US EPA ARCHIVE DOCUMENT

WATER & HEALTH SERIES

Filtration Facts

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

US EPA ARCHIVE DOCUMENT

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Advice for people with severely compromised immune systems

Some people may wish to take special precautions with the water they drink. In particular, people with immune systems that are weakened by AIDS, chemotherapy or transplant medications are more vulnerable to microbial contaminants in drinking water such as *Cryptosporidium*.

Cryptosporidium is a microscopic parasite that lives in the intestine of infected animals and humans. It passes in the stool in its dormant oocyst form. The oocyst is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it very resistant to chlorine-based disinfectants. It occurs mainly in surface water sources, such as lakes, streams and rivers. In healthy adults, *Cryptosporidium* can cause illness, but for people with weakened immune systems, it can cause severe illness and even death.

Those who wish to take extra measures to avoid waterborne cryptosporidiosis can bring their drinking water to a boil for a full minute. ***Boiling water is the most effective way of killing Cryptosporidium.*** As an alternative to boiling water, people may take the following measures:

Use a point-of-use filter

Consider using point-of-use (personal use, end-of-tap, under sink) filters that remove particles one micrometer or less in diameter. Filters that use reverse osmosis, those labeled as "absolute one micron filters," or those labeled as certified by an American National Standards Institute (ANSI) - accredited organization to ANSI/NSF Standard 53 for "Cyst Removal" provide the greatest assurance of removing *Cryptosporidium*. As with all filters, follow the manufacturer's instructions for filter use and replacement.

Use bottled water

Check the label or call the bottler to find out how bottled water is treated. The following bottled water treatments protect against *Cryptosporidium*: reverse osmosis, distillation, ultraviolet light, or filtration with an absolute one micron filter. Bottled waters derived from protected well and spring water sources are less likely to be contaminated by *Cryptosporidium* than those containing untreated municipal drinking water from less protected sources such as rivers and lakes.

Those who choose to take these precautions should remember that they can be exposed to waterborne pathogens through water used for brushing teeth, making ice cubes, and washing fruits and vegetables – not just through water they drink.

Home Water Treatment Facts

Americans spend billions of dollars each year on home water treatment units. According to the Water Quality Association, more than four out of 10 Americans use a home water treatment unit. These units range from simple pitchers costing less than $20 to sophisticated reverse osmosis units costing hundreds of dollars.

Some people use a home water treatment unit to improve the taste of their tap water. Others treat their water because of health concerns. While EPA does not endorse specific units, the Agency does set and enforce national standards for the tap water provided by public water systems.

Drinking water can reasonably be expected to contain at least small amounts of some contaminants. As long as those contaminants are at levels no higher than EPA standards, the water is considered safe to drink for healthy people. People with severely weakened immune systems or other specific health conditions, or those concerned about specific contaminants present in local drinking water, may wish to further treat their water at home or purchase high quality bottled water.

Before purchasing a home water treatment unit, consider local water quality, cost and maintenance of the unit, product performance, and certifications to make sure that the unit will meet your needs.

Local water quality

Begin by learning as much as possible about your tap water. If you haven't already received it, contact your local water supplier and ask for the annual water quality report (sometimes called a consumer confidence report). This report lists the levels of contaminants that have been detected in the water and shows how these levels compare with EPA's drinking water standards.

Some contaminant levels remain constant throughout the year, while others vary according to season, weather, or from house to house. For example, lead typically occurs when it leaches from the lead pipes and solder that are in some homes. If you are concerned about a contaminant whose level may vary, consider getting your water tested (use a certified laboratory for the most reliable results). Use this information to help decide on a home water treatment unit.

If your water comes from a household well, EPA recommends annual water testing for nitrates and coliform bacteria. In addition, check with your health department or local water systems that use ground water for information on contaminants of concern in your area.

Armed with this specific information, you can determine your purpose in buying a home water treatment unit: to remove specific contaminants; to take extra precautions because a household member has a compromised immune system; to improve the taste of the water, or some combination of these concerns.

Improve taste

If you object to the chlorine taste of your tap water, try placing the water in an uncovered pitcher in the refrigerator overnight. This will reduce the chlorine taste. Most tap water is treated with chlorine to kill disease-causing microbes. Water systems use chlorine because it is an effective disinfectant for viruses and bacteria, and because it continues to disinfect water as it travels through pipes.

Reduce lead

If you have tested your water and know that it has high levels of lead, or if your home has lead pipes, flush the cold water tap by running it until it becomes cold if the water hasn't been used for several hours. Lead accumulates after extended contact with lead pipes. You may use this flushed water to water plants and do other household chores.

Cost and Maintenance

Prices vary depending on type (pitcher, faucet filter, etc.), where and how the unit is installed, and what contaminants it removes. Prices can range from $20 for a simple pitcher to hundreds of dollars for a reverse osmosis unit.

All units require some maintenance, and it is important to follow the manufacturer's recommendations for replacements. For example, activated carbon filters are designed to filter a certain amount of water; after that, the filters become clogged and ineffective. Check the schedule and cost for replacement filters.

