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How To Handle Drugs In Your Drinking Water

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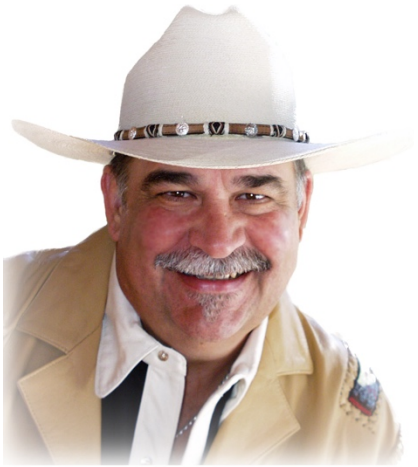

Lono Ho'ala

Author of the Best-Selling Book

"Don't Drink the Water"

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DRUGS IN YOUR DRINKING WATER

In March of 2008 the Associated Press reported that residues from a vast array of pharmaceuticals and personal care products (known as PPCPs) have been found in drinking water supplies across the country. These substances include dozens of different drugs and by-products including antibiotics, pain killers, anti-inflammatories, anti-convulsants, mood stabilizers, heart medications, bronchodilators, sex hormones, sun-screen agents, and fragrances.

While concentrations are measured in parts per billion or trillion, the long-term outcome of human ingestion of sub-therapeutic doses of numerous drugs is a troubling question. While researchers do not yet understand the exact risks, **recent studies have found disturbing effects on human cells as well as wildlife**.

Utility operators insist the water they provide is safe, but this is a story we've been told for decades. In reality, the EPA has forced many changes on the industry in response to overwhelming evidence that the drinking water they provide contains levels of contaminants that are far more toxic than once believed. Examples include disinfection by-products, arsenic, chemical residues, fuel additives, and many more. New studies suggest that the addition of fluoride to water by many municipal suppliers with the blessing of the American Dental Association is a very unwise practice, leading to an increased uptake of lead in children, neurological damage, hormonal disruption, and bone problems for the elderly.

Once more, **responsible people are finding out that reliance upon government about such matters is a poor substitute for self-reliance**. The purpose of this article is to arm people with what they need to know to protect themselves and their families from the dangers posed by contaminated drinking water.

WHY ARE DRUGS IN OUR WATER?

Drugs most commonly enter the environment in three ways:

1. **Humans and animals pass medicines and supplements through their system**. The use of both human and veterinary medicines is on the rise. These substances are not completely metabolized. Some pass through the body unchanged and re-enter the water supply through urine and feces.
2. **Drugs go unused** because they become outdated, the doctor discontinues old drugs and orders new ones, patients feel better or suffer

allergic reactions, or the patient dies. Because there is no effective drug disposal program **in America, most people throw their unwanted medicines in the toilet or trash where they contaminate our waterways.**

3. **Agricultural use of drugs**. Livestock are fed a cocktail of drugs to improve yields and resist infections. Some of these drugs are added to feed. Others are directly injected or implanted. Some of these drugs find their way into the waterways and aquifers that supply our drinking water

No matter how they get there, some drugs, including widely used cholesterol fighters, tranquilizers and anti-epileptic medications, resist common water treatment processes. **Sewage or water treatment systems are not specifically engineered to remove pharmaceuticals.** Furthermore, we don't know how many drugs are entering drinking water supplies because **no testing for such substances is required.**

ARE TRACE AMOUNTS OF DRUGS IN DRINKING WATER DANGEROUS?

Ask the pharmaceutical industry whether the contamination of water supplies is a problem and many officials will tell you no. *"Based on what we now know, I would say we find there's little or no risk from pharmaceuticals in the environment to human health,"* said microbiologist Thomas White, a consultant for the Pharmaceutical Research and Manufacturers of America.

But **recent laboratory research has found that trace amounts of medications affect human embryonic kidney cells, human blood cells and human breast cancer cells.** The cancer cells proliferated too quickly; the kidney cells grew too slowly; and the blood cells showed biological activity associated with inflammation.

In spite of this research, the sentiment of pharmaceutical companies is echoed by operators of municipal water treatment plants, many of whom authoritatively declare that the amounts of PPCPs found in water are too small to have any impact on human health and that their water meets or exceeds all EPA guidelines. Typical of this attitude are the New York City water officials who declined repeated requests for an interview with the Associated Press. Instead, they issued a statement in which they insisted, *"New York City's drinking water continues to meet all*

federal and state regulations regarding drinking water quality in the watershed and the distribution system."

