

\$6.95



HEALTHY WATER RESEARCH

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Healthy Water

Martin Fox is an environmental researcher and nutritionist. His full length book, *Healthy Water For A Longer Life*, has been called "the best book on the subject"

INTRODUCTION

This booklet briefly summarizes the main ideas and research from *Healthy Water For A Longer Life*. (23) **Healthy Water** discusses both the beneficial and harmful substances commonly found in our drinking water and what steps to take to protect your family and yourself to enjoy a healthier life.

WATER: THE ESSENTIAL NUTRIENT

We can go without food for weeks, but without water we die of dehydration in a few days. Over two--thirds of our body is water, yet most of us probably don't understand the importance of drinking water, plain clean water.

Water is the most abundant compound in the human body. It is necessary for the digestion and transport of food to the tissues, for the elimination of body wastes, for the circulation of body fluids (like blood and lymph), for a lubricant in the joints and internal organs, and for the regulation of body temperature. **Water is part of the blood system holding dissolved minerals like calcium and magnesium in solution, making them available to body tissues where they are required for Proper health.**

We all drink water, yet ironically most of us are suffering from dehydration. We have been led to believe that only when we experience a "dry mouth" we must be lacking adequate water. This misunderstanding has resulted in many health problems. *Your Body's Many Cries for Water*, by medical doctor Feereydoon Batmanghelidj, thoroughly explains the forgotten physiological importance of plain water and the body's many signals of dehydration.

When plain water is plentiful, blood viscosity, joint cartilage, blood capillaries, digestion, the ATP energy system and the spinal column, all work in an efficient, easy manner. However, when water consumption is limited, the body robs water from some areas to protect different tissues and organs, which results in pain, tissue damage, and a variety of common health problems.

Some of the problems treated and alleviated with adequate water intake are: asthma, allergies, hypertension, high cholesterol levels, headaches, migraines, low back pain, rheumatoid arthritic joint pain, angina pain and intermittent claudication pains (cramp-like pain in the legs due to insufficient blood supply). (6)

As people age, they lose their thirst sensation and become gradually, chronically dehydrated. All too frequently we tend to confuse thirst with hunger and instead of drinking water we eat, leading to weight gain.

Peak performance is dependent on water, the essential nutrient. One example I read about several years ago illustrates this. Two European mountain climbing teams were competing. One team was in far better physical condition than the other team, but was unable to win. The frustrated defeated team started to carefully study the other team's every move. The only thing that they found was that after so many minutes of climbing each team member drank water. Copying this water intake regime, they become victorious. No longer were they dehydrated, lacking sustained energy. Optimum water consumption was the key to peak performance.

The physiological effects of drinking plain water is not the same as consuming beverages that contain water like juices, sodas, coffee and tea. In fact, some of these liquids, coffee and tea, contain dehydrating agents (caffeine and theophylline) which stimulate the central nervous system while at the same time creating a strong diuretic action on the kidneys.

Your body needs a minimum of 6 to 8 8 ounce glasses of water each day. Remember, alcohol, juice, sodas, coffee, and tea don't count as water.

Dr. Batmanghelidj recommends one glass a half hour before each meal and a similar amount 2 1/2 hours after each meal with an extra glass taken before the heaviest meal or before going to bed. As an experiment, record the number of glasses of water you drink over a normal 3-day period. You'll be amazed. Most of us think we are drinking far more water than we actually

do. In fact 3 to 4 glasses, at most, is what you usually find; far short of the 6 to 8. Try it and see.

Thirst should be satisfied at all times with water. The more we pay attention to the body's constant need for water the healthier we will be. Having a “dry mouth” is the last outward sign of extreme dehydration. Many medications actually dehydrate the body, leading to more severe problems.

Keep in mind, the human body is roughly composed of 25 percent solid matter and 75 percent water. Brain tissue is said to consist of 85 percent water and the blood is 90 percent water. **Water - plain, properly filtered water - is an overlooked and essential nutrient and may be your missing ingredient to a healthier, more vibrant, and longer life.**

THE WATER STORY & HEART DISEASE

Over the years many studies have been published on the relationship between drinking water and cardiovascular mortality. Two beneficial factors continually stand out - hardness and total dissolved solids. Both have been associated with lower mortality from heart disease. Hardness refers to the amount of calcium (Ca) and magnesium (Mg), or calcium carbonate in the water. The more Ca, Mg, or calcium carbonate, the harder the water the less the softer the water.

The first major study on drinking water and heart disease was in 1960 by Schroeder. In his paper, “Relation Between Mortality from Cardiovascular Disease and Treated Water Supplies,” the water in 163 of the largest cities in the United States was analyzed for 21 constituents and correlated to heart disease.