Performance

The following information briefly describes how different types of home water treatment units work. ***For details, read information that accompanies the product and look for independent certification of manufacturers' claims.***

Different units remove different contaminants or classes of contaminants from the water. Sophisticated units may use multiple technologies to remove several types of contaminants and to provide backup protection in case one treatment fails.

A water treatment device can either be free-standing, attached to a tap, plumbed in with a dedicated faucet (also called a point-of-use device) connected to a refrigerator's water and ice dispensing system; or centrally attached to treat all water entering a house (a point-of-entry device).

For most contaminants, a point-of-use device is effective for treating only the water that is consumed. However, some contaminants, such as radon, disinfection byproducts, and some organic chemicals, easily turn

Kill microbes

If you have a contaminated private well, have special health needs (see left side of page 2), or in an emergency situation such as a flood, boil water for one minute to kill microbes (or three minutes at altitudes greater than one mile) and place in a clean, covered container.

into gases and may pose a risk when inhaled, such as when showering. A point-of-entry device can reduce concentrations of these contaminants and others that cause aesthetic problems such as scaling, staining, or odor.

Point-of-Use Devices:

Filter pitchers: *Water filtration pitchers are an affordable and commonly used free-standing home water treatment device. Most water pitchers use granular-activated carbon and resins to bond with and trap contaminants. These filters are effective at improving the taste of water, and many will also reduce lead and other contaminants.*

Specific contaminants removed vary by model and depend on the pore size and other factors. An activated carbon filter, by itself, is not designed to remove all disease-causing organisms. Carbon filters have a specified shelf life and should be replaced regularly according to the manufacturer's instructions.

How filters work

A water filter is composed of a screen with many microscopic holes. The smaller the holes, the more contaminants the filter can remove. Filter holes are measured in microns. (The period at the end of this sentence is 500 microns.) When considering filter size, look for an absolute (the largest hole), not a nominal (the average hole), rating. EPA and CDC recommend an absolute one micron filter (or one labeled for cyst removal) to remove Cryptosporidium.

Some contaminants and their size in microns:

Giardia lamblia - 8 to 12 microns

Cryptosporidium parvum - 4 to 6 microns

Bacteria *(such as E. coli* and *salmonella)* - 0.2 to 4 microns

Viruses - 0.004 to 0.1 microns (Generally, only a few filters, such as ultrafilters and reverse osmosis, have holes small enough to assure removal of all viruses. However, viruses can be killed using a disinfectant).

Filters that attach to a faucet or are installed under the sink for a drinking water third faucet: *These filters generally use the same technologies as their pour-through pitcher counterparts. Some filters use fabrics, fiber, or ceramic screening to physically remove contaminants. The most common types use a molded block of activated carbon. These filters are effective at improving the taste of tap water, and some will also reduce lead, protozoan cysts, and many other contaminants. Like filter pitchers, shelf lives and specific contaminants removed vary so read the label and instructions carefully.*

Distillers: *Distillers heat water to the boiling point, and then collect the water vapor as it condenses, killing disease-causing microbes and leaving most chemical contaminants behind. Contaminants that easily turn into gases, such as gasoline components or radon, may remain in the water unless the system is specifically designed to remove them. Distilled water may taste flat to some people because the water's natural minerals and dissolved oxygen often have been removed.*

Reverse Osmosis Units: *Reverse osmosis units force water through a semi-permeable membrane under pressure, leaving contaminants behind. Reverse osmosis units use approximately three times as much water as they treat, but they are effective in eliminating all disease-causing organisms and most chemical contaminants.*

Point-of-Entry Devices:

Adsorptive media: *Liquids, solids, dissolved or suspended matter adhere to the surface of, or in the pores of, a solid material. Carbon filters use this technology.*

Aerators: *Aerators force water to travel over air jets. Contaminants that easily turn into gases, such as gasoline components and radon, are removed. Other contaminants are not. The water may be additionally filtered after it passes through this system to remove additional contaminants.*

Removing specific contaminants

Giardia and Cryptosporidium - distillation, reverse osmosis, absolute one micron filters, ultraviolet light, and filters certified for cyst removal.

Bacteria and viruses - distillation, reverse osmosis, ultraviolet light, and disinfection.

Arsenic - adsorptive media

Disinfection byproducts - point-of-entry adsorptive media systems distillation, aeration, carbon filtration and reverse osmosis.

Lead - distillation, reverse osmosis and some carbon filters.

Nitrates - distillation, reverse osmosis or ion exchange.

Pesticides - some carbon filters.

Radium - ion exchange, distillation or reverse osmosis.

Radon - activated carbon filter and aeration.

Water Softeners: *Water softeners use a cation exchange resin, regenerated with sodium chloride or potassium chloride, to reduce the amount of hardness (calcium, magnesium) in the water. The hardness ions in the water are replaced with sodium or potassium ions. Ion exchange water softeners simultaneously remove radium and barium while removing water hardness.*

Certification

Make sure that the unit you intend to purchase can address your concerns. There are three different certifications to look for on the label. These organizations can also assist you in selecting a device that meets your needs. If a home water treatment unit isn't certified by one of these organizations, contact the manufacturer directly and ask for proof of the manufacturer's claims.