To those concerned about this issue such statements sound like a whitewash. The problem is that **there are no federal or state regulations that address trace PPCPs or even require testing for them.** When the New York state health department and the USGS tested the source of the city's water upstate, what they found was trace concentrations of heart medicine, infection fighters, estrogen, anticonvulsants, a mood stabilizer and a tranquilizer.

While the human body displays an amazing ability to adapt and protect itself from environmental toxins, common sense says it was never designed to cope with a chemical cocktail of a dozen or more drugs delivered continuously over a half century. Pregnant women, children, immune compromised individuals, the elderly and the very ill are likely to be far more sensitive.

As Dr. David Carpenter, who directs the Institute for Health and the Environment of the State University of New York at Albany says *"We know we are being exposed to other people's drugs through our drinking water, and that can't be good."*

ARE DRUGS IN OUR WATERWAYS DANGEROUS FOR OUR ENVIRONMENT?

Research demonstrates that pharmaceuticals in waterways are capable of damaging wildlife across the nation and around the globe. Notably, male fish are being feminized, creating egg yolk proteins, a process usually restricted to females. Pharmaceuticals also are affecting species at the foundation of the pyramid of life such as earthworms in the wild and zooplankton in the laboratory.

HOW WIDESPREAD IS THIS PROBLEM?

We don't really know. **Testing for PPCPs is not required by any government agency.** Until the AP story broke researchers didn't realize the problem was as widespread as it apparently is. Unfortunately, **PPCPs are only one part of a much bigger problem.** Drinking water can be contaminated with hundreds of different man made chemicals as well as a variety of other toxic by-products of agriculture, mining, and manufacturing. As with PPCPs, the full extent of this damage is not

really understood because the EPA does not require testing for many of these substances.

TO PROTECT YOURSELF, TAKE PERSONAL RESPONSIBILITY

If you want to be responsible for your health you cannot exclusively rely upon government. Toxic water contaminants are too widespread and too expensive to completely remove. Over 90% of the water any city treats gets sprayed on lawns and cars or flushed down toilets. No matter what water treatment method is employed by your water provider, that water then has to travel through miles of underground pipes to get to you. Much of this infrastructure is ancient. **Some cities still have water mains made of lead!** You must become educated so you can take appropriate measures to protect yourself. Here is what you need to know.

FIVE RULES TO REMEMBER

1. Begin by realizing that pure water is a very rare commodity and certainly not something one can find in nature. Because water is such an excellent solvent, natural sources contain many contaminants, some of which are healthy, and some of which are toxic. **What you want is not pure water, but healthy water.**
    a. Healthy water contains high levels of minerals like calcium, magnesium, phosphorus, potassium, and other trace minerals. Unhealthy water can contain pathogenic organisms, poisonous heavy metals, as well as a wide spectrum of dangerous organic and inorganic chemicals.
    b. The majority of these substances, whether toxic or healthy, exists in solution and is part of what is called TDS (total dissolved solids.) One sample of water can have 50 ppm of TDS (primarily composed of arsenic) and be very toxic. Another can have 250 ppm of TDS (primarily composed of calcium and magnesium) and be very healthy. What this means is that contrary to what certain advertisers may want you to believe, **while TDS is a useful measurement for certain purposes, it is a very poor measure of water safety.**

2. **Just because your water supply is a well does not mean you are safe.** Water pollution is not confined to surface waters like rivers and lakes. **Even deep underground aquifers high in the mountains of Colorado are contaminated** with pesticides used by the Forest Service to control pine beetles, as well as gasoline additives from leaking underground fuel tanks located miles from private wells. Wells can be contaminated with pathogenic organisms like Salmonella or Cryptosporidium that penetrate well casings and breed in the well. These organisms can come from the feces of wild animals, livestock, pets, and even septic tanks and cesspools that are located too near a well. Wells can also produce water that is highly acidic thereby causing toxic chemicals to leach from pipes, plumbing fixtures and appliances.
3. **City water does not make you safe.** As the problem with PPCPs demonstrates, many toxins can be present in city water. A Cryptosporidium outbreak in Milwaukee killed hundreds and made many thousands quite ill. Salmonella outbreaks, while uncommon, can render the entire water supply of some communities unusable. Some toxins like chloramine and fluoride, are even added to water. No matter how well the city treats your water at the plant, once the water leaves the treatment plant it must travel through miles of pipes before it gets to you. In most cities, much of this infrastructure is very old. Many pipes contain lead. Some water mains in older communities are even made of lead. Some are cracked and where these cracks occur, contaminated ground water can enter the system. Chlorine and chloramine used to disinfect water creates toxic disinfection by-products. Finally, water treatment depends on machinery and this equipment breaks or suffers malfunctions – more often than the average consumer realizes.
4. You must understand that just because you see something advertised doesn't make it true. Advertisers are masters of the art of spin to make things seem far more attractive than they really are. **Advertisements for water pitchers, faucet-mounted filters, and water ionizers are especially deceptive.**
5. People can be very resistant to change. In some people, questions about the safety of their water supply can touch a very sensitive nerve. The

