

Indiana State Department of Health

Sanitary Engineering

Diseases Involving Sewage

The following is a list of diseases caused by sewage or sewage contaminated water that can occur in the United States. For more information about methaemoglobinaemia, visit the U.S. Environmental Protection Agency's web site at <http://www.epa.gov/safewater/dwh/c-ioc/nitrates.html>. For more information on any of the other diseases, visit the federal Centers for Disease Control and Prevention's web site at <http://www.cdc.gov/health>:

Campylobacteriosis

Campylobacteriosis is the most common diarrheal illness in the United States. The infection is caused by the bacterium *Campylobacter*. While some people exhibit no symptoms, clinical manifestations include bloody diarrhea, cramping, abdominal pain, nausea, vomiting and fever within 2 to 5 days after exposure to the organism. In the immunocompromised, *Campylobacter* occasionally spreads to the bloodstream and causes a life-threatening infection.

Cryptosporidiosis

A disease caused by the microscopic parasite *Cryptosporidium parvum*. It is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it very resistant to chlorine disinfection. Cryptosporidiosis (also known as "Crypto") is the most common waterborne disease in the United States. The parasite is found in every region of the United States and throughout the world. While some people exhibit no symptoms, most experience diarrhea, loose or watery stools, stomach cramps, upset stomach, and a slight fever.

***Escherichia coli* Diarrhea**

Also known as "diarrheogenic *E. coli*," a disease caused by *Escherichia coli* bacteria of many different serotypes, including *E. coli* O157:H7. *Escherichia coli* can be transmitted by contaminated water or by person-to-person via the fecal-oral route. While some people exhibit no symptoms, most experience watery or bloody diarrhea, abdominal cramps, nausea, vomiting, and fever. In 2-7% of those who acquire *E. coli* O157:H7 infection, hemolytic uremic syndrome may develop, causing kidney failure and sometimes death. This syndrome occurs particularly in children under the age of 5, the elderly, and those with weakened immune systems. Some *E. coli* serotypes are thought to cause chronic diarrhea in HIV-infected patients.

Encephalitis

Two acute, inflammatory viral diseases (St. Louis Encephalitis and West Nile Virus Encephalitis) are transmitted via the bite of infected mosquitoes, primarily of the *Culex* species. *Culex* mosquitoes prefer to lay their eggs in heavily polluted water such as that contaminated by sewage. These viruses are amplified during periods of adult mosquito blood-feeding by continuous transmission between mosquito vectors and bird reservoir hosts. Infectious mosquitoes carry viruses in their salivary glands and infect susceptible birds during blood-feeding. Some birds will sustain the virus in their blood stream for one to four days subsequent to exposure, after which they develop life-long immunity. A sufficient number of mosquitoes must feed on an infected bird to ensure that some survive the period during which the blood meal is digested to feed again on another susceptible bird. People are not known to develop infectious levels of the virus, and thus cannot propagate the reservoir-host infection cycle. Most people exhibit no symptoms, and the diseases are of short duration. However, in severe infections symptoms can include high fever with head and body aches, stiff neck, muscle weakness, disorientation, tremors, convulsions and, in the most severe cases, coma or paralysis. The illness can be severe for infants, the elderly, and those who are immunocompromised. No vaccine exists for encephalitis.

Gastroenteritis

Viral gastroenteritis, also known as "stomach flu," is an infection caused by any of a number of viruses including rotaviruses, adenoviruses, caliciviruses, astroviruses, Norwalk virus, and a group of Norwalk-like viruses. However, it is not caused by influenza viruses. Symptoms include watery diarrhea, vomiting, headache, fever, and abdominal cramps. Generally, symptoms begin 1 to 2 days after infection, and may last for 1 to 10 days, depending on the virus involved. The illness can be severe for infants, young children, and those who are disabled, elderly, or immunocompromised, if they cannot drink enough fluids to replace what they lose through vomiting or diarrhea.

Giardiasis

A disease caused by the one-celled microscopic parasite *Giardia intestinalis* (also known as *Giardia lamblia*). The parasite is protected by an outer shell that allows it to survive outside the body for long periods of time. Giardiasis is one of the most common waterborne diseases in the United States. The parasite is found in every region of the United States and the world. While some people exhibit no symptoms, most experience diarrhea, loose or watery stools, stomach cramps, and upset stomach.

Hepatitis A

A liver disease caused by the virus Hepatitis A. Symptoms include jaundice, fatigue, abdominal pain, loss of appetite, nausea, diarrhea, and fever. Adults will exhibit symptoms of Hepatitis A more often than children. About 15% of those infected will have prolonged or relapsing symptoms over a 6-9 month period. One-third of Americans are immune to Hepatitis A because of past infection.