Three organizations are accredited by the American National standards Institute (ANSI), and they each certify units using ANSI/NSF standards. Each ANSI/NSF standard requires verification of contaminant reduction performance claims, an evaluation of the unit, including its materials and structural integrity, and a review of the product labels and sales literature. Each certifies that home water treatment units perform to meet or exceed ANSI/NSF and EPA drinking water standards. ANSI/NSF standards are issued in two different sets, one for health concerns (such as removal of specific contaminants) and one for aesthetic concerns (such as improving taste or appearance of water). Certification from these organizations will be tied to one or both of these specific standards.

NSF International: *The NSF Water treatment Device Certification Program requires extensive product testing and unannounced audits of production facilities. The goal of this program is to provide assurance to consumers that the water treatment devices they are purchasing meet the design, material, and performance requirements of national standards.*

EPA registration of water filters

Some units have an EPA registration number and an EPA establishment number. EPA registration (unlike that of NSF, WQA, or UL) is not intended to guide consumers in selecting a water treatment device, and is not an endorsement of the product. EPA registers any product that contains an antimicrobial (germ-killing) or bacteriostatic (slowing or inhibiting growth of germs) agent. EPA registers these products because consumers cannot independently verify whether the germ-related claims they make are true.

For most units, an EPA registration number means that the filter uses a bacteriostatic agent to slow the growth of microbes within the filter, the unit does not pose a human health threat, and EPA has verified all bacteriostatic claims on the label. Registration is not an endorsement of the filter or its performance. The most commonly used bacteriostatic agent is silver.

Underwriters Laboratories: *Underwriters Laboratories, Inc., is an independent, accredited testing and certification organization that certifies home water treatment units which meet or exceed EPA and ANSI/NSF drinking water standards of contaminant reduction, aesthetic concerns, structural integrity, and materials safety.*

Water Quality Association: *The Water Quality Association is a trade organization that tests water treatment equipment, and awards its Gold Seal to systems that meet or exceed ANSI/NSF standards for contaminant reduction performance, structural integrity, and materials safety.*

For more information about water treatment units:

NSF International
P.O. Box 130140
Ann Arbor, MI 48113-0140
877-8-NSF-HELP; (877) 867-3435
www.nsf.org
info@nsf.org

Underwriter's Laboratories, Inc.
333 Pfingsten Road
Northbrook, IN 60062-2096
(877) 854-3577
www.UL.com/water
mail to: ***water@us.ul.com***

Water Quality Association
4151 Naperville Road
Lisle, IL 60632-3696
(630) 505-0160
www.wqa.org
info@mail.wqa.org

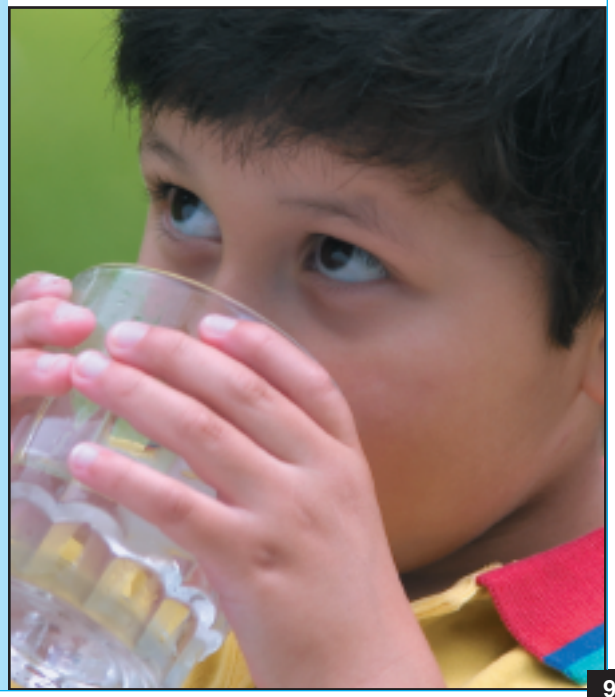
EPA also registers a type of water treatment device known as a purifier. A purifier must remove, kill, or inactivate all types of disease-causing organisms from the water, including viruses. Few water treatment devices can meet these criteria. These units typically work using a disinfectant within the filter to kill or inactivate microbes. Most purifiers are used by hikers or campers and are not generally needed in homes served by public water systems unless there is a water emergency.

EPA's Office of Pesticide Programs' Antimicrobial Division website provides additional information on EPA product registrations, ***www.epa.gov/oppad001***. You may also contact the Antimicrobial Hotline at 703-308-0127 (phone); 703-308-6467 (fax); or e-mail ***info_antimicrobial@epa.gov.***

For more information about tap water:

EPA's Safe Drinking Water Hotline
1 (800) 426-4791

www.epa.gov/safewater *- includes drinking water standards, state certification officers for water testing, and information for household well owners.*



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