psychology is similar to the defiant attitudes that used to prevail years ago when seatbelt laws were first passed. Common examples include the many well owners who stubbornly refuse to test their water at all much less on a regular basis. Other people love to make authoritative pronouncements about how all this concern about water safety is overblown. Unfortunately, some of these people work at water treatment plants. **Don't listen to those who will tell you that all this concern about water is foolish. They don't have to live with the consequences of your choices. You do.**

WHAT WORKS TO REMOVE PPCPS

Most of the chemicals in question are known as "organic chemicals." This means that they are based on the carbon atom. In general, anything organic (molecules based on carbon atoms) is best removed from water using carbon filtration. However, not all carbons are alike, nor are all organic molecules alike.

Many of these PPCPs are very resistant to common carbon filtration. That is why reverse osmosis (RO) or distillation is often recommended. But these technologies also have their problems. **Some of these chemicals are capable of going right through an RO membrane or the process of distillation.** Because the volume of water is reduced during these processes, these chemicals become concentrated in the product water, sometimes by as much as three to four times. Water ionizers are even worse. The other problem is that those chemicals that are rejected become concentrated in the wastewater stream and are reintroduced into the environment in a concentrated form.

The best technologies to remove these chemicals from water operate by changing the chemical nature of the substance. The two methods that can most easily be employed in water treatment are oxidation and catalysis.

Oxidation is the process of removing electrons from substances to change their chemical nature. For example, when iron is oxidized (has electrons removed from the outer shell of its atom) it turns into rust. Dissolved iron can be very difficult to remove from water. By comparison, rust is simple.

Oxidation can be accomplished by the addition of oxidizing agents to water like chlorine, chloramine, or ozone. As long as there is enough of the oxidizing

agent in the water, and the agent is strong enough, the process can be very effective. The problem is that chlorine can produce disinfection by-products that are as toxic or even more toxic than the original chemical. That is why many water systems have switched to chloramine, which is a much weaker oxidizing agent, but because it is weaker, chloramine is ineffective on some PPCPs. Ozone is so strong it is extremely corrosive to equipment and so it is not widely used.

Oxidation can also be accomplished by passing water through a redox media like KDF®55 which promotes the transfer of electrons between substances. The substance that loses electrons is said to be "oxidized." The substance that gains electrons is said to be "reduced." That is why KDF55® is called a "redox" media. The benefit is that the process produces no dangerous by-products and it kills microorganisms, but like chloramine, it is too weak break the chemical bonds of some PPCPs.

Catalysis is the process of using a catalyst to break molecules apart into simpler substances. The catalyst emerges from the process unchanged. A relatively new carbon exists that is excellent at this process. Called **catalytic activated carbon, it has been manufactured in such a way that complex chemicals are attracted to the surface of the media where they are catalyzed (broken apart) into smaller substances that are then readily adsorbed by the carbon.** While most carbons are capable of this behavior to some degree, catalytic activated carbon is far more efficient at the process. That makes it a great choice for handling PPCPs and other difficult organic contaminants. Unfortunately, it is also far more expensive than standard carbons. That is why so few manufacturers of residential water treatment appliances use it. So far, only LivingWaters™ Systems offers a selection of systems that use this powerful media.

UNDERSTANDING YOUR CHOICES

BOTTLED WATER

Users of bottled water don't avoid exposure to many dangerous substances including PPCPs. Many bottlers simply repackage tap or spring water that is already contaminated. Those that "purify" water use reverse-osmosis. While this is effective at reducing TDS, RO is a process that can actually increase concentrations of certain toxic chemicals including chloramine and many pharmaceuticals because

they go right through the RO membrane and get concentrated in the product water. According to their trade association, bottlers neither treat nor test for PPCPs.

HOME FILTRATION SYSTEMS

In today's world there is no substitute for owning personal water treatment equipment capable of providing a reliable source of clean water. Because advertising can be so deceptive, selecting the best one for your needs can be very confusing. Here is what you need to know to spend your money wisely.

