Cholera

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Definition

Cholera is a serious, acute, infectious disease characterized by watery diarrhea that is caused by the bacterium *Vibrio cholerae*. It was first identified by Robert Koch in 1883 during a cholera outbreak in Egypt. The name of the disease comes from a Greek word meaning “flow of bile.”

Description

Cholera is spread by eating food or drinking water that has been contaminated with *V. cholerae*. Contamination usually occurs when human feces from a person who has the disease seeps into a community water supply. Fruits and vegetables also can be contaminated in areas where crops are fertilized with human feces. Cholera bacteria live in warm, brackish water and can infect persons who eat raw or undercooked seafood obtained from such waters. In the United States, 4 cases of cholera in Louisiana were attributed to undercooked seafood taken from contaminated waters following hurricanes Katrina and Rita. Cholera is rarely transmitted directly from one person to another.

Because of an extensive system of sewage and water treatment in the United States, Canada, European countries, Japan, and Australia, cholera is not a concern for visitors and residents of these countries. However, people visiting or living in other parts of the world, particularly Haiti, the Indian subcontinent, and parts of Africa and South America, should be aware of the potential for contracting...
cholera and practice prevention. Fortunately, the disease is both preventable and treatable. Deaths usually occur in developing countries because of lack of access to hospitals and treatment.

Risk factors

Some people are at greater risk of having a severe case of cholera if they become infected. These risk factors include:

- taking proton pump inhibitors, histamine (H2) blockers, or antacids to control acid indigestion. As noted earlier, \( V. \text{cholerae} \) is sensitive to stomach acid.
- having had chronic gastritis caused by infection with \( Helicobacter \text{pylori} \)
- having had a partial gastrectomy (surgical removal of a portion of the stomach)
- being of a certain age group, such as infants, children, and the elderly

Demographics

Although cholera was a public health problem in the United States and Europe a hundred years ago, modern sanitation and the treatment of drinking water have virtually eliminated the disease in developed countries. In the United States, the rate is about 1 case per 1,000,000 population and in travelers returning from abroad about 1 case per 500,000 population.

Internationally, cholera outbreaks continue to occur in less developed countries, particularly following such natural disasters as hurricanes and tsunamis during which water supplies become contaminated. A particularly severe outbreak occurred in Haiti beginning in mid-October 2010. As of June 2011, more than 336,000 cases of cholera resulting in more than 5,500 deaths had been reported. The epidemic continued through 2014 and into 2015.

WHO estimates that between 3 and 5 million cases of cholera occur each year accounting for 100,000–120,000 deaths. This is only an estimate because WHO believes that the number of reported cases represents only 5%–10% of actual cases. In areas where cholera occurs, it is the most feared epidemic diarrheal disease because people can die within hours of infection from dehydration that results from severe diarrhea.

Cholera often occurs in major outbreaks or epidemics; seven pandemics (countrywide or worldwide epidemics) of cholera were recorded between 1817 and 2014. WHO estimates that during any cholera epidemic, approximately 0.2–1% of the local population will contract the disease.

Anyone can get cholera, but infants, children, pregnant women, and the elderly are more likely to die from the disease because they become dehydrated faster than other individuals. There is no particular season in which cholera is more likely to occur.

Causes and symptoms

Cholera is caused by the bacterium \( V. \text{cholerae} \). This bacterium is a gram-negative aerobic bacillus, or
rod-shaped bacterium. It has two major biotypes: O1 and O139. The O1 biotype is responsible for most outbreaks. The O139 biotype is found only in Southeast Asia.

Because *V. cholerae* is sensitive to acid, most cholera-causing bacteria die in the acidic environment of the stomach. However, when a person has ingested food or water containing large amounts of cholera bacteria, some will survive to infect the intestines. As would be expected, antacid usage or the use of any medication that blocks or reduces acid production in the stomach allows more bacteria to survive and cause infection.

In the small intestine, the rapidly multiplying bacteria produce a toxin that causes a large volume of water and electrolytes to be secreted into the bowels and then to be abruptly eliminated in the form of watery diarrhea. Vomiting may also occur. Symptoms begin to appear between one and three days after contaminated food or water has been ingested.

Most cases of cholera are mild, but about one in 20 patients experience severe, potentially life-threatening symptoms. In severe cases, fluids can be lost through diarrhea and vomiting at the rate of one quart per hour. This loss of fluid can produce a dangerous state of dehydration unless the lost fluids and electrolytes are rapidly replaced.

Signs of dehydration include intense thirst, little or no urine output, dry skin and mouth, an absence of tears, glassy or sunken eyes, muscle cramps, weakness, and rapid heart rate. The fontanelle (soft spot on an infant’s head) will appear to be sunken or drawn in. Dehydration occurs most rapidly in the very young and the very old because they have fewer fluid reserves. A doctor should be consulted immediately any time signs of severe dehydration occur. Immediate replacement of lost fluids and electrolytes is necessary to prevent kidney failure, coma, and death.

### Key Terms

- **Bacillus**: A rod-shaped bacterium. The organism that causes cholera is a gram-negative bacillus.
- **Biotype**: A variant strain of a bacterial species with distinctive physiological characteristics.
- **Electrolytes**: Salts and minerals that ionize in body fluids. Common human electrolytes are sodium, chloride, potassium, and calcium. Electrolytes control the fluid balance of the body and are important in muscle contraction, energy generation, and almost all major biochemical reactions in the body.
- **Pandemic**: A widespread epidemic that affects whole countries or the entire world. There have been seven cholera pandemics since 1817.
- **Toxin**: A poison, in the case of cholera, a poison secreted as a byproduct of the growth of the cholera bacteria in the small intestine.

