VIBRIOSIS (Non-Cholera *Vibrio* spp)

Genera in the family *Vibrionaceae* currently include: *Aliivibrio, Allomonas, Catenococcus, Enterovibrio, Grimontia* (*Grimontia hollisae*, formerly *Vibrio hollisae), Listonella, Photobacterium (Photobacterium damselae*, formerly *Vibrio damselae)*, *Salinivibrio,* and *Vibrio* species including *V. cholerae* non-O1/non-O139, *V. parahaemolyticus*, *V. vulnificus*, *V. fluvialis*, *V. furnissii*, and *V. mimicus alginolyticus and V. metschnikovi.* (Not all of these have been recognized to cause human illness.)

REPORTING INFORMATION

- **Class B:** Report by the close of the next business day in which the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism:
    - The Ohio Disease Reporting System (ODRS) should be used to report lab findings to the Ohio Department of Health (ODH). For healthcare providers without access to ODRS, you may use the Ohio Confidential Reportable Disease form (HEA 3334).
    - The Centers for Disease Control and Prevention (CDC) requires that states collect information on the Cholera and Other *Vibrio* Illness Surveillance Report (52.79 E) (COVIS). Reporting sites should use the COVIS reporting form to assist in local disease investigation and traceback activities. Information collected from the form should be uploaded into ODRS or faxed to the Ohio Department of Health (ODH).
- Key Fields for ODRS reporting include: sensitive occupation or daycare attendee, travel history and water exposure. Please note patient symptoms go into the Notes section.

AGENTS

Vibrio parahaemolyticus; Vibrio cholerae non-O1 (does not agglutinate in O group-1 sera), strains other than O139; *Vibrio vulnificus* and *Photobacterium damselae* (formerly *Vibrio damselae*) and *Grimontia hollisae* (formerly *Vibrio hollisae)*, *V. fluvialis*, *V. furnissii*, and *V. mimicus*, *V. alginolyticus* and *V. metschnikovii*).

Please note: *Vibrio cholerae* non-O1 and *Vibrio cholerae* non-L139 are reported as cholera.

Infectious Dose

The usual infective dose is 10^6 organisms. That dose can be lowered in the presence of antacids, and can be as low as 10^2 of *V. vulnificus* in predisposed persons.

CASE DEFINITION

Clinical Case Definition

An infection of variable severity characterized by watery diarrhea, primary septicemia, or wound infection. Asymptomatic infections may occur, and the organism may cause extra-intestinal infection.

Laboratory Criteria for Diagnosis

Supportive laboratory evidence: Detection of a species of the family *Vibrionaceae* (other than toxigenic *Vibrio cholerae* O1 or O139, which are reportable as cholera) from a clinical specimen using a culture-independent diagnostic test (CIDT).

Confirmatory laboratory evidence: Isolation of a species of the family *Vibrionaceae* (other than toxigenic *Vibrio cholerae* O1 or O139, which are reportable as cholera) from a clinical specimen.

Case Classification

Suspect*: A clinically compatible case with pending laboratory results.

Probable: A case that meets the supportive laboratory criteria for diagnosis, or a clinically compatible case that is epidemiologically linked to a case that meets the supportive or confirmatory laboratory criteria for diagnosis.

Confirmed: A case that meets the confirmed laboratory criteria for diagnosis.

Note that species identification and, if applicable, serotype designation (i.e. *Vibrio cholerae* non-O1, non-O139 or *Grimontia hollisae*) should be reported.

Not a Case: This status will not generally be used when reporting a case, but may be used to reclassify a report if investigation revealed that it was not a case.

* This case classification can be used for initial reporting purposes to ODH as CDC has not developed a classification.

Comment

Genera in the family *Vibrionaceae* (not all have been recognized to cause human illness) currently include:

- *Aliivibrio*
- *Allomonas*
- *Catenococcus*
- *Enterovibrio*
- *Grimontia*
- *Listonella*
- *Photobacterium*
- *Salinivibrio*
- *Vibrio*

In addition to reporting through the Ohio Disease Reporting System (ODRS). ODH requires that local health departments collect and report the information on the standard form for Cholera and Other Vibrio Illness Surveillance (COVIS), available at https://www.cdc.gov/vibrio/surveillance.html . ODH intends to integrate the COVIS form into ODRS, but reporting sites should use the COVIS reporting form until the integration is successfully implemented. This form should be uploaded to ODRS or faxed to ODH for submission to CDC to allow for further investigation and trace back activities.

Illness caused by toxigenic *V. cholerae* O1 or O139 should be reported as a case of cholera. Illness caused by *V. parahaemolyticus* or *V. vulnificus* should be reported as separate reportable conditions.

All *Vibrio* isolates should be forwarded to ODH Laboratory which will immediately forward all suspect *V. cholerae* isolates to CDC for serogrouping and cholera toxin testing as well as biotype and antimicrobial susceptibility testing.

