**Waterborne Diseases**

**Waterborne diseases** are caused by [pathogenic](http://en.wikipedia.org/wiki/Pathogenic) [microorganisms](http://en.wikipedia.org/wiki/Microorganisms) which are directly transmitted when contaminated [drinking water](http://en.wikipedia.org/wiki/Drinking_water) is consumed. Contaminated drinking water used in the preparation of food can be the source of [foodborne disease](http://en.wikipedia.org/wiki/Foodborne_disease) through consumption of the same microorganisms. According to the [World Health Organization](http://en.wikipedia.org/wiki/World_Health_Organization), diarrheal disease accounts for an estimated 4.1% of the total DAILY [global burden of disease](http://en.wikipedia.org/wiki/Global_burden_of_disease) and is responsible for the deaths of 1.8 million people every year. It was estimated that 88% of that burden is attributable to unsafe water supply, sanitation and hygiene and is mostly concentrated on children in developing countries.

Waterborne disease can be caused by [protozoa](http://en.wikipedia.org/wiki/Protozoa), [viruses](http://en.wikipedia.org/wiki/Viruses), [bacteria](http://en.wikipedia.org/wiki/Bacteria), and [intestinal parasites](http://en.wikipedia.org/wiki/Intestinal_parasites).

**Protozoal infections**

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| **Disease and Transmission** | **Microbial Agent** | **Sources of Agent in Water Supply** | **General Symptoms** |
| [Amebiasis](http://en.wikipedia.org/wiki/Amebiasis) (hand-to-mouth) | Protozoan (*Entamoeba histolytic*) (Cyst-like appearance) | Sewage, non-treated drinking water, flies in water supply | Abdominal discomfort, fatigue, weight loss, diarrhea, gas pains Fever, abdominal pain |
| [Cryptosporidiosis](http://en.wikipedia.org/wiki/Cryptosporidiosis) (oral) | Protozoan ([*Cryptosporidium parvum*](http://en.wikipedia.org/wiki/Cryptosporidium_parvum)) | Collects on water filters and membranes that cannot be disinfected, animal manure, seasonal runoff of water. | Flu-like symptoms, watery diarrhea, loss of appetite, substantial loss of weight, bloating, increased gas, stomach |
| [Cyclosporiasis](http://en.wikipedia.org/wiki/Cyclosporiasis) | Protozoan parasite (*Cyclospora cayetanensis*) | Sewage, non-treated drinking water | cramps, nausea, vomiting, muscle aches, low-grade fever, and fatigue |
| [Giardiasis](http://en.wikipedia.org/wiki/Giardiasis) (oral-fecal) (hand-to-mouth) | Protozoan (*Giardia lamblia*) Most common intestinal parasite | Untreated water, poor disinfection, pipe breaks, leaks, groundwater contamination, campgrounds where humans and wildlife use same source of water. Beavers and muskrats act as a reservoir for Giardia. | Diarrhea, abdominal discomfort, bloating, gas and gas pains |
| [Microsporidia](http://en.wikipedia.org/wiki/Microsporidia) | Protozoan ([*Microsporidiosis*](http://en.wikipedia.org/wiki/Microsporidiosis)), but closely related to [fungi](http://en.wikipedia.org/wiki/Fungi) | The genera of [Encephalitozoon intestinalis](http://en.wikipedia.org/w/index.php?title=Encephalitozoon_intestinalis&action=edit) has been detected in groundwater, swimming pool via AIDS patients and the origin of drinking water |  |

**Parasitic Infections**

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| --- | --- | --- | --- |
| **Disease and Transmission** | **Microbial Agent** | **Sources of Agent in Water Supply** | **General Symptoms** |
| [Schistosomiasis](http://en.wikipedia.org/wiki/Schistosomiasis) (immersion) | Schistosoma | Contaminated fresh water with certain types of snails that carry schistosomes | Rash or itchy skin. Fever, chills, cough, and muscle aches |
| [dracunculiasis](http://en.wikipedia.org/wiki/Dracunculiasis) | dracanculus medinensis | drinking water containing infective cyclops | allergic reaction, urticaria rash, nausea, vomiting, diarrhea, asthmatic attack. |
| [taeniasis solium](http://en.wikipedia.org/w/index.php?title=Taeniasis_solium&action=edit) | taenia solium | contaminate drinking water with eggs | intestinal disturbances, neurologic manifestations, loss of weight, cysticercosis |
| [fasciolosis](http://en.wikipedia.org/wiki/Fasciolosis) | fasciola | contaminated drinking water with encysted metacercaria | GIT disturbance, diarrhea, liver enlargement, cholangitis, cholecystitis, obstructive jaundice. |
| [hymenolepiasis nana](http://en.wikipedia.org/w/index.php?title=Hymenolepiasis_nana&action=edit) | hymenolepis nana | contaminated drinking water with eggs | mild GIT symptoms, nervous manifestation |
| [hyatidosis](http://en.wikipedia.org/w/index.php?title=Hyatidosis&action=edit) | echinococcus granulosus | contaminated drinking water with eggs | hyatid cyst press on bile ductand blood vessels, if it ruptured cause anaphylactic shock. |
| [coenurosis](http://en.wikipedia.org/w/index.php?title=Coenurosis&action=edit) | multiceps | contaminated drinking water with eggs | increases intracranial tension |
| [ascraiasis](http://en.wikipedia.org/w/index.php?title=Ascraiasis&action=edit) | ascaris lumbricoides | contaminated drinking water with eggs | Loefflers syndrome in lung, nausea, vomiting, diarrhea, malnutrition, underdevelopment, |
| [enterobiasis](http://en.wikipedia.org/wiki/Enterobiasis) | entrobius vermicularis | contaminated drinking water with eggs | peri-anal itch, nervous irritability, hyperactivity and insomnia |
|  |  |  |  |
| **Disease** | **Morbidity (cases per year)** | **Mortality (deaths per year)** |  |
| 1,500,000,000 | 100,000 |  |  |
| Schistosomiasis | 200,000,000 | 200,000 |  |