- **Not all water is the same**. Even within the same municipal system water quality can vary widely from one location to another, or from one year to another as utility companies juggle their water sources or change methods of water treatment. The point is that buying a generic, off-the-shelf water treatment appliance is unlikely to be your best option. **What you want is a system that can be easily modified if your needs change.**
- In any given situation, **effectiveness depends upon water having an adequate contact time with the media in the equipment.** The higher the water flow, the bigger the equipment needs to be. This means that whole house equipment treating a flow of 7 gpm needs to be a lot bigger (and more expensive) than a drinking water filter that is treating ½ to 1 gpm.

Home filtration systems can be classified as point-of-use (POU) systems or point-of-entry (POE) systems.

Understanding Point-of-Entry (POE) Systems

POE systems are used to treat water problems that affect the whole house. These are usually problems like excessive hardness that creates lime-scale and excessive use of detergents, iron and/or manganese that create staining of appliances and laundry, or acidity that causes excessive corrosion. They are typically installed where the water line enters your home and sized to treat water flowing at 7 to 10 gallons per minute (gpm) or more.

Most health issues with water have more to do with drinking water rather than bathing in it, but there are several exceptions where installing POE systems makes sense. In general**, if your water contains any toxic contaminant that evaporates and can be absorbed through the lungs during hot showers and baths or that can be absorbed through the skin, POE equipment can be a very wise investment.**

Volatile organic chemicals are the most notorious example. These include a variety of pesticides, herbicides, and PCBs. Certain PPCPs fall into that category as well. Chemicals used to disinfect water including chlorine and chloramines are also problems. So are radiological contaminants like radon.

Understanding Point-of-Use (POU) Systems

POU systems are typically used to treat drinking water. Most are installed under a kitchen sink and operate at a flow rate of between ½ and 1 gallon per minute.

Home filtration systems can employ a variety of technologies depending upon the purpose of the systems.

1. **Faucet mounted filters are a waste of money.** Most contain nothing more than a cheap grade of activated carbon mixed with a lead-adsorbent resin. They are trying to treat a flow of 3 gpm with the equivalent of ¼ cup of this inexpensive media. All these so called filters can do is remove some lead along with some volatile organic chemicals that cause off-tastes and odors. They also breed bacteria. **Avoid them.**
2. **Filtered pitchers** are only slightly better than faucet-mounted filters because the volume of water they are treating is much lower relative to the amount of media, but they still breed high levels of bacteria.
3. **Sediment Filters** are made from a variety of materials. Some look like strings wound around a cardboard core. Others look like a pad of interwoven fibers. Still others look like pleated paper. Their purpose is to remove larger particles of dirt and sediment from water. These filters come in a variety of sizes and are rated according to the smallest size of particle they can remove – usually in microns. (A micron is one millionth of an inch.) A 20-micron filter is good for removing sand and dirt. A 5-micron filter will reduce much finer particles. Filters are rated in terms of "nominal" and "absolute." A one-micron nominal filter means that 90% of particles 1 micron or bigger will likely be removed by the filter. A one-micron absolute filter means that no particle larger than 1 micron will pass through. This difference is important because dangerous cysts like Giardia and Cryptosporidium can pass through a 1-micron nominal filter but not through a filter that is rated 1 micron absolute.

4. **Carbon Filters** come in many sizes, qualities, and configurations. Most common are filters made with granular activated carbon (GAC.) Typical of this kind of filter are those used on refrigerators with dispensers for ice and water on the door. GAC carbon is highly effective at removing many substances from water that cause off-tastes and odors. For that reason they can make your water and/or beverages taste better. However most toxic contaminants in water don't have tastes or odors, or if they do, they are not strong enough to notice. Lead actually makes water taste sweeter!

   Some GAC is mixed with a lead-adsorbent resin but other heavy metals like mercury, cadmium and arsenic, or inorganics like sodium, nitrates, and fluoride are unaffected. Powdered Activated Carbon (PAC) is GAC milled into a finer powder. Because it is made of finer particles its surface area is higher and so it is more effective.

   Carbon blocks are generally made of carbon that has been highly compressed. The effect is like filtering water through a solid block of wood as opposed to sawdust. They offer much finer filtration and like sediment filters they are rated in microns.

   The best quality carbon blocks are made with PAC impregnated with the lead-adsorbent resin and compacted to the point where they achieve a .5-micron absolute rating. This means that cysts like those of Giardia and cryptosporidium cannot pass through but they are not able to reliably filter bacteria and/or virus. They will breed high levels of bacteria over time.