He concluded “Some factor either present in hard water, or missing or entering in soft water is associated with higher death rates from degenerative cardiovascular disease.” (48)

1979 after reviewing fifty studies, Comstock concluded, **“In there can be little doubt that the associations of water hardness with cardiovascular mortality are not spurious. Too many studies have reported statistically significant correlations to make chance or sampling errors a likely explanation.”** (16)

He suggests that the reason for this association is due to a “deficiency of an essential element or an excess of a toxic one.” Certainly a combination of both is also possible.

Today, after thirty years of research we are left with possible. Schroeder’s initial **conclusion, drinking hard water results in less cardiovascular disease than drinking soft water.**

Yet over the years there have been several published reports analysing specific elements in drinking water and their possible relationship to heart disease. One researcher studies zinc, another copper, another selenium, and so on. And as you read this material, you find an inconsistent and confusing picture. But, if you look at the broader picture, if you look at the studies on hardness, **you will find very consistent results: the harder the water, the less heart disease deaths.**

In most cases the harder the water the more Ca and Mg is in the water. However several interesting studies indicate that Mg might be the more important of the two elements.

Professor Ragnar Rylader notes that studies in Switzerland, Germany and Sweden show that when the Mg in drinking water exceeds 10-15 mg/L, the rate of mortality falls in comparison to neighbouring communities with lower levels of Mg in the water. Some studies recommend 20 mg/L as the ideal Mg level. However, there are studies showing 6 to 8 mg/L is highly beneficial while some bottled water manufacturers go so far to claim that 90 mg/L is best. (46)(33)(34)(35). At this time I do not believe that Mg is the all encompassing “silver bullet” that some claim. But I do believe it is important. **Knowing the levels of Ca and Mg in your drinking water is**

worthwhile. Look at both the hardness levels and the specific amounts of Ca Mg.

Before highlighting some of the major studies, let's discuss total dissolved solids (TDS). TDS is a measurement of all the minerals in drinking water. TDS not only includes calcium and magnesium (the hardness factors), but also zinc, copper, chromium, selenium and so on. Sauer analyzed 23 drinking water characteristics in 92 cities ("Relationship of Water to the Risk of Dying") and found, **people who drank water higher in TDS had lower death rates from heart disease, cancer, and chronic diseases than people who drank water with lower amounts of TDS. (47)**

Frequently, where the water is hard, the water is also high in TDS. Although most studies on heart disease have not looked at TDS, but only at hardness, this factor has been ever present and may be playing a very significant role.

The more we try to isolate and study the impact of individual minerals the more we can lose sight of the unifying, comprehensive, beneficial factors present in water like hardness, TDS, and pH. Perhaps one of the main reasons there are inconsistencies in the water story is simply because we are obsessed to locate a specific isolated element that is responsible for the beneficial effects of healthy drinking water.

Let's look at some of the major studies. In Great Britain, the British Regional Heart Study analyzed 253 towns from 1969 to 1973. They found 10% to 15% more cardiovascular deaths in soft water areas than in hard water areas. They suggest that the ideal amount of hardness is approximately 170 mg/L (or ppm parts per million). (50)

In the United States, Greathouse and Osborne studied 4200 adults, ages 25 to 74 in 35 different geographic areas. Their findings also showed less heart disease mortality in hard water areas than in soft water areas. (26) **A report by the Oak Ridge National Laboratory found that the calcium and magnesium in hard water reduces the risks of heart attacks and strokes.** This study compared the health records of 1,400 Wisconsin male farmers who drank well water from their own farms. The farmers who drank

soft water suffered from heart disease, whereas the farmers who drank hard water were, for the most part, free of the problem. (63)

Sometimes, the best experiments are those nature has been silently conducting for years. Some of the most revealing water studies highlight two neighboring towns in which one town alters its hard water to create a softer water. What are the results of this action? A higher rate of heart disease mortality. We see this in the English towns of Scunthrope and Grimsby. Both towns drank the same water with 444 mg/L of hardness and had identical heart disease mortality rates. Scunthrope softened its water to 100 mg/L of hardness and within a few years a striking increase in cardiovascular deaths occurred. Whereas in Grimsby the rate was virtually the same as it had been. (51) This pattern has also been reported in the Italian towns of Crevalcore and Montegiorgio and the Abruzzo region of Italy.

