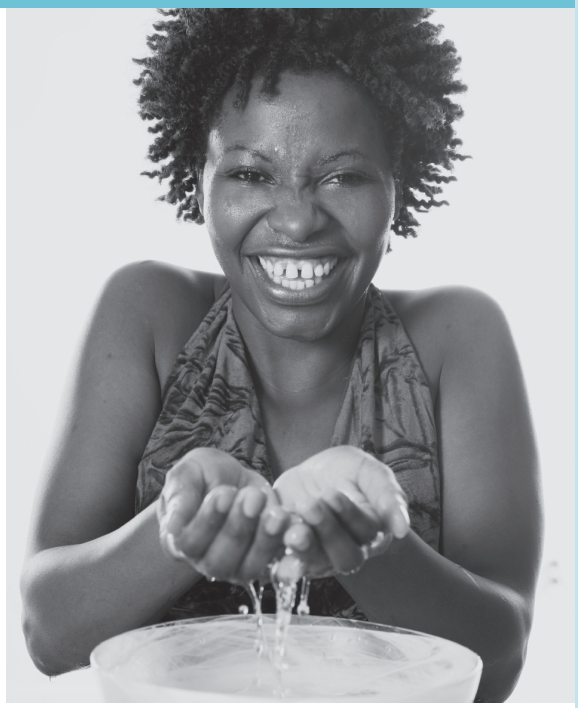
Healthy Drinking Waters

for

MASSACHUSETTS

Safe and healthy lives in safe and healthy communities



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Ultraviolet Radiation Treatment of Drinking Water Supplies

Effective Against:
vegetative and sporous forms of bacteria, viruses, Giardia lambia, Cryptosporidium *cysts, and other pathogenic microorganisms.*

Not Effective Against:
untreated water containing high levels of coliform, substantial color or suspended solids. Does not improve the taste, odor, or clarity of water.

How Ultraviolet Radiation Works

Ultraviolet (UV) systems expose water to the light from a special lamp. The light is at a specific wavelength capable of killing common bacteria. The percentage of organisms killed depends on the intensity of the UV light, the contact time that the water has with the light, and the amount of suspended solid particles in the water. The system adds nothing to the water, produces no tastes or odors, and typically requires only a few seconds of exposure to be effective. No residual is produced because UV radiation quickly dissipates into water. Therefore, treatment of the water occurs as the water passes into the light. The light penetration into water is shallow, usually only two to three inches.

Suspended solid particles in the water can shield organisms from the light. Therefore, UV devices are often combined with other technologies such as particle filters, carbon filters, ion exchange units, and reverse osmosis systems to remove particles prior to UV disinfection. UV is often the last device in the "treatment train" (a series of treatment devices) following reverse osmosis, water softening, or filtration. The UV unit can either be a point-of-entry system, treating all the water entering the house, or a point-of-use device, treating water from a single tap, as a final disinfection method.

The typical UV treatment device consists of a cylindrical chamber housing the UV bulb along its central axis. A quartz glass sleeve encases the bulb; water flow is parallel to the bulb which requires electrical power. A flow

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control device prevents the water from passing too quickly past the bulb, assuring appropriate radiation contact time with the flowing water. It has been reported that turbulent (agitated) water flow provides more complete exposure of the organism to UV radiation.

Maintenance

Regardless of the quality of the equipment purchased, it will not perform satisfactorily unless maintained in accordance with the manufacturer's recommendations for maintenance, cleaning, and part replacement. Keep a logbook to record equipment maintenance and repairs.

Since UV radiation must reach the bacteria to kill them, the housing for the light source must be kept clean. Commercial products are available for rinsing the unit to remove any film on the light source. An overnight cleaning with a solution of 0.15 percent sodium hydrosulfite or citric acid effectively removes such films. Some units have wipers to aid the cleaning process. Consider purchasing a unit with manual wipers to aid the cleaning process.

UV systems are designed for continuous operation and should be shut down only if treatment is not needed for several days. The lamp needs a few minutes to warm-up before the system is used again following shutdown. In addition, the plumbing system of the house should be thoroughly flushed following a period of no use. Whenever the system is serviced, the entire plumbing system should be disinfected with a chemical such as chlorine prior to relying on the UV system for disinfection.

