Engineering and Recreation
Tech Tips

United States Department of Agriculture
Forest Service
Technology & Development Program
August 1993
7100/2300 9371 1305 - SDTDC

Cryptosporidium, What Is It?

William J. Makel, Program Leader - Recreation

IMPORTANT NOTICE

This *Tech Tips* is FOR INFORMATION ONLY.

Be advised that the involvement nationwide of drinking water providers with problems of *cryptosporidium* in potable water systems is being monitored. The San Dimas Technology and Development Center will monitor and investigate research in *cryptosporidium* filtering mitigation which could serve Forest Service potable water systems. When appropriate, direction and mitigation guidance concerning *cryptosporidium* will be developed and distributed Service-wide.

Background

Cryptosporidium is an organism that may be found in lakes, streams, rivers, and springs—and in water systems drawing from these sources. These natural waters may be clear, cold, and free-running and can look, smell, and taste good; yet, might not be safe to drink. Some Forest Service water systems are supplied or influenced by surface sources and may be affected by *cryptosporidium.*

Transmission of *cryptosporidium* is via the fecal/oral route (person-to-person, animal-to-animal, and waterborne transmission). It can only be contracted through swallowing. This includes transmission by hand-to-mouth and then swallowing. It does not enter the body through cuts, the ears, or other openings. Most people are unaware when they have been infected until the onset of symptoms. Outbreaks of *cryptosporidiosis* have been associated with swimming pools, day care centers, untreated surface water, and treated potable water.

The illness caused by *cryptosporidium* can make a person quite sick, but it is not usually life threatening for people with healthy immune systems. It does pose a serious threat to people with AIDS or other diseases that weaken the immune system. Symptoms of this disease are similar to those caused by *giardia:* Diarrhea, headaches, stomach cramps, and nausea.

Much like *giardia,* the *cryptosporidium* parasite survives in the water in a hard shell, oocyst form. Once inside the body, however, it develops into an active form. A *cryptosporidium* oocyst measures 3 to 6 microns (3 microns is about 100 times smaller than the smallest speck of dust you see with the naked eye).

The only reliable way to destroy *cryptosporidium* in water is boiling the water for at least 5 minutes. It is not killed by freezing. It survives well in cold stream waters and cannot be killed with chlorine or iodine tablets. Research is being conducted to determine if other disinfectants, such as ozone, will inactivate *cryptosporidium.*

Cryptosporidium can be removed by filtration—if the filter pore size is small enough (0.2 micron or smaller).

Current Status

Disease outbreaks in communities with municipal water systems meeting all current State and Federal standards with respect to water quality (e.g., Carrolton, Georgia, and Milwaukee, Wisconsin) have alerted health organizations to the seriousness of this problem.

There is very little guidance, data, or consensus of experts as to what course of action to take when *cryptosporidium* is suspected. There are no Federal, State, or local community standards for removal of *cryptosporidium*, although California is moving toward developing these standards. The Environmental Protection Agency (EPA) and the American Water Works Association (AWWA) are also evaluating the need for standards.

For additional information contact: *Recreation Program Leader, San Dimas Technology & Development Center, 444 East Bonita Avenue, San Dimas, CA 91773-3198 Phone: 909-599-1267; FTS: 700-793-8000; FAX: 909-592-2309; DG—SDTDC: WO7A*

Oocysts of *cryptosporidium* have been detected in highly variable numbers in surface water surveys in the United States. No one knows how many oocysts in a water sample constitute a health hazard. Filtration/treatment plants capable of removing these oocysts can be very costly and conversion from surface springs and streams to deep wells is also costly. Filters certified by the State of California and having the capability to filter down to 0.2 micron should be effective in removing oocysts from water systems.

The test used to determine the presence of *giardia* and *cryptosporidium* is not very reliable. Oocysts are concentrated by passing a water sample through a filter and recovering the oocysts from the filter. Microscopic counts can be used to calculate the numbers in the equivalent volume of water passed thru the filter membrane. However 80 percent, or more, of the oocysts from river water may pass through the filter without being detected. Recovery rates are influenced by the volume sampled, oocyst levels, and water quality (turbidity, suspended solids, organic content).

