

WATER PURIFICATION HANDOUT

All water obtained in the wilderness should be considered contaminated and should be treated. Before treatment, strain through a clear cloth (e.g., T-shirt) to remove large

particles. **Summary:** The surest ways to treat water: either (1) boil or (2) treat with iodine, then use a 0.2 micron filter.

NOTE: All the following information is based on listed references and assumes a healthy immune system.

TABLE I - METHODS

Boiling	Kills all pathogens at approx 180°F	Below 6000', vigorous boil for 1 min; above 6000', for 3 min. Above 14,000', need pressure cooker (as water boils at less than 180°F)	After boiling, add a pinch of salt – or aerate to improve taste. (Time is safe estimate - All parts of water need to get to 180°F.)
Iodine	Kills everything except cryptosporidium (& possibly cyclospora)	Cryptosporidium appears to be very uncommon; therefore, iodine, by itself, may be adequate most of the time. Remember to treat cap and threads as well as canteen.	Do not use iodine if: allergic, pregnant, thyroid disease. Otherwise, use for several months is considered reasonably safe.
Filter (0.2 micron)	Removes everything except viruses	Filters do not remove viruses (including hepatitis)!	

TABLE II - PROCESS

PUR Explorer filter	Allegedly removes or kills all pathogens	(uses iodine)	
Iodine crystals - 4 to 8 gm USP grade resublimed Iodine crystals (covered with water) in a one oz leak proof medicine bottle	Nearly fill the one oz bottle with water; shake vigorously for 1 min to get saturated solution; let settle. Temp of this solution determines amount of iodine it holds. Qty at right is amount to obtain proper 4 parts per million concentration in one qt of water.	Qty (cc) Temp °C / °F Time (min) 10 40 / 104 15 12 30 / 86 15 13 20 / 68 15 16 10 / 50 30 20 3 / 37 40	Temperature of untreated water determines contact time after solution is decanted into untreated water. Solution listed will treat approximately 1000 quarts before crystals are all dissolved. (Ref #4) CAUTION: Iodine crystals are poisonous!
Iodine solution	2% tincture	5 drops/qt clear water (10 if cloudy)	
Betadyne	10% solution	4 drops/liter	
Tetraglycine hydroperiodide tablets - easiest & most effective	One tablet/qt clear water (two if discolored). After tablet dissolves, shake, then allow solution to contact threads of cap. Wait 10 min (20 or 30 min if below 40°F)	AFTER treatment, a tablet of vitamin C gets rid of iodine taste. Any supplements should be added only after the purification has been completed.	Discard unopened bottle after 4 yr; opened bottle after 1 yr. Immediately recap container tightly. Use tablets immediately after removing from bottle as air deactivates. Store in refrigerator.
Halazone (chlorine) tablets	Two tablets/qt clear water (4 if cloudy); wait 30 min)		– not as effective as iodine

TABLE III - MISC

Cryptosporidium (protozoan micro-organism)	Causes transient diarrhea	Boiling kills; iodine & chlorine do not kill cyst. Cyst small enough to pass thru municipal water supply.
Giardia lamblia (protozoan micro-organism)	Giardiasis may cause explosive, watery, foul-smelling bowel movements, lack of appetite, nausea, gas, abdominal bloating, chills & vomiting; bulky but bloodless stools	Treatment: See your doctor, who may recommend - atabrine (100 mg 3x/day for 5-10 days), flagyl (avoid alcohol - 2 gm single dose for 3 days or 750 mg 3x/day for 5 days or 250 mg 3x/day for 5-10 days), or furoxone

Filters to use: Reverse osmosis filters or Membrane filters (less than one micron; 0.2 preferred – PUR Explorer, Katadyn)

3. Filters that meet NSF standard 53 for cyst removal (call 1-800-673-8010 to check on make & model of your filter)

If filter does not use iodine, treat filtered water with iodine to kill viruses. The PUR Explorer is advertised to use iodine and to kill all pathogens. However, if water is cold, additional treatment with iodine may be necessary, especially in high-risk areas.

Filters are expensive, bulky, weigh one pound (or more), & require proper maintenance. If dropped, ceramic

elements can crack & become ineffective. If manufacturer (e.g., First Need) provides test kit, test filter periodically.

References:

1. Mountain Medicine, Darvill, 14th ed, 1998, pp 66-74
2. Wilderness Medicine, Auerbach, 3rd ed, pp 1092-1109
3. Backpacker magazine, March 1997, Liquid Assets
4. Off Belay, June 1977, pp 23-24, based on Western Journal of Medicine, May 197?, 122-5, "Water Disinfection in the Wilderness" Drs. K??? & Visscher (??? Indicates can't read copy)