   In general, carbon is a good choice as part of an overall water treatment system. Its ability to remove chlorine and its disinfection by-products make it an excellent pre-filter for RO and a necessary adjunct to systems that distill water. However, because of its limitations **carbon is not suitable as a stand-alone treatment system**. It is important that carbon cartridges of any kind be changed regularly to avoid the reintroduction of high levels of bacteria to the water supply.

5. **Catalytic activated carbon** is a new development. It is effective on PPCPs, chloramine, PCPs, MTBE, perchlorate, and other difficult to remove contaminants because its catalytic activity causes these

molecules to break apart into smaller molecules that can then be adsorbed by the carbon matrix. Like other forms of carbon it is not suitable as a stand-alone treatment system for drinking water because it will not adsorb metals, many inorganic chemicals, or pathogenic organisms and it will breed bacteria over time.

6. **Ceramic Filters** like those made by British Berkefeld, and Doulton are more durable forms of very fine sediment filtration. The ceramic shell is made of diatomaceous earth. The best ceramics are complexed with silver so bacteria cannot breed in the matrix of the ceramic material.

   These filters are excellent for use on water that contains a lot of sediment and dirt. When dirt has accumulated on the surface of the media to the point where water flow becomes too slow they can be scrubbed and reused. They are also capable of reducing 99.99% of infectious cysts and 99.9% of bacteria. That, combined with their durability make them highly desirable for use in remote areas where agencies like the Red Cross or missionary efforts need to create acceptable quality drinking water out of polluted rivers and streams. However, ceramic filters do not remove all bacteria or viruses so they cannot be relied upon to provide drinking water completely safe from these organisms. That is why water filtered with these devices is still treated with some sort of disinfectant like iodine or chlorine.

   Ceramic filters cannot remove toxic chemicals like fluoride and chlorine, or toxic heavy metals like arsenic and lead. Neither can they remove any sort of organic chemical unless they are accompanied by carbon. Units made with carbon make excellent travel filters, but are not the best choice for a comprehensive long-term water solution. Their strengths make ceramic filters a good choice as part of a larger system.

7. **Hollow fiber, gradient density capillary membrane, and nanotechnology media** are all new developments in water treatment technology. Filters made with these kinds of media are capable of very fine filtration, in some cases down to .01 micron in size. They fill the gap between reverse-osmosis (hyperfiltration) and traditional sediment filters.

   What is most important about these kinds of media is that for the first time, filters made with this kind of technology are capable of

disinfecting water without the need for chemicals, power, high water pressure, or water waste. Microfilters rated to .15 micron are capable of removing not only cysts, but also all forms of bacteria to an 8-log removal rate (99.999999%), which exceeds the FDA guidelines for disinfection. Ultrafiltration media rated to .01 micron are capable of removing virus to a 5-log rate (99.999%), which also exceeds the FDA guideline of a 4-log removal rate.

The advantage of these new media is that they don't require high water pressure or water waste to work. However, they do require a very high level of prefiltration or they will become prematurely blocked.

Like ceramic media they are not capable of removing dissolved heavy metals like lead and arsenic, nor a wide spectrum of organic and inorganic contaminants, but **their ability to disinfect water opens up a whole new frontier in water treatment equipment design.**

8. **Water ionizers** play on the current fad surrounding the benefits of an alkaline diet. Most are sold through multi-level marketing schemes using well-meaning people who know little about water chemistry, but who want to get rich developing their "downline." When it comes to water, alkaline water is no guarantee of safety. Lead, mercury, and a whole spectrum of other toxic minerals and organic and inorganic chemicals exist in water as alkaline ions. Water ionizers that produce an alkaline stream of water actually concentrate these toxic minerals and chemicals several-fold in the product water. **They do not live up their many exaggerated health claims. Avoid them.**
9. **Reverse Osmosis** is a technology in which water is pressed against a semi-permeable membrane under high pressure. Another term for the reverse-osmosis (RO) process is hyperfiltration. Theoretically, pore sizes in an RO membrane are so small that only water molecules are able to pass through. Larger molecules are washed away in the waste stream of water. In practice, rejection rates are more like 90% - 98% of total dissolved solids (TDS) and that is assuming the water is at 77° and under a pressure of at least 60 psi. The lower the temperature and pressure, the lower the efficiency and the slower water is produced.