Leptospirosis

A disease caused by bacteria of the genus *Leptospira*. While some people exhibit no symptoms, clinical manifestations include high fever, severe headache, chills, muscle aches, vomiting, jaundice, red eyes, abdominal pain, diarrhea, or a rash. Left untreated, Leptospirosis will cause kidney damage, meningitis, liver failure, respiratory distress, and in rare cases, death.

Methaemoglobinaemia

Methaemoglobinaemia (also known as "blue-baby syndrome") is a poisoning that can occur in infants during the first few months of life due to ingestion of well water high in nitrates. Improperly designed septic systems installed in sandy soils are known to cause nitrate contamination of groundwater. Infants who breast-feed can be poisoned if their mothers drink water high in nitrates. Symptoms include shortness of breath and blueness of the skin, and death can occur within a few days. An infant's stomach has a different pH than that of adults and older children. Poisoning occurs when the infant's stomach converts nitrate to nitrite, which interferes with the oxygen-carrying capacity of its blood. The U.S. Environmental Protection Agency has established a maximum contaminant level for nitrate in drinking water of 10 milligrams per liter, expressed as Nitrogen, or 45 milligrams per liter, expressed as Nitrate. Boiling of water does not remove nitrates; it only increases the concentration.

Poliomyelitis

A disease caused by the *Poliomyelitis* virus. While most exposed people exhibit no symptoms, some experience sore throat, fever, nausea, vomiting, abdominal pain, constipation, and occasionally diarrhea. However, less than 1% of those infected suffer paralysis. Most recover completely, and muscle function returns to some degree. However, any weakness or paralysis that remains 12 months after infection is usually permanent.

Salmonellosis

A disease caused by a group of bacteria called *Salmonella*, the most common of which are *Salmonella typhimurium* and *Salmonella enteritidis*. Symptoms include diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. The illness usually lasts 4 to 7 days, and most people recover without treatment. However, the disease can be severe for infants, young children, and those who are disabled, elderly, or immunocompromised, if they cannot drink enough fluids to replace what they lose through vomiting or diarrhea. Left untreated, *Salmonella* can spread from the intestines to the blood stream, to other sites, and can cause death.

Shigellosis

Shigellosis (also known as "Bacillary Dysentery") is caused by a group of bacteria called *Shigella*. *Shigella sonnei* and *Shigella flexneri* account for most of the Shigellosis in the United States. While some people experience no symptoms, most develop bloody diarrhea, fever, and stomach cramps starting a day or two after exposure. Shigellosis usually resolves in 5 to 7 days, but it can be severe for infants, young children, and those who are disabled, elderly, or immunocompromised, if they cannot drink enough fluids to replace what they lose through diarrhea. A severe infection with high fever may lead to seizures in children less than 2 years old.

Paratyphoid Fever

A disease caused by a group of bacteria called *Salmonella paratyphi*. Symptoms are similar to that of Typhoid Fever, but are milder, with fewer deaths.

Typhoid Fever

A disease caused by the bacteria *Salmonella typhi*, which lives only in the bloodstream and intestinal tract of humans. Symptoms

include a sustained fever as high as 104°F, weakness, cough, stomach pains, headache, and loss of appetite. Some patients have a rash of flat, rose-colored spots. Persons given antibiotics usually begin to feel better within 2 to 3 days, and death rarely occurs. Fever can continue for weeks and months in those who do not receive antibiotics. Of those not treated 20% will die from complications related to the infection. A small number of people, known as carriers, recover from Typhoid Fever but continue to carry the bacteria. Both ill persons and carriers shed *Salmonella typhi* in their stools. Even after symptoms recede, a person can still carry *Salmonella typhi*, in which case the illness could return or be passed on to others. For that reason it is imperative that patients keep taking antibiotics for the full length of time prescribed by their doctor. Those suffering from Typhoid Fever must not prepare food or serve it to others.

Yersiniosis

A disease caused by a family of rod-shaped bacteria called *Yersinia*. In the United States, Yersiniosis is caused only by *Yersinia enterocolitica*. Yersiniosis occurs most often in young children. It causes a variety of symptoms depending on the age of the person infected. Symptoms in children include fever, abdominal pain, and diarrhea, which is often bloody. In older children and adults, symptoms include right-sided abdominal pain, fever, and occasionally skin rash or joint pain. Symptoms typically develop 4 to 7 days after exposure and may last 1 to 3 weeks or longer. Most infections are uncomplicated and resolve completely. In a few cases the bacteria can spread to the bloodstream.