The National Academy of Sciences concluded, “An optimum conditioning of drinking water could reduce the amount of cardiovascular disease mortality by as much as 15% in the US research, two facts stand out. First, there is a definite relationship, a clear association between water hardness and heart disease mortality. We should try to drink water that has approximately 170 mg/L of hardness, the level found ideal in Great Britain. Second, there is a definite relationship with TDS and heart disease mortality. Higher levels of TDS result in less heart disease. **Proper levels of hardness and TDS are two of the beneficial properties in drinking water constituting a healthy drinking water.**

SODIUM & HYPERTENSION

Several studies have been published on sodium in drinking water and its effect on blood pressure. First some background. Many researchers believe a reduced salt intake can help lower blood pressure. There is evidence that low salt diets could help prevent high blood pressure in humans. However, many factors are involved in high blood pressure besides sodium. Diets high in potassium, rich in vegetables and less meat consumption have been shown to be effective in reducing or preventing high blood pressure. **Also adequate calcium and magnesium intake are instrumental in lowering blood pressure. And chloride, not sodium, has been found to be a key factor in raising blood pressure. Salt is a combination of sodium and chloride.**

Many experts worldwide claim 2 to 5 grams of salt daily does not pose any real problems for most people. However, in Western cultures, dietary intake of salt is between 8 to 15 grams daily. Ninety percent of all the salt we consume is from food, 10 from water. Now let's look at the research on sodium, hypertension and drinking water.

Some studies have reported that higher levels of sodium in drinking water resulted in higher blood pressure. (55) (28) However, most studies have not supported this finding. No correlation was found between high blood pressure and high levels of sodium in the drinking water in Illinois, Michigan, Iowa and Australia. (4) (27) (22) (39)

However, the vital question is: Are there studies showing a correlation between high levels of sodium in the drinking water and higher mortality rates? When we ask this question and look at the studies, we come up lacking.

Robinson in England and Wales and Schroeder, Sauer, Greathouse and Osborne in the United States studied this. None of these investigations showed that higher levels of sodium in drinking water resulted in higher levels of mortality. In fact, some of these studies indicated that higher levels of sodium resulted in lower death rates. (45) (48) (47) (26)

What about water softeners? Many people use them for their laundry and drinking water. Are they healthy? Some water softening techniques add sodium to the water, replacing significant amounts of calcium and magnesium. Other procedures do not add sodium but still reduce the hardness of the water.

Earlier, we discussed that people drinking harder water have less heart disease mortality rates than people drinking soft water. Softened water is unhealthy to drink - not because of the sodium, per se, but because of the lack or lower amounts of calcium and magnesium in the water. If you are now using a water softener, have a separate cold water line installed for your drinking water and install a proper filter unit on this line.

Recent statements from the American Heart Association and the World Health Organization recommend limiting the sodium in drinking water to 20 mg/L. In the United States, 40% of all the drinking water exceeds 20 mg/L of sodium. If we follow this advice, many people will have to purchase either low sodium bottled water or de-mineralise their own drinking water through reverse osmosis, distillation or de-ionisation.

But, if we adopt these procedures, we will create a soft water, a water low in hardness and low in TDS. The effect of this is to create an unhealthy drinking water. **Frequently water supplies high in sodium are also high in hardness (Ca and Mg) and TDS. Higher levels of hardness and TDS protect us from potentially harmful substances and have been shown to result in lower heart disease and cancer mortality rates. If we want to lower our sodium intake, we should look to our diets, 90% of all the sodium we consume is in the food we eat.**

THE WATER STORY & CANCER

It is estimated 60% to 80% of all cancers are environmental in origin. (21) There is a growing consensus that the majority of cancers are caused by chemical carcinogens in the environment and, hence, ultimately preventable. Several studies have demonstrated the presence of chemical carcinogens in surface water, ground water and municipally treated drinking water. In addition, trihalomethanes (THM's) can actually be produced during the chlorine treatment of our drinking water.

The amount of chemical compounds discharged in our water, directly or indirectly, is staggering. "Over 2100 organic and inorganic drinking water contaminants have been identified in U.S. drinking water supplies since 1974. Out of these 2100, 190 of the contaminants have confirmed adverse health effects, whether carcinogens, mutagens, teratogens or toxic."(17)

Even with the EPA drinking water standards, we cannot be assured that the tap water we are drinking is not going to weaken our immune system or lead to cancer. **Many cancer-causing agents take twenty to thirty years before the effects show up.** Each of us is metabolically different and reacts to carcinogenic agents in a unique way. Epstein sums it up, "There is no threshold for chemical carcinogens."

Information on a variety of carcinogenic agents in drinking water: fluoridation, chlorination and asbestos will be represented later. However, before looking at these, there is some fascinating research based on positive substances in drinking water that actually can help protect us from cancer. This research centers on four factors: total dissolved solids TDS hardness Ph and Silica.

