Parasites and New Jersey Drinking Water:
Information on Giardia and Cryptosporidium

September 1995
1. **What parasites in drinking water are a concern?**

*Giardia* (pronounced “gee-AR-dee-al”) and *Cryptosporidium* (pronounced “crip-toc-spo-RID-ee-um”) are two kinds of microscopic parasites that can infect the intestines of humans and animals and can contaminate water.

2. **Have these parasites caused drinking water-related disease in New Jersey?**

Through August, 1995, no known disease outbreaks due to these parasites in treated drinking water have occurred in New Jersey and the state is doing everything possible to ensure that this good record continues.

3. **What are the health effects of *Giardia* and *Crypto***?

Exposure to *Giardia* or *Cryptosporidium* can cause diarrhea lasting from a few days to several weeks in people of all ages. Other symptoms include cramps, nausea, and sometimes vomiting and low-grade fever. These symptoms can have other causes, so their occurrence does not necessarily mean someone has been infected with these parasites. Individuals with normal immune systems may be infected without any signs of disease or, following illness, recover without problems. As announced by the U.S. Centers for Disease Control and Prevention in June 1995, *Cryptosporidium* can be life-threatening for “high-risk” individuals, including pregnant women, persons receiving cancer chemotherapy and persons with inherited immunodeficiencies (for example, children who must live in a “bubble”). (For protective steps high-risk individuals can take, see #15.)

4. **How do *Giardia* and *Crypto*** enter the environment?

*Giardia* and *Cryptosporidium* parasites multiply in the intestines of infected people or animals. They are shed in the feces in the form of “cysts” and “oocysts”, microscopic egg-like objects with protective coats. *Giardia* cysts and *Cryptosporidium* oocysts can enter rivers, lakes, or reservoirs from sewage treatment plants. Feces from pets, farm animals and wild animals can pollute surface waters directly or from storm water runoff. *Giardia* and *Cryptosporidium* are not usually found in ground (well) water because the soil filters them out, but ground water can be contaminated if directly affected by surface water or a septic tank discharge. Their protective coats allow the parasites to survive in the environment for up to several months.

5. **How does infection with *Giardia* or *Crypto*** occur?

Infection occurs when live parasites are swallowed. Infection can occur when lake, pond or river waters containing these parasites are consumed directly or accidentally during water sport activities. Chlorinated swimming, wading and wave pools are also occasional sources of *Cryptosporidium* infection, particularly when used by diaper-age children. Treated drinking water can be an occasional infection source due to treatment deficiencies or contamination due to pipe ruptures. Infection also can come on the “hand-to-mouth” route following contact with an infected person, animal or contaminated object, such as a soiled diaper. Infection from eating contaminated food is unusual, but has been reported. Infection is not spread by coughing or sneezing.

6. **Are waters used for drinking water protected from contamination sources?**

Many lakes and reservoirs used for drinking water are protected from human and domestic animal contamination by fences, bans on waste discharges in the watershed and other actions. However, many rivers cannot be protected this way, and all surface waters can be affected by wild animals. Ground waters are protected by soil filtration and by regulations keeping pollution sources away from public wells.

7. **What are *Giardia* or *Crypto*** sometimes found in treated drinking water?

If water containing *Giardia* or *Cryptosporidium* isn’t adequately treated, or if an accident occurs following treatment (for example, ruptured underground water pipes let sewage mix with treated water), drinking water can be contaminated. State and federal regulations require complete treatment to prevent disease outbreaks, yet several disease outbreaks due to *Giardia* and *Cryptosporidium* in treated drinking waters have occurred in recent years in other states (not in NJ) and in other countries (see #17).

8. **Are *Giardia* and *Crypto*** common in U.S. drinking water?

No. Properly treated drinking water is usually free of disease-causing organisms, including *Giardia* and *Cryptosporidium*, or contains them at levels thought low enough to be...
safe. Regulations require public water systems to filter surface waters (unless certain criteria are met), disinfect surface and ground waters, and produce low levels of suspended particles in treated waters (see also #11). Filter performance, and levels of disinfection and particles in treated water, are checked regularly. These regulations have largely prevented contamination by disease-causing organisms. Through August 1995, no drinking-water-related disease outbreaks have occurred in NJ. Nevertheless, Giardia, and particularly Crypto, resist disinfection (see #10). Therefore, even properly operated and maintained treatment systems cannot ensure parasite-free drinking water.