In most household situations the water to be treated is entering the system at 40° - 50° and the pressure differential on the membrane is more like 30 psi. In these cases the rejection rate can be as low as 80% and a membrane rated at 2 gallons per hour will be working hard to make half that amount of water. Other problems include the fact that some contaminants like chloramine and certain PPCPs go right through RO membranes and become concentrated by as much as 4 times on the product water side. Storage tanks can breed high levels of bacteria, and RO membranes are subject to deterioration and can "break through" dispensing unsafe water without warning. These are facts not widely understood by people who buy these systems.

Other disadvantages are more widely known. These include the fact that RO systems waste a lot of water, and the wastewater side releases a lot of concentrated toxic waste back into the environment. The water supply is limited to a couple of gallons and when empty can take hours to refill so people don't tend to use RO water for cooking or washing food.

Nevertheless, given the right circumstances, with the right kind of membrane for the water being treated, and assuming the water being treated does not have undue levels of hardness or iron and manganese that can prematurely foul any RO membrane, these systems can do an excellent job of providing a high quality source of drinking water. The problem is that water conditions are rarely that ideal. That is why the best systems use booster pumps to assure adequate water pressure, carbon filtration with thin-film-composite membranes (TFC) that give better performance, and integrated TDS meters that can warn you when the membrane needs to be replaced. **When water is unduly salty, contains a high level of colloidal solids or TDS, or demineralized water is the goal, RO systems remain on the front line of water treatment technology.**

10. **Distillation** is a technology that can produce high quality water. Years ago it was the only way to get high quality drinking water. Today, because distillation uses so much energy the process can no longer be justified as a reasonable treatment technology. Like RO, certain contaminants like chloramine and certain PPCPs go right through

distillers and become concentrated in the product water. The biggest problem is that they require large amounts of electricity to operate. In times of emergency where a reliable supply of drinking water is the most important, if you rely on a distiller you will be out of luck. **Given the advances in RO and cartridge-based technology, there is no reason to invest in one of these devices.**

11. **UV Light** uses the energy region of the electromagnetic spectrum, which lies between the x-ray region, and visible light region to disinfect water. UV light itself lies in the range of 200 nanometers (nm = billions of a meter) to 390 nm. When it comes to water, the optimum germicidal action occurs at 260 nm.

    When water containing microorganisms is exposed to UV light, the light penetrates through the cell walls and cytoplasmic membranes causing a molecular rearrangement of the microorganism's DNA thereby rendering it unable to reproduce.

    The best UV lights pass water through a polished stainless-steel housing that contains a mercury vapor lamp surrounded by a quartz sleeve at its core. Much like a fluorescent light, a flow of electricity through the mercury vapor creates the light. Coatings on the bulb are designed to insure that light is emitted at the proper 260 nm frequency.

    To work properly, water to be treated with UV light has to be very clean because bacteria embedded inside tiny dirt particles will not be exposed to the light and will emerge from the process unaffected. Another problem is that any dirt or film that coats the quartz sleeve will quickly impede performance.

    Because UV lamps gradually lose their ability to produce the proper frequency for disinfection, they should be changed annually. The best systems will have ballasts that eliminate lamp flickering and will provide an audible and visual warning when it is time for lamp replacement or if the lamp fails.

    UV lights are not suitable for a stand-alone water treatment device but are best used as a post treatment for RO water.

12. **Cartridge-based Systems** use a combination of the best technologies in ways that maximize the strength of each technology while compensating for their weaknesses. LivingWaters™ Water Treatment Systems are a great example. They utilize a unique combination of 4 different technologies to create ideal an unlimited supply of high-quality, microbiologically pure drinking water without the need for electricity, high water pressure, and/or water waste.

    The basic technology incorporates an. Argonide Nanoceram® double-pleat superfilter impregnated with silver. This means that it doesn't have to be boiled or otherwise disinfected to keep it from breeding bacteria. This is followed by an Argonide DEAL® filter that has been electrostatically treated to attract bacteria and virus. The combination of these patented technologies are called COOLBLUE®, and are one of the only water treatment technologies independently certified to protocol P231 for this purpose.

    This technology is followed with KDF®55 redox media that removes metals, improves the water's redox potential, and renders the water bacteriostatic (unable to grow bacteria.) Water emerges from this cartridge free of sediment, turbidity, heavy metals like lead, mercury and cadmium, cysts, as well as 99.9% of most bacteria, and viruses.

    In our 4 and 5 cartridge systems the next stage of treatment is a large volume of catalytic carbon and KDF®55 redox media. This is the best carbon for removing volatile organics including those that create "off" tastes and odors and toxic pesticides and herbicides. It is the ONLY carbon capable of effectively reducing chloramine and certain other very difficult-to-remove chemicals like certain pharmaceutical and personal care product residues.