Burton and Conhill analyzed the drinking water of the 100 largest cities in the United States . They found a 10% to 25% reduction in cancer deaths if the drinking water contained a moderately high level of TDS (around 300 mg/L), if the water was hard, if the water had an alkaline pH (above 7.0) and if the water had 15 mg/L of silica. (13) (14)

Sauer also found a correlation between silica and cancer. Namely, the more silica the less cancer. In addition, he uncovered that when the water was

hard, there was less cancer. **Therefore, drinking water with higher levels of TDS and hardness results in lower heart disease and cancer mortality rates.**

A comment on the Silica observations: In general, as researchers continue to study specific elements in drinking water and their relationship to cancer, we are going to see diverse and conflicting findings. For example, a report from Seneca County, New York revealed high levels of selenium in the drinking water was associated with a significant decrease in cancer.

When specific elements are analyzed we find diverse and at times confusing or conflicting results. This identical pattern was observed with heart disease studies. But, when we look at the inclusive water factors such as TDS and hardness, a highly consistent, meaningful picture emerges.

Button's work shows water with an alkaline pH is another key factor in lower cancer mortality rates. Very few studies have examined the positive or negative health effects of pH. However, his remarks remind one of Schroeder's findings.

Schroeder observed an alkaline pH resulted in less cardiovascular disease than water with an acid pH. For many years, people have thought that soft water is corrosive, that soft water leeches substances like lead and cadmium from water pipes. But it's the pH that causes the corrosive action and not the water's softness due to lower levels of minerals like Ca or Mg. An alkaline water should not leech heavy metals or chemicals from galvanized or PVC pipes into the drinking water **The positive picture emerging from this research is: drink water with around 300 mg/L of TDS and drink a hard water with an alkaline pH (7.0 or higher) to reduce the risk of cancer mortality.**

FLUORIDATION & CANCER

Now, let's turn our attention to some of the harmful substances commonly found in our drinking water.

Fluoridation is a highly emotional and controversial issue in which it's difficult to separate fact from fiction. The bottom line is: Is it effective? Is it safe?

Dr. Dean Burk, who worked more than fifty years in cancer research, mainly at the National Cancer Institute states: "More people have died in the last thirty years from cancer connected with fluoridation than all the military deaths in the entire history of the United States." (11)

Fluoride toxicity has been linked to genetic damage in plants and animals, birth defects in humans, especially Down's Syndrome, plus a whole series of allergic reactions ranging from fatigue, headaches, urinary tract irritations, diarrhea and many others. (56) The Marier--Rose study, "Environmental Fluoride 1977" by the National Research Council of Canada documents the mutagenic and chromosomal effects of fluoride as well as the evidence that chronic intake of fluoride interferes with the metabolism of calcium, magnesium, manganese and vitamin C. If all these problems can arise from too much fluoride, why do we have artificial fluoridation? Why do we add sodium fluoride to our drinking water?

The main reason given by pro--fluoridationists is that up to 1 part per million (ppm) or 1 mg/L (per liter) of fluoride will reduce tooth decay. However, no genuine scientific research has supported this contention.

Court testimony from a Illinois trial on fluoridation reveals: "Although attempts have been made, the United States Center for Disease Control and the British Ministry of Health admit that no laboratory experiment has ever shown that one ppm fluoride in the drinking water is effective in reducing tooth decay. Furthermore, they admit that there are no epidemiological studies on humans showing fluoridation reduces tooth decay that would meet the minimum requirement of scientific objectivity."

After a forty day trial, Judge Ronald A. Newman ruled, “a conclusion that fluoride is a safe and effective means of promoting dental health cannot be supported by this record.”

A full account of fluoridation and how it has become a political instead of a scientific issue is fully documented in Dr John Yiamouyiannis book, Fluoride: The aging factor argument is that up to the age of puberty there may be a temporary delay of about one tooth from decay. When you look at the problems of fluoridation, this insignificant temporary reduction in tooth decay is meaningless. Let's face it, tooth decay is not a fluoride deficiency disease. In most cases, tooth decay is caused by malnutrition and poor dietary habits, especially the over believe that fluoride in drinking water results in less tooth decay? I think this confusion originated in 1942 in Hereford, Texas, which was heralded as a 'town without a toothache.' Drinking water in Hereford, Texas had 2.3 to 3.2 ppm of natural fluoride. But it also had generous amounts of calcium, magnesium and other minerals. The prot fluoridationists pointed to the fluoride as the reason, for lower levels of dental fithties called attention to the hard drinking water as the possible reason for the benefits. “The damage fluoride does,” Dr. Heard stated, “is far greater than the good it may appear to accomplish.”