9.  **Is my drinking water tested for Giardia and Crypto?**

A survey completed at the end of 1994 showed that, despite drawbacks of the current tests (see below), treated waters from nearly half of the 33 surface water treatment plants in NJ had been tested for Giardia and Crypto on one or more occasions. The treatment plants voluntarily conducted the tests (see #11). Of 116 samples tested for Giardia, only 2 tested positive, with 1 parasite each. Of 107 samples tested for Crypto, only 1 parasite was found. None of the parasites seemed to be alive (and thus infectious), but the test cannot determine this with certainty.

Giardia and Crypto tests are not done routinely because they require 370-gallon samples, take 1 to 2 weeks to complete, may not always detect parasites when they are in the water, cannot reliably tell how many parasites are alive and thus able to cause disease, and require skills most water utilities and testing laboratories lack.

10.  **If my water isn't tested regularly for Giardia and Crypto, how is it known that water treatment works?**

Until simpler, more reliable tests for Giardia and Crypto are developed (see #15), the state relies on other regular tests of treated water quality to indicate water safety. In addition to higher than normal amounts of particles finding coliform bacteria (a different group of microorganisms) in treated water may indicate the presence of Giardia, Crypto, or other disease-causing organisms. This is because coliform bacteria are always present in fecal matter, the source of Giardia and Crypto. Coliform bacteria testing is required in all public water systems. The number of required tests depends on the size of the population the water treatment plant serves and on past coliform test results. The required test frequency varies from 1 test every 3 months for the smallest plants to a maximum of 480 per month for the largest plants.

However, the absence of coliform bacteria does not necessarily mean parasites are absent from drinking water. Proper disinfection eliminates coliform bacteria, which lack protective coats, but Giardia and Crypto strongly resist disinfection. Crypto particularly resists disinfection. Thus, even when coliform bacteria are not detected, treated water may still contain Crypto and possibly Giardia.

11.  **Are there laws specifically regulating Giardia or Crypto levels in drinking water?**

Federal regulations require that at least 99.9% of Giardia in untreated water must be removed or made non-infectious during treatment. Because of test limitations (see #9), regulations don’t require testing for Giardia or Crypto; a utility meets the Giardia standard if it uses the right treatment method. Pending federal regulations may include a Crypto reduction requirement.

12.  **Who enforces these regulations?**

The Bureau of Safe Drinking Water, New Jersey Department of Environmental Protection (NJDEP), administers all federal and state drinking water regulations, monitors and inspects all NJ water treatment plants and certifies plant operators.

13.  **What does it mean if Giardia or Crypto are found in treated drinking water?**

A national survey 1 and a NJDEP survey (in 1995 at four NJ treatment plants) have found a few Giardia and Crypto parasites in treated water, but few appear to be alive (again, the test cannot tell this for certain; see #9). Scientists can’t yet tell whether, even if alive, so few parasites can cause infection. Thus the occasional finding of these parasites in treated water is not, by itself, cause for the state to issue a health advisory or “boil water” notice. A health advisory is issued if filtration or disinfection of drinking water hasn’t been done properly, or there is evidence people are infected.

14.  **What about my chances of getting Giardia or Crypto if I have a private well?**

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As previously stated (see #4), ground water is usually, but not always, free of Giardia and Crypto. NJ regulations, enforced by local officials, require newly constructed private wells to be tested for coliform bacteria. The water must be free of coliforms or else disinfection is required. There are no state requirements for coliform testing of existing wells; however, local boards of health may have such requirements. Owners should test their wells for coliform bacteria at least annually, or if flooding occurs. Lack of coliform bacteria does not ensure parasite-free water but the presence of coliform bacteria may indicate a potential problem requiring more coliform tests. If tests find coliforms, corrective action (for example, disinfection or relocating a septic tank) may be needed.

15. **If I am a high-risk individual, what can I do to protect myself from waterborne Cryptosporidium?**

Individuals with weakened immune systems (see #3) should consult with their doctors about what steps would best reduce their risk from Crypto and other types of infection. Individuals who wish to take extra care to avoid waterborne Crypto infection can bring drinking water to a complete boil for one minute. This is the most effective way to kill Crypto. As an alternative to boiling water, individuals may wish to use a filter or certain brands of bottled water (see below). This advice was endorsed by the U.S. Centers for Disease Control and Prevention in June 1995.

Because Giardia and Crypto can cause gastrointestinal disease in people with normally functioning immune systems, anyone may choose to take any of these measures to protect against these organisms.