**Bacterial infections**

* [Botulism](http://en.wikipedia.org/wiki/Botulism) - Clostridium botulinum bacteria - gastro-intestinal food/water borne; can grow in food
* [Campylobacteriosis](http://en.wikipedia.org/wiki/Campylobacteriosis)
* [Cholera](http://en.wikipedia.org/wiki/Cholera) - Vibrio cholerae bacteria - gastro-intestinal often waterborne
* [Chronic granulomatous disease](http://en.wikipedia.org/wiki/Chronic_granulomatous_disease) - caused by the [Mycobacterium marinum](http://en.wikipedia.org/wiki/Mycobacterium_marinum) infection and localized in skin, frequently occurred with aquarium keepers.
* [Diarrheal disease](http://en.wikipedia.org/w/index.php?title=Diarrheal_disease&action=edit) due to [*E. coli*](http://en.wikipedia.org/wiki/E._coli).
* [Dysentery](http://en.wikipedia.org/wiki/Dysentery) - Shigella/Salmonella bacteria - gastro-intestinal food/water
* [Legionellosis](http://en.wikipedia.org/wiki/Legionellosis) - cause Pontiac fever and Legionnaires' disease
* [Leptospirosis](http://en.wikipedia.org/wiki/Leptospirosis)-
* [Otitis externa](http://en.wikipedia.org/wiki/Otitis_externa)
* [Typhoid](http://en.wikipedia.org/wiki/Typhoid) - Salmonella typhi bacteria - gastro-intestinal water/food borne
* Vibrio illness caused by the bacteria of [Vibrio vulnificus](http://en.wikipedia.org/wiki/Vibrio_vulnificus), [Vibrio alginolyticus](http://en.wikipedia.org/wiki/Vibrio_alginolyticus) and [Vibrio parahaemolyticus](http://en.wikipedia.org/wiki/Vibrio_parahaemolyticus) commonly found in seafood and recreational water.

**Viral Infections**

* [Adenovirus infection](http://en.wikipedia.org/wiki/Adenovirus_infection) - its serotypes are typically waterborne.
* Astroviruses -
* Caliciviruses -
* [Circoviruses](http://en.wikipedia.org/w/index.php?title=Circovirus&action=edit) - its human form of [Transfusion Transmitted Virus](http://en.wikipedia.org/wiki/Transfusion_Transmitted_Virus) found in feces, saliva, skin and hair
* [Coronaviruses](http://en.wikipedia.org/wiki/Coronavirus) - cause [SARS](http://en.wikipedia.org/wiki/SARS) and excreted in the feces
* Enteric Adenoviruses -
* Hepatitis A - Hepatitis A virus - gastro-intestinal water/food borne
* [Parvoviruses](http://en.wikipedia.org/wiki/Parvovirus) - associated with [Gastroenteritis](http://en.wikipedia.org/wiki/Gastroenteritis).
* [Picobimaviruses](http://en.wikipedia.org/w/index.php?title=Picobimavirus&action=edit) - associated with [Gastroenteritis](http://en.wikipedia.org/wiki/Gastroenteritis) in AIDS patients, children and elderlies.
* Polio - polioviruses - gastro-intestinal exposure to untreated
* [Polyomaviruses](http://en.wikipedia.org/wiki/Polyomavirus) - its human form of [JC virus](http://en.wikipedia.org/wiki/JC_virus) cause [Progressive multifocal leukoencephalopathy](http://en.wikipedia.org/wiki/Progressive_multifocal_leukoencephalopathy) and detected in sewage
* Small Round Structured Virus

**Allergic infections**

* [Hay fever](http://en.wikipedia.org/wiki/Hay_fever) - a part of disease rate is associated with the high frequency of swimming pool attendance in childhood
* [Meningitis](http://en.wikipedia.org/wiki/Meningitis)
* [Trihalomethanes](http://en.wikipedia.org/wiki/Trihalomethanes) - a byproduct of chlorinated water which will cause [bladder cancer](http://en.wikipedia.org/wiki/Bladder_cancer) through inhalation and dermal absorption during showering, bathing, and swimming in pools.