Colorado Springs, Colorado also has a high level of fluoride in its drinking water, 2.5 ppm, yet has a very high level of cavities. The Colorado Springs drinking water is very soft, low in calcium and magnesium. The water in Hereford, Texas was very hard, high in calcium and magnesium. **The beneficial element is hardness not fluoride levels.**

All the large scale studies done since 1970 have shown that fluoride is ineffective in reducing tooth decay. The largest study, conducted in New Zealand by John Colquhoun, reviewed the cases of 60,000 children and found no difference in tooth decay because of fluoridation. But it did find a 25 percent increase in dental fluorosis (fluoride poisoning of the teeth). The largest study of fluoridation and tooth decay ever done in the United States examined tooth decay rates of 39,000 children ages 5 to 17 from 84 different areas of the country. The results again showed no difference in the

decay rates of permanent teeth at any age that could be attributed to fluoridation. A Canadian survey found that the tooth decay rate in British Columbia, where only 10 percent of the population consumed fluoridated water, was lower than in any of the other provinces, where 40 to 70 percent were fluoridated. And four studies published in the Journal of the American Medical Association. In fact, many countries that previously adopted fluoridation have stopped. A few examples: Germany, no fluoridation, discontinued in 1971 for health and legal reasons, after eighteen years of experiments. Spain has no fluoridation, forbidden by law. France, no fluoridation, never considered it essential to good health. Sweden, no fluoridation, forbidden by law, discontinued in 1969 after a ten year experimental program. The World Health Organization (WHO) was asked by the Swedish government to produce evidence to support its earlier claim that fluoridation was safe. No evidence was produced. Parliament declared fluoridation illegal in November of 1971. (12) Many more countries are listed in Healthy Water For A Longer Life. (23)

“One tenth of all cancer deaths in this country,” Dr. Burk states, “can be shown to be linked to fluoridation of public drinking water.” That’s 40,000 extra cancer deaths a year. It’s ten times the number who die from asbestos-induced cancer and exceeds deaths from breast cancer. Yet 40% of the people in the U. S. continue to drink fluoridated water.

High levels of fluoride, artificial or natural can be harmful to our health. “The softer the water, the more fluoride passes through the intestinal wall.” (61) Experiments show that when the water is hard, less fluoride is absorbed. Therefore, if you are drinking a hard water, the harmful effects of fluoride will be reduced. If you wanted healthy teeth, correct your diet, drink hard water and avoid the addition of sodium fluoride to your drinking water. Use special filters to remove fluoride without removing the hardness (Ca and Mg) in the water.

ASBESTOS & CANCER

Asbestos is starting to be discovered in drinking water systems. The research on asbestos inhalation reveals the lengthy process needed to prove that harmful agents in the environment affect our health. Dr. Irving J. Selikoff painstakingly documented the relationship between occupational asbestos exposure and increased respiratory and digestive cancers began in 1924 and it took him several years before he was able to show convincing evidence that asbestos exposure causes cancer. In fact, he says, "For thirty years, labt oratories tried to produce cancer in animals with asbestos and were not able to. We learned in 1963 to 64 and now every patholotgist can produce them with ease. But for thirty years we couldn't." (49)

This inability to detect the cancerous effects of asbestos on animals for thirty years is disturbing. Most tests and subsequent standards on whether or not a substance is harmful to humans and in what dose is first based on animal studies. When animals are tested for potentially harmful substances, only one substance at a time is used. Yet when we drink water, we can be consuming many chemicals at the same time. With over 2100 organic and inorganic contaminants identified in our drinking water since 1974, does anyone know the synergistic effect these substances are having?

Selikoff discovered that most workers with less than twenty years of exposure had normal X--rays, despite the fact that they worked with asbestos fibers nearly every day. However, after twenty years, the X--rays commonly revealed extensive cancer development. Selikoff calls this the twenty to thirty years rule for environmental disease. It takes that long before we really start to see the harmful effects of many chemicals, and once observed the damage is frequently far advanced.

With this background, let's look at the research on asbestos fibers in drinking water. Probably the most publicized case took place in Duluth, Minnesota with the Reserve Mining Company and its dumping of taconite waste and asbestos fibers into Lake Superior. (52)

Although the cancer rates in the cities of Duluth and Minneapolis are similar, Duluth residents have higher cancer mortality rates of the stomach, small intestines, pancreas, gastrointestinal area and lungs. Remember, it took twenty to thirty years to have cancer from asbestos inhalation, yet we are starting to see cancer from asbestos in drinking water with only ten to fifteen years of exposure.

Studies in Iowa City, Iowa and in San Francisco, California also show the same harmful pattern with cancer locations similar to asbestos inhalation.
(19)(18)

Let's hope we don't wait thirty years to realize asbestos fibers don't belong in our drinking water. Proper filtration systems will remove asbestos fibers that may be present in our drinking water.

CHLORINATION

Is the chlorine in our drinking water a catalyst triggering tumor development both in atherosclerosis and cancer? The addition of chlorine to our drinking water started in the late 1890's and had wide acceptance in the United States by 1920. Joseph Price, MD wrote a fascinating, yet largely ignored book in the late 1960's, entitled Coronaries. Cholesterol. Chlorine. Dr. Price believes the primary and essential cause of atherosclerosis is chlorine.

