Vibrio cholerae as a Bioterrorist Agent

Agent: *Vibrio cholerae*, a Gram-negative, comma-shaped rod, would serve as an effective biological weapon if the organisms were used to contaminate a large supply of the drinking water or food.

Disease: Cholera

Incubation Period: 4 hours-5 days

Signs/Symptoms: Persons infected with *V. cholerae* may be asymptomatic, have mild diarrhea, or have fulminant disease characterized by sudden onset of vomiting and abdominal distension followed by profuse watery diarrhea. Consequently, there is a rapid loss of body fluids, and frequently collapse. After several watery bowel movements the stools take on a "rice-water" appearance. Hypotension may become apparent within an hour of symptom onset. Without treatment, death may result from severe dehydration, hypovolemia and shock. Shock may appear within 4-12 hours of onset, with death following from 18 hours to several days later. Almost all clinical signs and symptoms may be explained by fluid and electrolyte loss.

Diagnosis:
Differential Diagnosis: Other causes of watery diarrhea to be ruled out are enterotoxigenic *Escherichia coli*, rotavirus, other viruses, other *Vibrio* species, or food poisoning due to ingestion of preformed toxins such as those produced by *Clostridium perfringens*, *Staphylococcus aureus*, or *Bacillus cereus*. Infection with *Cyclospora* species or *Cryptosporidium parvum* should also be considered.

Laboratory: Dark-field microscopy of cholera stools reveals large numbers of vibrios (short, curved rods) with a characteristic motility that gives the appearance of shooting stars. Cultures can be made directly from stool or from a rectal swab.

Send specimens for laboratory confirmation in a triple container to the Oregon State Public Health Laboratory, 1717 SW Tenth Avenue, Portland, OR 97201. Rectal swabs must be sent in Cary-Blair medium. Prior notification is requested by calling the laboratory at (503) 229-5882 and Acute and Communicable Disease Prevention at (503) 731-4024.

Supportive Tests: Stool samples seldom will have red or white cells on microscopic examination. Acidosis and renal failure may accompany severe dehydration.

Serum electrolytes may demonstrate hypokalemia, or in the case of inappropriate fluid replacement may show hypernatremia or hyponatremia.

Treatment: Treatment should be instituted prior to laboratory confirmation. Intravenous treatment with lactated Ringer's (LR) solution should be instituted immediately for patients with persistent vomiting or high rates of stool loss (>10ml/kg/hr). IV solution should be given rapidly until the patient's blood pressure is normal. LR solution should be infused so that about two liters are given in the first 30 minutes. Hydration should be reassessed at 30 minutes, then every 1-2 hours until rehydration is complete. If the patient's condition improves, the infusion can be slowed to deliver approximately 100 ml/kg of body weight within the first four hours of therapy. Children in shock should receive LR solution, 30 ml/kg of body weight in the first hour, and 20 ml/kg/hr over the next two hours. Oral rehydration solution (ORS) should be added to the treatment as soon as possible.

ORS should be administered even if vomiting is present. World Health Organization solution (3.5g NaCl, 2.5g $NaHCO_3$, 1.5g KCl and 20g glucose per liter) is effective for oral rehydration and can be used in mild to moderate cases. Other oral rehydration solutions include Ricelyte® and Rehydralyte®. Most over-the-counter infant rehydration solutions do not contain the proper electrolyte balance for treatment of cholera. Mildly and moderately dehydrated patients should be instructed to drink ORS until they are no longer thirsty. Estimated fluid losses should be replaced at 100ml/5 minutes. Daily oral replacement volume should include ongoing losses plus 1 liter; patients may need over 5 liters of fluid per day. The patient's volume status should be reassessed every 1-2 hours.

Antibiotic therapy (tetracycline 250 mg q6h for 3-5 days, or doxycycline 300 mg one time or 100 mg q12h for 3 days) will shorten the duration of diarrhea and reduce fluid losses. Other antibiotics that can be considered (because tetracycline resistance is widespread) include ciprofloxacin 1000 mg po one time, ciprofloxacin 500 mg po q12 h for 3 days, or erythromycin 500 mg q6h po for 3 days. Norfloxacin 400 mg q12h for 3 days or ampicillin 250 mg q6h for 5 days may also be used. Children may be treated with tetracycline 50 mg/kg/d divided into 4 doses for 3 days. Alternates include erythromycin 40 mg/kg/d divided into 4 doses for 3 days, trimethoprim (8 mg) and sulfamethoxazole (40 mg)/kg/d divided into 2 doses for 3 days, and furazolidone 5 mg/kg/d divided into 4 doses for 3 days.

Infection Control: Standard precautions as well as enteric precautions and careful hand washing should be employed. Bactericidal solutions such as 0.5% sodium

hypochlorite solution (1 part household bleach added to 9 parts water) provide adequate decontamination.

Report: Immediately report any suspect cases to your local health department or the Oregon Health Division at (503) 731-4024 during working hours (8:00 am to 5:00 pm Monday through Friday) or (503) 731-4030 nights, weekends and holidays.

Adapted with permission from the Texas Department of Health