### Diagnosis

#### Tests
Rapid diagnosis of cholera can be made by examining a fresh stool sample under the microscope for the presence of *V. cholerae* bacteria. Cholera can also be diagnosed by culturing a stool sample in the laboratory to isolate the cholera-causing bacteria. In addition, a blood test may reveal the presence of antibodies against the cholera bacteria. Because of the speed at which life-threatening dehydration can occur, in areas where cholera occurs often, however, patients are usually treated without laboratory confirmation for diarrhea and vomiting symptoms as if they had cholera.

### Treatment

The key to treating cholera lies in preventing dehydration by replacing fluids and electrolytes lost through diarrhea and vomiting. The discovery that rehydration can be accomplished orally revolutionized the treatment of cholera and other, similar diseases by making this simple, cost-effective treatment widely available throughout the world. WHO has developed an inexpensive oral replacement fluid containing appropriate amounts of water, sugar, and salts that is used worldwide. In cases of severe dehydration, replacement fluids must be given intravenously. The death rate for patients with access to intravenous fluid replacement is about 1%. Patients should be encouraged to drink when they can keep liquids down and eat when their appetite returns. Recovery generally takes three to six days.

### Drugs

Adults may be given the antibiotics to shorten the duration of the illness and reduce fluid loss. WHO recommends antibiotic treatment only in cases of severe dehydration. If antibiotics are overused, the cholera bacterium may develop drug resistance, making commonly used antibiotics ineffective in treating even severe cases of cholera.

Tetracycline is the most common antibiotic given to adults. Other antibiotics that may be given to speed up the clearance of *V. cholerae* from the body include azithromycin (Zithromax), doxycycline (Bio-Tab, doryx, Vibramycin), ciprofloxacin (Cipro), and erythromycin.

### Alternatives

A possible complementary treatment for fluid loss caused by cholera is a plant-derived compound, an extract made from the tree bark of *Croton lechleri*, the Sangre de grado tree found in the South American rain forest. Researchers at a hospital research institute in California reported that the extract appears to work by preventing the loss of chloride and other electrolytes from the body. However, this herbal treatment is no substitute for oral hydration therapy in moderate to severe cases.

### Prognosis

Cholera is a very treatable disease so long as resources are available for rehydration. Patients with milder cases of cholera usually recover on their own in three to six days without additional complications. They may eliminate the bacteria in their feces for up to two weeks. Chronic carriers of the disease are rare. With prompt fluid and electrolyte replacement, the death rate in patients with severe cholera is less than 1%. Untreated, the death rate can be greater than 50%. The difficulty in
treated severe cholera does not lie in not knowing how to treat it but rather in getting medical care to the sick in developing areas of the world where medical resources are limited.

**Prevention**

The best form of cholera prevention is to establish good sanitation and waste treatment systems. In the absence of adequate sewage treatment, the following guidelines should be followed to reduce the possibility of infection:

- **Boil water.** Drink and brush teeth only with water that has been boiled or treated with chlorine or iodine tablets. Safe drinks include coffee and tea made with boiling water or carbonated bottled water and carbonated soft drinks.
- **Cook foods.** Eat only thoroughly cooked foods, and eat them while they are still hot. Avoid eating food from street vendors.
- **Peel foods.** Eat only fruit or nuts with a thick intact skin or shell that is removed immediately before eating.
- **Avoid raw foods.** Do not eat raw foods such as oysters or ceviche. Avoid salads and raw vegetables. Do not use untreated ice cubes in otherwise safe drinks.
- **Avoid polluted water.** Do not swim or fish in polluted water.

Preventive measures following natural disasters include guaranteeing the purity of community drinking water, either by large-scale chlorination and boiling or by bringing in bottled or purified water from the outside. Other important preventive measures at the community level include provision for the safe disposal of human feces and good food hygiene.

Because cholera is one of the few infectious diseases that can be spread by human remains (through fecal matter leaking from corpses into the water supply), during natural disasters, emergency workers who handle human remains are at increased risk of infection. It is considered preferable to bury corpses rather than to cremate them, however, and to allow survivors time to conduct appropriate burial ceremonies or rituals. The remains should be disinfected prior to burial and buried at least 90 feet (30 m) from sources of drinking water.

A cholera vaccines exists that can be given to travelers and residents of areas where cholera is known to be active, but the vaccine is not highly effective. It provides only 25% to 50% immunity and then only for a period of about six months. The vaccine is never given to infants under six months of age. As of 2014, the Centers for Disease Control and Prevention (CDC) did not recommend routine cholera vaccination for travelers. Residents of cholera-plagued areas should discuss the value of the vaccine with their doctor.

**Further Readings**

**Books**


Websites


Organizations
United States Centers for Disease Control and Prevention (CDC) 1600 Clifton Rd. Atlanta, GA 30333 Phone: 404 639-3534 Toll Free: 800 CDC-INF0: 232-4636); TTY: (888) 232-6348 Email: inquiry@cdc.gov Website: http://www.cdc.gov

World Health Organization (WHO) Avenue Appia 201211 Geneva 27 Switzerland Phone: 41 791 21 11 Fax: 41 791 31 11 Email: info@who.int Website: http://www.who.int


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