“Nothing can negate the incontrovertible fact, the basic cause of atherosclerosis and resulting entities, such as heart attacks and most common forms of strokes is chlorine. The chlorine contained in processed drinking water. Chlorine in the drinking water of chickens. The results: 95% of the chickens given chlorine added to distilled water developed atherosclerosis within a few months.

Atherosclerosis, heart attacks and the resulting problems of hardening of the arteries and plaque formation are really the last step in a series of biochemical malfunctions. Price points out it takes ten to twenty years before symptoms in humans become evident. This time factor is reminiscent of cancer, which can take twenty to thirty years to develop.

Can chlorine be linked to cancer too? In the chlorination process itself, chlorine combines with natural organic matter, decaying vegetation, to form potent, cancer causing trihalomethanes (THM's) or haloforms. Trihalomethanes collectively include such carcinogens as chloroforms, bromoforms, carbon tetrachloride, dichloroethane and others. The amount of THM's in our drinking water is theoretically regulated by the EPA. Although the maximum amount allowed by law is 100 ppb, a 1976 study showed 31 of 112 municipal water systems exceeded this limit. (36)

According to some studies by 1975, the number of chemical contaminants found in finished drinking water exceeded 300. (59) In 1984 over 700 chemicals had been found in our drinking water. The EPA has targeted 129 as posing the greatest threat to our health. Currently the EPA enforces federal standards for 34 drinking water contaminants. In July 1990 they

proposed adding 23 new ones and expects to increase this list to 85 in 1992.
(2)

Another report claims the picture is much worse. According to Troubled Waters on Tap “over 2100 contaminants have been detected in U. S. drinking water since 1974 with 190 known or suspected to cause adverse health effects at certain concentration levels. In total, 97 carcinogens and suspected carcinogens, 82 mutagens and suspected mutagens, 28 acute and chronic toxic contaminants and 23 tumor promoters have been U.S. drinking water since 1974... The remaining 90% of the organic matter detected in drinking water has not been identified by testing to date. Compounds in these concentrations could pose serious toxic effects, either alone or in combination with other chemicals found in drinking water... Overall, available scientific evidence continues to substantiate the link between consumption of toxins in drinking water and serious public health concerns. Studies have strengthened the association between ingestion of toxins and elevated cancer mortality risks.” (17)

Studies in New Orleans, Louisiana; Erie County, New York; Washington County, Maryland; and Ohio County, Ohio reveal high levels of haloforms or THM's in drinking water. The result is higher levels of cancer. (40) (25) (15) (58)

“The continued use of chlorine as the main drinking water disinfectant in the United States only adds to the organic chemical contamination of drinking water supplies. The current federal standard regulation of trihalomethanes do not adequately protect water consumers from the multitude of other organic chlorination by-products that have been shown in many studies to be mutagenic and toxic.” (17)

“Chlorine is so dangerous,” according to biologist/chemist Dr. Herbert Schwartz, “that it should be banned.” Putting chlorine in the water is like starting a time bomb. Cancer, heart trouble, and premature senility, both mental and physical, are conditions attributable to chlorine treated water supplies. It is making us grow old before our time by producing symptoms of aging such as hardening of the arteries. I believe if chlorine were

now proposed for the first time to be used in drinking water, it would be banned by the Food and Drug Administration. M

Alternatives, such as chlorine dioxide, bromine chloride, and chloramines are just as dangerous as chlorine. We're replacing one toxic chemical with another positive side, some cities are starting to use aeration, carbon filtration, ultraviolet light and ozone as safe alternatives to chemical disinfectants. But the number of cities and people getting water from these safer methods are Ismincihmaorli. nation linked to heart disease and cancer?

In Super Nutrition for Healthy Hearts, Dr. Richard Passwater shows how "the origin of heart disease is akin to the origin of cancer." Chlorination could very well be a key factor linking these two major diseases. Chlorine creates THM's and haloforms. These potent chemical pollutants can trigger the production of excess free radicals in our bodies. Free radicals cause cell damage. Excess free radicals can cause normal smooth muscle cells in the arterial wall to go haywire, to mutate. The fibrous plaque formed is essentially a benign tumor. (41) Unfortunately, this tumor is linked with the origin of heart disease.

If your drinking water is chlorinated, don't drink it . You can purchase effective water filters to remove 99% of the THM's or buy proper bottled spring water. Just this simple safeguard may save thousands from heart disease and cancer, the two major degenerative killers in the United States.

