# WATER

## The necessity of water treatment

It is sometimes difficult for people to realize that the cool, clear water they see in that mountain stream isn't safe to drink. These days, experienced outdoor lovers and travelers know that drinking untreated water can cause serious illness. It's no longer a question of *should you treat the water,* but rather, *how do you treat the water?*

There are a number of micro-organisms that can cause illness in back-country travelers, or those taking a trip to a foreign country. One of the most well-known is giardiasis, also known as "beaver fever." Symptoms of giardiasis, for instance, may not even show up until several days to several weeks after ingestion.

The illness can last up to six weeks, and may return intermittently because the giardia cysts are difficult to destroy (medicine from your doctor is available to kill the cysts). Also, illnesses such as shigellosis, amebiasis, typhoid or cholera, can be picked up in untreated water. That is why it is imperative to treat drinking water - don't take the chance of becoming ill.

## Methods of treatment

There are three methods of treating water to make it safely drinkable: boil it, chemically treat it, or filter it.

## Boiling

A  tried and true method of destroying many micro-organisms is boiling. For instance, boiling is very effective against giardia, as the cysts are quite sensitive to heat. Boiling for at least one minute (at high altitudes, add 3-4 minutes) is best to kill parasites and bacteria. Water that has come to a full rolling boil is best.

Boiling's drawbacks include, what is to some, an unpleasant or flat taste, no removal of debris from the water, and a long waiting time until it is cool enough to drink. Boiling requires fuel - for long trips, extra fuel stores may not be feasible. For those staying in hotels, a heat source may not always be available.

## Chemical treatments

There are a number of chemical treatments for water purification. Most are effective against giardia, water-borne bacteria and some viruses.

**Iodine** is on effective treatment. It is inexpensive, lightweight and takes up little room in a pack. Iodine comes as either crystals, tablets,or liquid. Both crystals and tablets are available from REI.

***Crystals:*** Crystals can be a cost-effective way to teat water. An advantage over tablets is that crystals can treat approximately 2,000 quarts of water, and the solution can be reused as long as there are crystals remaining.

A crystal kit consists of a glass bottle with a small amount of 99% active iodine crystals, a built-in trap in the bottle neck, and a

thermometer on the bottle to determine solution temperature and dosages.

The bottle is filled with water and left standing for one hour or more, allowing the water to become saturated from the crystals. This is the solution used to treat the water. A chart on the bottle side tells how many capfuls of solution should be poured off and added to a quart of water, based on temperature.

Treated water should be left standing for at least twenty minutes or longer while the iodine kills the organisms. Then, the bottle containing the crystals should be topped off with water to prepare for the next use. Only the solution is used, not the crystal themselves, as they are harmful if ingested directly (the trap keeps the crystals from pouting into the drinking water).

***Tablets:*** Tablets are very convenient to use, and usually require only one tablet to make a quart of water safe to drink. If the water is very cold, or gritty and discolored, two tablets are recommended. Contact time for tablets varies, from 20 minutes to an hour. The tablets are placed directly in the water.

Heat, humidity, moisture and exposure to air will reduce the tablets' effectiveness. Opened bottles of tablets will have to be discarded after a time specified by the manufacturer because of this loss.

Drawbacks to iodine include a noticeable taste to some people. For those who find it unpleasant, adding some lemonade or a little powdered drink mix can mask the taste. Iodine also does not remove solids or debris. Some people react negatively to iodine. Before taking a trip, test the system for yourself by trying iodine several times to see if you have a reaction.

**Chlorination** is another chemical method of purifying water, but is considered unstable and impractical for back country use, so is generally not recommended for use in outdoor activities. It may be a more acceptable method for travelers in comfortable hotel settings.

## Filtration

Filter systems have come a long way in the past few years. In fact, filters have become the system of choice for many backpackers because of their ease of use, low weight, and effectiveness in removing both micro-organisms and other particles. Large units are also made that are useful for groups.

Removable filters that can be cleaned or replaced are a sign of a durable and useful water filter. Other good features to look for are a tight, well-made pump, high volume output and quick filtration.

**Effectiveness:** The micro-organisms filters remove are measured in microns - one micron is equal in length to one millionth of a meter. A good filter will physically screen out all organisms over 0.5 microns (including giardia cysts, which can squeeze through an opening much smaller than their actual size), with some screening down to 0.2 microns (eliminating cocci, protozoa, fungi, bacteria, and parasites).

Some filters are more expensive than others. The cost of filters usually reflects reliability, durability and longevity as well as the technology of their design.

For occasional backcountry users, for instance, a less expensive system may be perfectly suitable for a few trips a year that require just filtered drinking water. But a more extensive trip may require a more sophisticated system that can be taken apart and cleaned. Knowing your needs will help you determine which filtration system is best for you.

**Elements:** Filter elements differ, but most use a combination of things to make them effective. Eventually, filter elements have to be cleaned or replaced, depending upon their use and what type of water is filtered - cloudy or debris-filled (turbid) water will obviously clog it faster. Certain filters perform better than others with turbid water. For this, some manufacturers make a pre-filter, which removes the large particles before reaching the inner filter, prolonging the inner filter's life.

In some filters, silver is used in the element to eliminate the amount of bacterial growth in the filter over time.

**Cleaning/Replacement:** A factor that differentiates filters is the length of time the filter element lasts before it needs replacement. Some systems need the filter to be replaced entirely, while others need disassembly and cleaning, or backwashing (backwashing is a quick method of cleaning some types of filters).

Drawbacks to filters can include their cleaning or disposal of used elements. While it may be more convenient to use a filter that allows cleaning, taking apart a cartridge to brush off the collected organisms might expose the user to much higher levels of pathogens than normal.

Replaceable element systems can't be cleaned effectively. Since the element is wet from the very first use, this creates an environment ideal for bacterial growth, so the element should be replaced on a regular basis. This can be and added cost factor.

Whether you're replacing or cleaning a filter, you should read the cautionary information and closely follow the instructions.

Currently, filter suppliers do not state whether their units will remove certain virus contamination since there are no federal guidelines for specific testing procedures. Therefore, the filters are not believed to be effective against viruses such as hepatitis. If you travel to a third world country where hepatitis is a problem, you should first filter the water and then add iodine.

These three methods of treating water have all been proven effective in making your water drinkable. Whichever method you choose to make your water safely potable, be certain you read all the information available to you. Pay close attention to the recommended procedures to ensure that you stay healthy and get the most from your trip.

*(This section on water treatment reprinted from an informational brochure from Recreational Equipment Inc., Seattle, WA.)*