    These systems, and others like them, are made possible because of the latest advances in water treatment technology. They are not suitable for water that has high levels of salt, extremely fine colloidal turbidity, or extreme levels of dissolved iron and manganese, but these situations are very rare. **For most people these cartridge-based systems or systems like them represent the closest water treatment science has come to creating the ideal water treatment system.**

HOW TO SELECT A WATER TREATMENT SYSTEM THAT WILL WORK BEST FOR YOU

The truth is that water treatment is a complicated and rapidly evolving science. Advances in research and technology means that methods once considered appropriate may now be considered unacceptable for a variety of reasons. A prime example is outmoded technology is distillation, which requires a huge amount of electricity to create water that may concentrate certain toxic chemicals like chloramine and some PPCPs in the product water.

Heightened public awareness about the importance of water quality to health has opened the door to many disreputable companies who attempt to capitalize on fear born of ignorance. Purveyors of water ionizers, microwater devices, magnets, and other dubious water treatment appliances sold through poorly educated multilevel marketing associates fall squarely into this category.

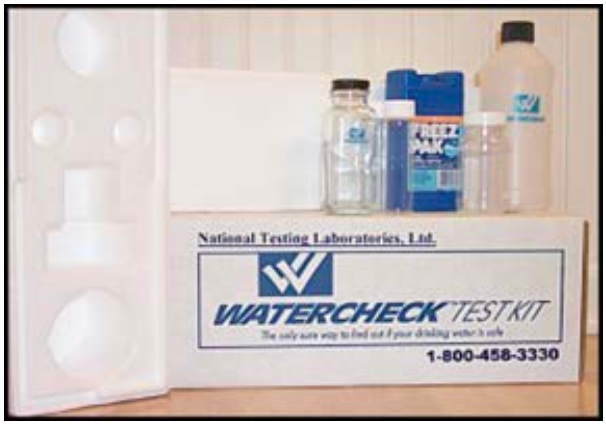
Your best solution is to get expert advice from a reputable, highly educated water treatment professional who has been in business long enough to encounter a variety of water quality problems. These people recognize that when it comes to dealing with water, each technology is a tool, and certain tools are best for certain purposes. For that reason they will sell all kinds of technologies at reasonable prices. You will be able to recognize them because these people won't offer you free groceries or movie tickets to get into your door and they won't engage in high-pressure sales tactics. Instead, they will attempt to understand your needs and insist on an professional, independent water test from an accredited laboratory and make their recommendations accordingly.

You can probably (but not necessarily) buy cheaper equipment online or through your local hardware store. However, you might not get the right equipment for your needs. Examples include the thousands of reverse-osmosis systems that are bought each year through "big-box" home improvement stores that must be replaced after a short while because no one told the purchaser that high levels of iron or hardness in the water will ruin an RO membrane. Even more common are people who buy filters too small for the volume of water they are treating and who are unaware that their investment is not only a waste of money, but probably doing more harm than good.

True professionals will be able to help you avoid such mistakes. The mark-ups professionals apply to their equipment will be sufficient for them to stay in business and offer continued service, but they won't be excessive. Besides, the mark-up you pay will be more than offset by the value of the advice and after-the-sale service you receive.

The first step is to find out what is actually in your water. People who are connected to municipal water treatment systems can simply call their supplier and ask for the latest water report. They are required to provide it free of charge. Also ask if their treatment plan includes the addition of fluoride to water, and if so in what amount, and if they use chlorine or chloramination to disinfect their water.

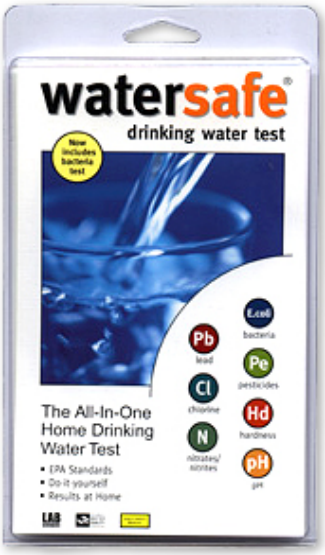
Unfortunately, some public water reports are very misleading. They read like a slick advertisement but the actual water reporting seems to be deliberately written to be as hard-to-interpret as possible. Even experts have a hard time deciphering many of them. Perhaps that is no accident. Some municipalities don't really want their customers to really know what is going on with their water supplies. In those cases, paying for an independent test makes sense.