ANIMAL EXPERIMENTS

The research discussed so far has been based mainly on human studies. They have led me to recommend drinking a hard water, a water moderately high in total dissolved solids with an alkaline pH as being a Healty water

Because of the general nature of human studies, animal experiments were designed to verify and expand the water story. A variety of animals have been studied: rats, horses, rabbits, pigeons and chickens. Most experiments used artificial hard water and artificial det mineralized soft water to which

potentially harmful agents were added. To my knowledge, the effects of different amounts of total dissolved solids or pH has not been studied on animals. Animals given hard water, spiked with a harmful substance, like cadmium, lead, chlorine or fluoride, have been compared to animals given soft water spiked with the same substance. **What is usually found is: animals drinking the hard water have less of the harmful substances in their tissues than the animals drinking the soft water!** (7) (42) (20) (38) (29)

Dr. Joseph Price did a series of experiments on chickens adding a chlorine solution to distilled water to one group and none to the control group. In a very short time, 95% of the chickens drinking the chlorinated water developed atherosclerosis. He then divided the original control group, conducted the exact same experiment and found the exact same results. (43)

Richard Bull of the EPA studied pigeons and the effects of chlorinated water. His findings support Price's work and go a step further. Pigeons given chlorinated water with only 80% of the RDA for calcium had serum (blood) cholesterol levels 50% greater than pigeons drinking unchlorinated water. A follow-up study revealed that when the pigeons were given 100% of the RDA for calcium there was no increase in the cholesterol levels of the chlorinated group. (1) Proper calcium levels protected the pigeons from some of the harmful effects of chlorinated drinking water.

The animal experiments dramatically and clearly support the main conclusions observed from the human studies. Namely, hard water is healthier than soft water. Either hard water ties up harmful agents (like lead, cadmium, chlorine, fluoride) and thereby lowers their absorption, and/or the minerals found in hard water provide needed beneficial nutrients which prevent the deleterious effects of toxic substances.

DE-MINERALIZED WATER

De-mineralized water contains little or no minerals. This is accomplished by distillation, reverse osmosis, ion exchange or a combination of these methods.

The research on heart disease and cancer shows a healthy water is hard and moderately high in TDS. Therefore, de-mineralized water which is an artificial soft water without calcium and magnesium, and very low in total dissolved solids, is not healthy to drink.

Yet, many people drink it. Usually, their thinking goes something like this. “I know I should drink water, but it’s so polluted with chlorine, chemicals and toxic metals; it’s not safe. So I’ll buy a distiller or a reverse osmosis unit that claims to remove everything from the water and now the water should be okay to drink.” Sound familiar?

When we act like this we are looking at only part of the story and not the whole picture. We are focusing on the harmful agents and not understanding the beneficial properties in drinking water. To drink healthy water we need to look at both aspects. We need to greatly reduce or eliminate harmful substances and still have beneficial minerals in our drinking water. In most cases, proper filtration systems or proper bottled spring waters will achieve this.

In fact, minerals in drinking water may be more easily and better absorbed than minerals from food! A leading authority of mineral metabolism, Dr. John Sorenson, medical chemist, states, “**minerals in drinking water are well absorbed.**” He has found that the metabolism of essential versus non-essential metallic elements is greatly affected by the amount of essential elements in the water. If the needed essential element is present, there will be little or no absorption of the of the nonessential element.

For example if high amounts of calcium and magnesium and low levels of lead are in the drinking water, the body selects the essential elements (calcium and magnesium) and excretes the non essential element (lead). If, however, there are low. levels of calcium and magnesium, the cells could

select the nonessential lead resulting in a dysfunctional protein or enzyme. If this occurs, the protein or enzyme could become toxic.

Distillers and reverse osmosis units provide soft, mineralized water without any protective minerals. The effects of any harmful substance in this softened water will be greatly amplified. A small amount of a harmful substance in the mineralized water can have a more harmful, negative effect on our health than the same amount in hard water.

For very different reasons both polluted water and demineralized water are harmful to our health.

BOTTLED WATER

Bottled water is big business. In 1989 sales were \$2 billion. One out of 18 families in the US buys bottled water. In pace--setting California one out of three indulge. Florida, Illinois, California, New York and Texas account for 87% of the total sales, with Californians buying over a half.

But is bottled water, a healthy water? It depends.

Ask yourself: Is the water hard? Is it moderately high in TDS? If the answers are “yes” then you probably have selected a healthy water. With bottled water the pH may not be as important as it is with well--water or municipal treatment systems where an acidic pH leaches harmful elements, like lead, from the pipes into the water. **Many bottled waters are simply processed water using distillation, reverse osmosis, de-ionization or filtration. Frankly, you can do this yourself and save money.** With over 700 brands of bottled water available in the US, around 80% are processed waters. (54) Laboratory tests have discovered that some bottled waters contained more THM's than surface and ground waters. Needless to say, bottled waters should be totally free of contaminants and chemical pollutants. This is not always the case.

