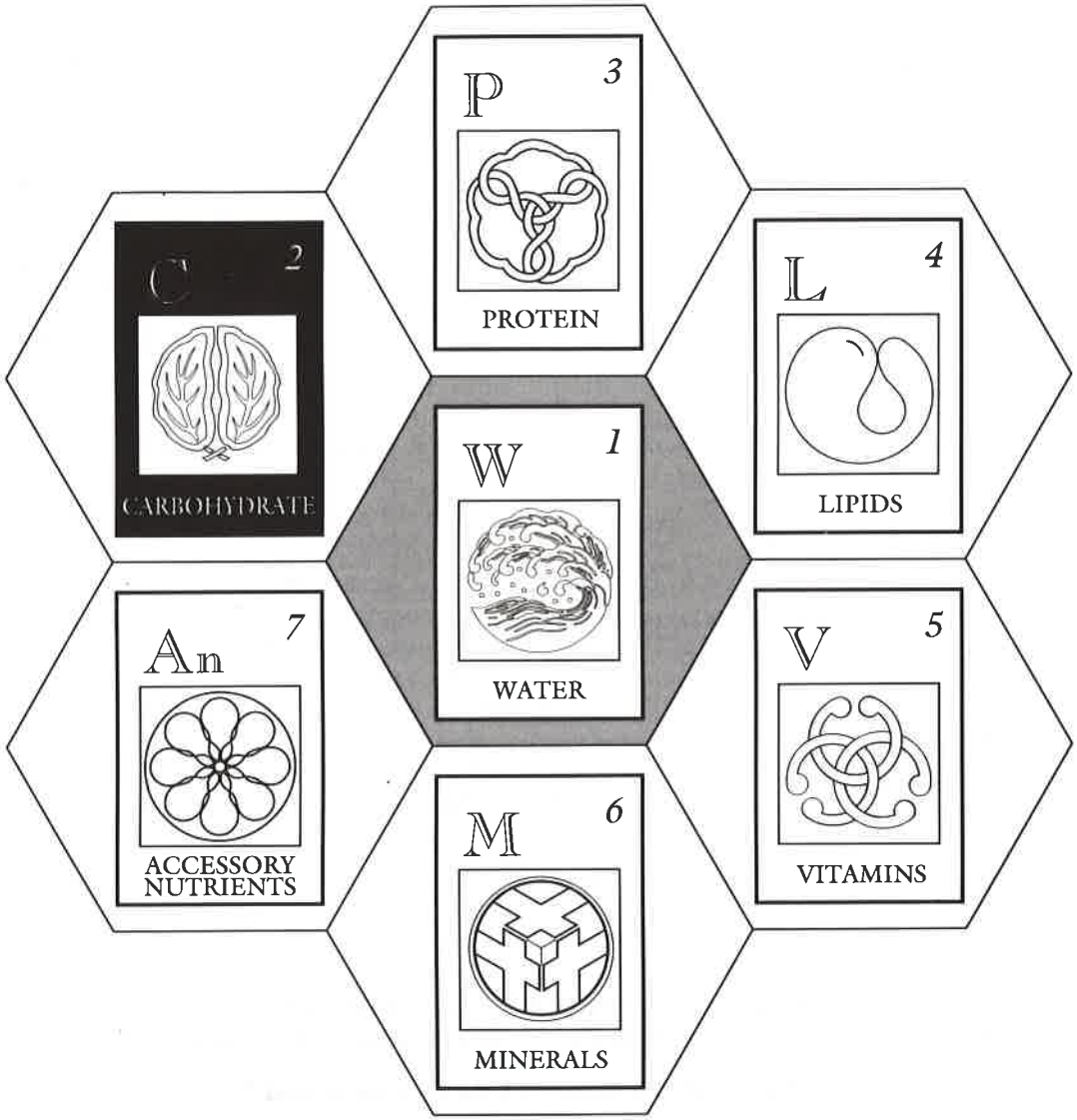
Water is best consumed at several intervals throughout the day—one or two glasses upon awakening and also about an hour before each meal. Water should not be drunk with or just after meals, as it can dilute digestive juices and reduce food digestion and nutrient assimilation. Some people like to drink a glass or two in the evening to help flush out their systems overnight, even though this may result in getting up during the night to urinate. It is important to drink water to avoid problems such as constipation and dry skin. Drinking enough contaminant-free water is likely our most significant nutritional health factor. Water will keep us current, clean, and flowing through life.



On the desk in my office, my purified drinking water is in a special gold-amber bottle engraved with the slogan:

"Nectar of the Golden Life of Health and Vitality."

I believe water to be that substance.


P
3
PROTEIN
C
2
CARBOHYDRATE
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LIPIDS
W
1
WATER
An
7
ACCESSORY NUTRIENTS
V
5
VITAMINS
M
6
MINERALS