Currently, there are no commercial laboratories that test for viability of these oocysts. The Centers for Disease Control, Atlanta, Georgia, does do some testing for viability of oocysts. It will likely be some time before studies to answer these questions are completed and analyses available to guide our actions.

The bottom line is there are no standards. The medical profession knows *cryptosporidium* makes people sick, but they don't know how many oocysts in a sample is a problem; only that it takes less for people with immune system problems.

Surface Water Treatment Regulations

On December 31, 1990, the EPA's Surface Water Treatment Rule (SWTR) went into affect. This SWTR requires increased treatment of all public drinking water systems that obtain water from sources which come directly from the surface of the earth (surface water), or are influenced by water that comes directly from the surface of the earth (surface water influenced).

As of January 1, 1992, all public water systems affected by surface water are required to be disinfected with chlorine or other approved disinfectants. Adequate testing must be done to ensure a residual of the disinfectant remains in the supply (delivery) lines. Daily chlorine residual tests are required for systems using chlorine.

As of June 1993, public drinking water systems that utilize surface waters must be filtered to remove organisms, including *giardia.* However, there is no requirement regarding *cryptosporidium,* although standards will likely be set sometime in the future. By 1999, groundwater sources must be evaluated to see if they are under the direct influence of surface water. If surface water influence is discovered, the system must be filtered within 18 months of the determination.

Currently, managers must make modifications to surface water systems to bring them into compliance with these regulations. Where conversion to well water is not feasible, systems must be filtered to meet current requirements. This will be costly; if new standards are adopted for *cryptosporidium,* the water treatment systems may be inadequate and need to be redone. On the other hand, if managers install finer filters to remove *cryptosporidium,* it may be a wasted expense if standards are set that can be met with less expensive alternatives.

Angeles National Forest Experience

This Forest, located in northern Los Angeles County, California, had an outbreak of intestinal illness of employees living at several Forest Service residences. Tests confirmed that several employees had *giardia. Cryptosporidium* was suspected in some cases, but never confirmed. Laboratory tests determined that a number of Forest Service water supply systems serving Forest Service stations and campgrounds had both *giardia* and *cryptosporidium.* Initial action (based on recommendations of the California Department of Health Services and Los Angeles County) was a shutdown of the water systems and issuance of a "boil water advisory" to all employees, residents, and permittees.

All parties agreed to:

- Higher level of chlorination for water systems that utilize surface water or water that might be influenced by surface water

- Increased level of testing for *giardia* and *cryptosporidium* and for surface water influence

- Development of an overall strategy by the Forest Service to convert all systems to ground water, provide adequate filtration, or close the water systems in accordance with the requirements and time frames given in the SWTR.

Note: These regulations did not reference *cryptosporidium.* All agencies also agreed that the detection of any *cryptosporidium* oocysts indicated a problem that required immediate action.

After a review of all available information, the State found that the levels of *cryptosporidium* found on the Angeles National Forest are consistent with post-treatment levels found in municipal water systems. Los Angeles County and the State informed the Forest Service that they did not feel that the number of oocysts detected in these water samples were of a level requiring any precautions be taken other than notification to all water users on these systems, including the public, that the low level of *cryptosporidium* was not a threat to persons with healthy immune systems, but that immunologically compromised individuals might need to take extra precautions.

The Forest—in agreement with the County and State and the Regional Office—is no longer requiring permittees to stop serving water from these systems to the public, and is no longer requiring permittees to apply a "boil water advisory" to users of these systems. The Forest is requiring, however, that permittees serving the public notify the public of the potential health risks. The following statement must be provided to the public at Angeles National Forest locations where *cryptosporidium* has been detected:

> We have information that indicates that *cryptosporidiosis* can be very serious and possibly deadly for individuals with immune deficiencies (e.g., persons who are HIV positive or who have AIDS or cancer).

Recommendations

Recognized health agencies, universities, and water organizations are conducting research on *cryptosporidium* and the means for controlling it. Until guidelines and standards are developed for *cryptosporidium,* cooperate fully with appropriate State and local health officials should a problem arise at a Forest Service public facility or station. If employees are exposed to *cryptosporidium,* they should contact their physician for medical advice.

GPO 784-236/82012