

tion of particular disorders” (emphasis added).

Those “benevolent but much mistaken men” who Malthus would “restrain,” are the hope of mankind. And it is our

task—those of us in jail, and those of us now free, whatever our particular circumstance might be—to carry that battle forward and see it through to victory.

Cholera epidemics, symptoms, and cure

Cholera is an acute, sometimes explosive, diarrheal disease caused by a toxin produced by *Vibrio cholerae* in the small intestine. It generally occurs in epidemics and may cause a rapid massive fluid loss from the gut, with extreme salt depletion, acidosis, and shock.

V. cholerae is a short, slightly curved, rod-shaped, bacterium that moves rapidly by a single, whip-like structure called a flagellum.

The common delta of the Ganges and Brahmaputra rivers of India and Bangladesh was a known focus of cholera since the sixteenth century. Until the nineteenth century, cholera remained confined to Asia, almost exclusively to India. Under the British Raj, forerunner of the “new world order,” cholera spread along the trade routes of most of the globe in six pandemics between 1817 and 1923. Subsequently, cholera retreated to the endemic regions of Southeast Asia, except for one isolated epidemic in Egypt in 1947. The seventh pandemic spread of disease extended from Sulawesi (Celebes), Indonesia in 1961, northward to the Korea peninsula, and through Southeast Asia, the Indian subcontinent, the Middle East, southern Europe, and Africa. Endemic foci in many of these recently involved areas, and isolated illness, have occurred since this pandemic reached its acme in 1971.

Since Robert Koch discovered the cholera vibrio in 1884, scientists have found many other vibrios. Most of these vibrios are hemolytic, that is, they attack and destroy red blood cells. True cholera vibrios supposedly were not hemolytic. This distinction collapsed in 1906, when Gotschlich isolated hemolytic vibrios from dead pilgrims at the Eltor quarantine station in Egypt. There was no cholera epidemic then, and the significance of this hemolytic cholera vibrio remained unknown. In 1939, DeMoor described cholera in Sulawesi (Celebes), Indonesia, that was due to *V. cholerae* biotype Eltor. This Eltor vibrio is the etiologic agent in the present pandemic.

The cholera patient ingests viable *V. cholerae*, which multiply in the small bowel and produce a toxin. This toxin stimulates the intestinal cells to secrete large quantities of isotonic fluid faster than the colon can reabsorb it. This produces a watery, isotonic diarrhea. All strains of

V. cholerae produce the same stool fluid-electrolyte losses that cause the physical findings and laboratory abnormalities seen in cholera. There is no evidence that the vibrio invades any tissue or that the enterotoxin directly affects any organ other than the small intestine. Cholera has the shortest incubation period of any infection; grave symptoms can occur within a few hours of infection.

Most infections with *V. cholerae* are asymptomatic or mild. The ratio of severe disease to mild and inapparent infections has been from 1:5 to 1:10 in classic cholera, and only about 1:25 to 1:100 for cholera Eltor. The hospitalized cases of both forms of disease, therefore, represent extreme manifestations of disease, with most infections going undetected unless intensive bacteriologic or serologic studies are made.

The sudden onset of profuse, effortless diarrhea is the *sine qua non* of severe symptomatic cholera. The diarrhea initially may be bile tinged and contain fecal particles, but a “rice water stool” soon follows. This is a continuous, light-gray water diarrhea with flecks of mucous material, but no pus or blood. Most patients, soon after the onset of diarrhea, have copious effortless vomiting that is precipitous but not persistent. Severe muscular cramps, most frequently located in the fingers, toes, and lower extremities, but sometimes generalized, are present in 75% of patients. Patients usually are not seen by a physician until 8 to 16 hours after onset of diarrhea. If not moribund, the patient is hoarse, reasonably alert, and oriented. Marked dehydration causes sunken eyes and cheeks, dry tongue and mucous membranes, poor skin turgor, shriveled feet, and “washerwoman’s hands.” The lips are cyanotic, the skin is cold and clammy, temperature is subnormal, and respirations are rapid and shallow. There is tachycardia and hypotension or an imperceptible pulse and blood pressure.

Children do not respond like adults. They frequently have fever, tetany or generalized convulsions, and pulmonary edema.

Prompt fluid, electrolyte, and base replacement rapidly improves all signs and symptoms except diarrhea. The illness may last from 12 hours to seven days. There should be no complications or sequelae if cholera is treated promptly and correctly. Under ideal conditions and with prompt and adequate fluid replacement, mortality and significant sequelae approach zero. Oral glucose-electrolyte therapy can be effective even under the most primitive conditions.—*John Grauerholz, M.D.*