If your public water report is confusing, or if your water supply comes from a well or private water system, it is imperative you get a comprehensive water test done by an independent laboratory that provides such a service. You can find them by looking under "Laboratories" in the yellow pages of your phone book. Searching the web will reveal a number of qualified services. The service we most often recommend is National Testing Laboratories Watercheck Test. It offers broad spectrum testing at one of the most reasonable prices we've been able to find.

Depending on your needs you may be able to get by with a simple water test like those provided by Watersafe®. You may also want to use these inexpensive kits to periodically check on the performance of your water treatment system no matter where you live. Watersafe® identifies harmful levels of eight different common contaminants in water: Bacteria, Lead, Pesticides, Nitrates, Nitrites, Chlorine, pH and Hardness. Watersafe test kits are reasonably accurate, easy-to-use

and produce results on the spot. It should be noted that their one-step test kit can detect dissolved lead at levels below the EPA Action level of 15 parts per billion (ppb). If you are debating whether or not you need a water treatment system for your home, this is a great place to start.



BEWARE OF FREE WATER TESTS

Do not rely on water tests provided by companies that sell water treatment equipment. This is only a ploy to get a salesman inside your home. These so-called "tests" are simply designed to convince you that your water is hard and you need a water softener. The offer very little other useful information. They are part of a high-pressure sales pitch that has been carefully refined for many years by the nation's largest purveyors of water softeners and reverse-osmosis systems.

Unless you enjoy high-pressure gimmickry, you might want to pass on the experience. At best it's time consuming and annoying to have to push a salesperson to leave your home when you are not ready to buy. At worst it will become an very expensive education about how to pay way more than necessary for equipment that is more "brand marketing" than substance.

While effective, such commission-based marketing is very expensive because purveyors of these products have to pay for phone room personnel, salesmen, managers, and others. The average ticket for one of these evenings now costs around $5,000. If you need an even bigger wake up call you can turn the experience into the gift that keeps on giving by using one of their "special financing plans" and prolong the agony over years.

On the other hand, if what you really want is just a quality water treatment system, pay for an independent test and spend a little time shopping, and you will discover you can buy better quality equipment for less than half their prices through a qualified water treatment specialist.

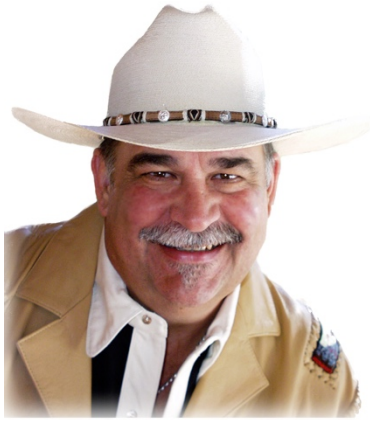
THE BOTTOM LINE

America's water quality is not what it used to be. Gone are the days when a person could drink with confidence from most any stream or river, or owners of remote wells could boast that their drinking water was the finest available. As the AP report clearly demonstrates, our nation's water supply has suffered widespread contamination with a variety of dangerous chemicals.

Bottled water is an expensive and generally ineffective option for those who want to provide themselves and their families with a reliable supply of clean drinking water. Distillation can actually concentrate certain toxic chemicals in the product water and wastes too much electricity to be considered a relevant technology for the 21st century. Reverse osmosis can't guarantee microbiologically pure water and wastes a lot of water, but still has its place.

New cartridge-based systems that employ a variety of technologies are at the forefront of water treatment safety. These systems can offer effective reduction of PPCPs and other toxic chemicals and compounds on a par of the finest reverse-osmosis systems while providing a continuous flow of delicious alkaline water that is guaranteed safe from pathogenic microorganisms. Best of all they can provide this high quality water supply without the need for power, high water pressures, or water waste.

One thing is for sure. If you want a reliable supply of clean drinking water, you cannot rely on any governmental entity or quasi-government utility to provide it. You must take personal responsibility to provide it for yourself.



Lono Ho'ala is a researcher, author, and internationally recognized expert on issues involving drinking water supplies and drinking water treatment technology. As a biochemist and water treatment systems engineer his expertise is important to those who want to insure that they and their families have a safe and adequate supply of drinking water.

Lono is the author of the nation's best selling book on water "Don't Drink the Water" published by Lotus Press and endorsed by Dr. Andrew Weil, M.D. He is also the developer of LivingWaters™ SafeWater® Technology.

Lono is available by appointment for speaking engagements as well as interviews for radio and television programs.