If you decide to purchase bottled water, request a complete lab analysis from the company. Just because it's bottled water does not

mean it's free of harmful pollutants, nor does it necessarily fulfill the criteria for a "healthy water." Ideally, purchase natural spring or artesian waters that meet or come close to the criteria outlined for hardness (Ca and Mg) and TDS.

WATER FILTERS

Another alternative is water filtration systems. Naturally, this approach assumes the water meets the healthy water criteria for hardness, TDS and pH.

Water filters in this country are a big business, a billion dollar a year market, growing by leaps and bounds. Water today looks like the oil business of the 1950's.

One of the problems with water filters is understanding whether they are really doing a good job. Trying to evaluate a lab report from a water filter company can be very difficult, if not impossible.

A filter should be tested for twice its rated life. If it's good for 1,000 gallons, the tests should be for 2,000 gallons and not just 100 g or 10 g. Studies have shown for many filters that are not tested/rated in this manner, after 75% of "their rated" life, they can become much less efficient in removing harmful chemicals. Once you purchase a sink-top or under-sink filter, make sure you change the unit regularly. Don't just wait till it clogs up or for the water flow to decrease before changing the cartridge. Most units will make the water taste and smell better for a considerable time after they have ceased being effective in reducing chemicals.

For all practical purposes most sink-top or under-sink carbon units cannot reduce chemicals for longer than 12 months, regardless of how much water goes through them. This is due to the deterioration of the carbon caused by the repetitive action of passing water through the unit and letting the carbon dry out.

Each morning it's a good idea to run the water for a couple of minutes to flush away any toxic buildup that may be in the filter, before passing the water through the filter for consumption. Whole house systems don't have these problems, however be sure you get a system that backwashes regularly.

Recently, several States passed strict guidelines regarding testing and claims to protect consumers from inferior products. In some cases, having your water tested by a reliable independent water testing laboratory can be useful. However, for most of us on municipal water systems, extensive testing is sometimes overdone, expensive and unnecessary. Those on well water, however, should have a complete water analysis performed once a year by a state certified laboratory. This is because of the threat that underground water supplies can become contaminated at any time.

For the most part, the major problems in our drinking water are chlorine, organic chemical compounds, THM's and lead. The optimum filter is one that has been tested and proven effective in the reduction of these major pollutants and still leaves in the beneficial minerals, like calcium and magnesium.

SKIN ABSORPTION

Preliminary research suggests that the ingestion of harmful chemicals from drinking water may not be the primary route of exposure. Both skin absorption and inhalation exposure have been studied.

Skin versus oral absorption rates for the toxic chemicals -toluene, ethylbenzene, styrene - were studied in adults and children. These absorption rates appear to be similar to the rates of other chemicals commonly found in our drinking water. The following table is derived from this research. (10)

Average Skin Absorption Versus Oral Ingestion:

Skin Exposure	Absorption	Time	Ingestion	Consumed
Adult bathing	63%	15 min.	27%	2 liters
Infant bathing	40%	15 min.	60%	1 liter
Child	88 %	1 hour	12%	1 liter

Skin absorption rates are tremendous. People with pools and hot tubs especially take note! These calculations are based on hand skin absorption rates. The hand is a better barrier against harmful substances compared to other skin areas, which are highly sensitive. This means that the true absorption rates are significantly higher.

Are we at risk when we bathe or shower from the inhalation of chemical pollutants? Field studies using a model shower with water contaminated with TCE (trichloroethylene) show that the inhalation exposure from such chemicals is much greater than by direct ingestion. In fact, a person could take in 6 to 80 times more of the chemicals via inhalation. (3)

Based on skin absorption and inhalation exposure, having a proper water filter on the tap or drinking healthy bottled water may not adequately protect you and your family from the many harmful chemicals commonly found in water supplies.

Paying attention to the quality of our drinking water is not enough. "You can now envision a situation where the total body burden of volatile chemicals will be distributed roughly one third from inhalation during showering, one third from oral ingestion and one third from washing/bathing. In effect, this easily doubles or triples our exposure to the harmful chemicals found in water." (9)

Ideally, one should consider a whole house filtration system to remove the organic volatile chemicals from bathing water. In many cases a whole house system will also solve your drinking water problems too. Another option is to use shower filters for bathing and tap water filters for drinking.

CONCLUSION

The quality of drinking water (bottle or tap) is important to our health. Perhaps it's a missing link in your overall health program. Follow the guidelines on hardness (ideal around 170 mg/L); total dissolved solids - TDS - (ideal around 300 mg/L), and pH (alkaline - 7.0 or higher for well-water or municipal water). Combining these positive water elements with an intelligent and effective filtering of harmful substances results in a drinking and bathing water that is beneficial and safe. Evaluate your situation for a whole house filtration system or select properly tested drinking water filters and shower filters. All of this results in "drinking" a healthy water for a longer life.