UV lamps gradually lose effectiveness with use, so the lamp should be cleaned on a regular basis and replaced at least once a year. It is common for a new lamp to lose 20 percent of its intensity within the first 100 hours of operation, and that level is maintained for the next several thousand hours. Units equipped with properly calibrated UV emission detectors alert the owner when the light intensity falls below a certain level.

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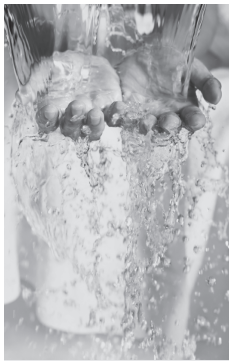

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The treated water should be monitored for coliform bacteria on a monthly basis for at least the first six months of the device's use. If these organisms are present in the treated water, the lamp intensity should be checked, and the entire plumbing system should be disinfected with a chemical such as chlorine

Other Considerations

Ensure the system you choose is installed and operated according to the manufacturer's instructions. After installation, retest both the raw water (prior to treatment) and the treated water at a state certified laboratory to ensure it is working properly and removing the contaminants. You should continue to test the quality of both the untreated and treated water annually. This annual test will

also help you determine how well your treatment system is working and whether maintenance or replacement of components may be necessary.

The following affect the disinfection efficiency of a UV system:

- Contact times and flow rate.
- Depth of water being treated.
- Chemical and biological films that develop on the surface of UV lamps.
- Dissolved organics and inorganics.
- Clumping or aggregation of micro-organisms.
- Turbidity.
- Colored water.
- Short-circuiting in water flowing through the UV contactor.
- Accumulation of solids on the surface of the UV sleeves.

Questions to Ask Before You Buy

Before purchasing a water treatment device, have your water tested at a state certified laboratory to determine the contaminants present. This will help you determine if UV is an effective treatment method for your situation. See the fact sheet *Questions to Ask When Purchasing Water Treatment Equipment* for more information.

Consumers should inquire about the following before purchasing UV treatment:

- Has the treatment system been tested and certified by a third party to ensure that it meets manufacturer's claims?
- What are the maintenance requirements for the system?
- Are there any special installation requirements that may add to the equipment cost, for instance changes to your household plumbing?

Product Certification

NSF International is a non-profit organization that sets performance standards for water treatment devices. Because companies can make unsubstantiated statements regarding product effectiveness, the consumer must evaluate test results of the device to determine if claims are realistic. Products that have been tested or evaluated by NSF and meet their minimum requirements are entitled to display the NSF listing mark on the products and in advertising literature for products. Manufacturers and models that meet NSF's standard are included in a listing published twice a year. For more information contact NSF at: 800-NSF-MARK (800-673-6275) or http://www.nsf.org/consumer/

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Resources

UMass Extension

This fact sheet is one in a series on drinking water wells, testing, protection, common contaminants, and home water treatment methods available on-line at the University of Massachusetts website: http://www.umass.edu/nrec/watershed_water_quality/watershed_online_docs.html and Cape Cod Cooperative Extension: 508-375-6699 http://www.capecodextension.org

MA Department of Environmental Protection, Division of Environmental Analysis

Offers assistance, information on testing and state certified laboratories: 617-292-5770 For a listing of MassDEP certified private laboratories in Massachusetts: http://www.mass.gov/dep/service/compliance/wespub02.htm

U.S. Environmental Protection Agency, New England Office

Information and education on where drinking water comes from; drinking water testing and national laws; and how to prevent contamination: http://www.epa.gov/ne/eco/drinkwater

US Environmental Protection Agency

For a complete list of primary and secondary drinking water standards: http://www.epa.gov/safewater

MA Department of Conservation and Recreation, Division of Water Supply Protection

Maintains listing of registered well drillers, information on well location and construction: 617-626-1409 http://www.mass.gov/dcr/waterSupply/welldril/index.htm

NSF International

The NSF International has tested and certified treatment systems since 1965. For information on water treatment systems: 800-NSF-MARK (800-673-6275) http://www.nsf.org/consumer/

Water Quality Association

The Water Quality Association is a not-for-profit international trade association representing the household, commercial, industrial, and small community water treatment industry. For information on water quality contaminants and treatment systems: http://www.wqa.org

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