**Filtering water**

A personal use, end-of-tap, or under-sink filter that removes particles one micrometer (or micron) or more in diameter will remove Crypto and Giardia, because they are larger than this. Filters in this category include those that use reverse osmosis, those labeled “absolute” one micrometer filters, or those meeting American National Standards Institute (ANSI)/NSF (formerly National Sanitation Foundation) International Standard #53 for “Cyst Removal” (NSF International, P.O. Box 130140, Ann Arbor, MI, 48113-0140, phone 1-800-673-8010). Such filters can be found in plumbing supply, home supply or hardware stores.

A filter labeled with a “nominal” one micrometer rating may not reliably remove Crypto. A filter that only says “NSF approved” may not be approved for particle or parasite removal (the filter may be designed to absorb odor-causing and other chemicals from the water).

As with all filters, people should follow the manufacturer’s instructions for filter use and replacement. Water treated with a filter meeting the above criteria may not necessarily be free of organisms smaller than 1 micrometer that could pose a health hazard for individuals with weakened immune systems.

**Bottled waters**

Many, but not all, brands of bottled water may provide a reasonable alternative to boiling tap water. Individuals should not presume that all bottled waters are free of Giardia or Crypto. Some sellers of bottled waters advertise that they use water treatment methods that eliminate these parasites. However, bottled water sellers are not required to test for Giardia and Crypto. Individuals at high risk for Crypto should contact the bottled water company to learn how their brand of water is treated. Distillation, reverse osmosis, or other filtration processes (see above) are all effective at removing Giardia and Crypto from bottled water. Use of the word “microfiltration” on the bottled water label does not ensure that the filters used are effective against Crypto.

16. **If I think I may be infected with Giardia or Crypto, what should I do?**

Contact your doctor. Infections can be diagnosed with fecal sample tests. Prescription drugs can treat Giardia. The only treatments for Crypto are for diarrhea (such as replacement of lost fluids and nutrients). Measures which boost immune system function can help some high-risk individuals recover from Crypto.

17. **Can I get Giardia or Crypto from drinking water if I travel outside of the United States?**

Yes, particularly in areas with poor sanitation and little modern water treatment. Water there should be boiled, or filtered with portable travel filters (1 micrometer or less; see #15), before drinking. Vaccination for hepatitis A and cholera also may be advisable for anyone traveling to these areas, but such vaccinations do not protect against Giardia or Crypto. The Centers for Disease Control and Prevention’s International Traveler’s Health Information Hotline at (404) 332-4555 (area code 770, effective November 1995) has preventive medical advice.

18. **What research is being done on waterborne Giardia and Crypto?**

Governments, universities and water utilities worldwide are doing research to: 1)
learn more about the sources of parasites entering water bodies to find more effective controls; 2) improve test methods; 3) learn what levels of *Giardia* and *Cryptosporidium* can cause disease; 4) find drugs to treat *Cryptosporidium*; and 5) further improve drinking water treatment methods.

In 1993, the Division of Science & Research (DSR), NJDEP, looked for *Giardia* and *Cryptosporidium* in source water at 14 NJ drinking water treatment plants. The number of parasites found was similar to that in source waters nationwide (see footnote on previous page). DSR also studied how well surface water treatment plants could reduce *Giardia* levels. In the two plants studied, *Giardia* levels were reduced at least 1,000 times more than required by federal regulations. Another NJDEP source water study will begin in 1996.

For more information on the following topics, contact:

**Drinking water:**

1) your local water utility
2) NJDEP, Bureau of Safe Drinking Water, CN-426, Trenton, NJ 08625, 609-292-5550
3) U.S. Environmental Protection Agency’s Safe Drinking Water Hotline, 1-800-426-4791; electronic mail address, hotline-sdwa@epamail.epa.gov

**Parasite health effects:**

1) your local health agency
2) New Jersey Department of Health, Consumer Health Services, CN-369, Trenton, NJ 08625
   609-588-3120
3) Centers for Disease Control and Prevention (CDC), Division of Parasitic Diseases, Atlanta, GA 30341
   404-488-7760 (area code 770, effective November 1995)
4) CDC AIDS Hotline; 1-800-342-2437 (English language), 1-800-344-7432 (Spanish).

**Parasite research:**

NJDEP, Division of Science & Research, CM-409, Trenton, NJ, 08625, 609-292-9692.

DSR: 9/11/95