Cholera

Anatomy or system affected: Circulatory system, gastrointestinal system, intestines, kidneys

Definition: An acute bacterial disease transmitted by polluted water and contaminated food

Causes: Bacterial infection via contaminated food or water

Symptoms: Diarrhea, vomiting

Duration: Several days

Treatments: Fluid and electrolyte replacement, antibiotics

Causes and Symptoms

The comma-shaped bacterium *Vibrio cholerae* causes the life-threatening disease cholera. The organism is spread when people ingest water or raw food contaminated with fecal matter. Studies have shown that the bacterium can live in both oceanic salt water and freshwater. In the ocean, it adheres to a type of zooplankton called a copepod, which is eaten by certain types of shellfish. Therefore, people who consume shellfish grown in contaminated water can ingest the cholera organism, as can people who eat crops fertilized with human feces.
Distribution of cholera. By Marvel (Own work) [GFDL (http://www.gnu.org/copyleft/fdl.html) or CC-BY-SA-3.0 (http://creativecommons.org/licenses/sa/3.0/)], via Wikimedia Commons

Cholera particularly affects underdeveloped nations with poor sewage disposal and sanitation practices. It is found worldwide, but it predominantly found in countries in Africa, South and East Asia, and Central and South America. Even in developed nations, however, cholera may emerge after major disasters, such as hurricanes and earthquakes. In 2011 the World Health Organization (WHO) reported 589,854 cases worldwide; 32 percent of cases were in Africa, while 61.2 percent were in North and South America, mostly attributed to an outbreak in Haiti that began after the 2010 earthquake there. The WHO reports did not include an additional estimated 500,000 to 700,000 unreported or misdiagnosed cases. In 2015, the WHO reported 172,454 cases across forty-two countries, including 1,304 deaths.

After a person ingests contaminated food or water, between twenty-four and seventy-two hours elapse before the symptoms of cholera develop. Normally, between ten million to a billion *V. cholerae* bacteria must be present to cause infection, due to the large number that die in stomach acid. If an individual has taken antacids to neutralize stomach acid, however, only about one thousand organisms are necessary to cause infection. Fewer organisms are also required if they enter the body via food, because the food protects some of the bacteria from the stomach acid.

The organisms that survive travel to the small intestine, attach to the epithelial cells there, and produce a toxin that causes a tremendous loss of water and electrolytes though extreme diarrhea and sometimes vomiting. Patients can lose more than twenty quarts of fluid per day. The extremely dilute feces are primarily a whitish liquid containing flecks of solid mucous material resembling rice grains, and hence are commonly called rice-water stools. The tremendous loss of fluids and electrolytes can lead to hypotension (low blood pressure), an increase in both pulse and respiratory rates, cardiac arrhythmia, kidney failure, and the appearance of sunken eyes and cheeks. Shock, resulting from changes in blood acidity and extremely low blood volume, can lead to death within a few hours, especially in children.

Some strains of *V. cholerae* may produce almost no symptoms or only mild diarrhea in some individuals, but the majority of infected people experience very severe disease. Left untreated, approximately 60 percent of patients die; however, immediate rehydration therapy normally saves all but about 1 percent of patients. Nonfatal cases spontaneously resolve themselves after a few days, since both the organisms and the toxin that they produce are ejected from the patient’s body in the diarrhea.

**Treatment and Therapy**

The best method for controlling cholera is prevention. Societies with adequate sanitation and sewage treatment are normally protected, except for contaminated seafood. Underdeveloped nations should be assisted to improve their sanitation and sewage treatment practices and to cease using human feces as crop fertilizer. Also, especially in infected areas, raw foods and unpurified water should be avoided.
Although different cholera vaccines have been developed, the immunity that they produce appears to be short-lived and not effective against all strains. Prophylactic antibiotic treatment for travelers entering affected areas has not been shown to be effective. Given the large number of bacteria needed for the disease to occur, however, proper hygienic practices alone should provide sufficient protection.

Treatment for cholera patients is primarily supportive, with rehydration and restoration of the electrolyte balance being paramount. Secondary treatment with antibiotics may reduce the presence of organisms and their production of toxin, thus ameliorating the symptoms. Because of the high volume of watery diarrhea, the antibiotic tends to be released from the body very rapidly. Doxycycline is usually the preferred drug, but trimethoprim/sulfamethoxazole and tetracycline have also been used. Unfortunately, certain strains of V. cholerae have been discovered to be resistant to the latter two antibiotics. Using antibiotics to more effectively eliminate the organism may be important, since it has been estimated that up to 20 percent of patients continue to carry V. cholerae asymptomatically for a time after recovery from the disease.

Perspective and Prospects

Historically, cholera has been a very important epidemic pathogen credited with causing seven different pandemics. These pandemics have affected various areas, including Asia, the Middle East, and Africa. Between 1832 and 1836, two pandemics (the second and fourth) affected the North American continent, resulting in two hundred thousand American deaths. While studying and trying to limit the effects of the 1854 cholera epidemic in London, physician John Snow founded the science of epidemiology and introduced techniques that are still in use today. The seventh pandemic occurred in 1961, starting in Indonesia and spreading to South Asia, the Middle East, and portions of Europe and Africa.

In 1991, Peru suddenly reported new cases after being free of cholera for more than a century. Contaminated bilge water discharged from a freighter into the Peru harbor has been hypothesized as being responsible for the disease's reappearance. The water supply in the capital city of Lima was not chlorinated, and the organism rapidly multiplied and infected the inhabitants. In two years, more than 700,000 cases and 6,323 deaths were recorded in South and Central America, and spread of this cholera strain continues today.

The 1961 pandemic strain caused over five million cases of cholera and more than 250,000 deaths. In 1992, a genetic variant of this strain appeared in Bangladesh, causing an epidemic and spreading to neighboring countries. In January 2010 an earthquake hit Haiti and devastated much of the country's capital and the surrounding areas. The first case of cholera was confirmed in October 2010, and the disease quickly spread; by January 2013 the epidemic had killed more than eight thousand people and affected more than six hundred thousand more.

In 2017, Yemen faced the worst and fastest-spreading cholera outbreak in the world, caused in part by an ongoing war between Houthi rebels and a Saudi-led coalition that began in 2015 and trigged a nationwide collapse in Yemen's economy and its sanitation and health care systems. Between April and July 2017, approximately 313,533 suspected cases of cholera and 1,732 deaths had been reported in Yemen. In June 2017, the United Nations reported that the number of cholera cases in Yemen was increasing at an average of five thousand per day.

Bibliography


Copyright of Magill's Medical Guide (Online Edition) is the property of Salem Press. The copyright in an individual article may be maintained by the author in certain cases. Content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.

Source: Magill's Medical Guide (Online Edition), 2019, 2p

Item: 86193983