SIGNS AND SYMPTOMS

The spectrum of clinical illness is varied. Infections presenting as gastroenteritis usually include explosive watery diarrhea; abdominal cramps, nausea, vomiting, and headache are common; and fever and chills may occur. The duration of illness is generally short (median three days, with a range of two hours to 10 days). *V. cholerae* non-O1 can occasionally cause symptoms similar to those of *V. cholerae* O1. *V. vulnificus* can cause gastroenteritis or wound infection especially in persons with liver disease or immunosuppression, septicemia, which is up to 50% fatal.

DIAGNOSIS

ODH Laboratory performs testing for *Vibrio*. In some circumstances testing can be done at ODH Laboratory without charge. To obtain the fee exemption and to arrange for receipt of the stool transport kit, contact the ODH Outbreak Response and Bioterrorism Investigation Team (ORBIT) at 614-995-5599. Diagnosis of vibriosis is made by isolating the organism from stool or other site. A fresh stool is the best specimen in cases of gastroenteritis. Specimens should be submitted using the Cary-Blair fecal kit. ODH Laboratory also performs confirmatory testing of clinical isolates at no charge. Any positive lab finding for Vibrio must be submitted to ODH Lab for further characterization.

A case should not be counted as a new case if laboratory results were reported within 30 days of a previously reported infection in the same individual.

When two or more different species of the family *Vibrionaceae* are identified in one or more specimens from the same individual, each should be reported as a separate case.

EPIDEMIOLOGY

Source

V. parahaemolyticus, V. vulnificus: ubiquitous in salt waters.
V. cholerae non-O1: ubiquitous in fresh and salt waters.

Occurrence

Worldwide. Most infections occur sporadically, especially during the warmer months.

Mode of Transmission

The most common mode of transmission is via raw or under cooked seafood, with oysters being the most frequently implicated source. Non-cholera *Vibrio* spp. may also be spread through contact with water, especially seawater.

Period of Communicability

Secondary spread has not been documented in the United States. *V. parahaemolyticus* has only rarely been cultured from asymptomatic persons. No carrier state has been identified.

Incubation Period

Ranges from 4-96 hours, usually 12-24 hours (mean 15 hours).

PUBLIC HEALTH MANAGEMENT

Case

Investigation

All cases reported to the local health department should initially be followed up with a telephone call to obtain demographic, epidemiologic data and food history. If a case has consumed shellfish, determine the source of the shellfish and report details to the ODH Outbreak Response and Bioterrorism Investigation Team (ORBIT) at 614-995-5599 without delay so that appropriate regulatory actions can be taken and additional illnesses can be prevented. If there is left-over product, the product should be held until determinations about laboratory testing are made. ODH ORBIT will work with the ODH Laboratory if laboratory testing is indicated. ORBIT will contact the Ohio Department of Agriculture Shellfish Program at 614-728-6353.

"Shellfish" means all aspects of: (a) Oysters, clams, or mussels, whether: (i) Shucked or in the shell(ii) Fresh or frozen; and(iii) Whole or in part; and(b) Scallops in any form, except when the final product form is the adductor muscle only. To determine the source of the shellfish, for boxed shellfish obtain the lot number and distributor and for tagged shellfish obtain the harvest date, harvest area and distributor.

No further work-up is necessary unless the case is employed in a sensitive occupation (direct food handling, direct patient care, child care center employees who handle food or directly care for children) or attends a child care center.

Treatment

Treatment depends on the organism isolated and the patient's condition. In general, treatment is not necessary in most cases of *V. parahaemolyticus* infection. There is no evidence that antibiotic treatment decreases the severity or the length of the illness. Patients should drink plenty of liquids to replace fluids lost through diarrhea. In severe or prolonged illnesses, antibiotics such as tetracycline or ciprofloxicin can be used. The choice of antibiotics should be based on antimicrobial susceptibilities of the organism.

If *V. vulnificus* is suspected, treatment should be initiated immediately because antibiotics improve survival. Aggressive attention should be given to the wound site; amputation of the infected limb is sometimes necessary. Clinical trials for the management of *V. vulnificus* infection have not been conducted. The antibiotic recommendations below come from documents published by infectious disease experts; they are based on case reports and animal models.

- Culture of wound or hemorrhagic bullae is recommended, and all V. vulnificus isolates should be forwarded to a public health laboratory
- Blood cultures are recommended if the patient is febrile, has hemorrhagic bullae, or has any signs of sepsis
- Antibiotic therapy:
    - Doxycycline (100 mg PO/IV twice a day for 7-14 days) and a third-generation cephalosporin (e.g. ceftazidime 1-2 g IV/IM every eight hours) is generally recommended.
    - A single agent regimen with a fluoroquinolone such as levofloxacin, ciprofloxacin or gatifloxacin, has been reported to be at least as effective in an animal model as combination drug regimens with doxycycline and a cephalosporin.
    - Children, in whom doxycycline and fluoroquinolones are contraindicated, can be treated with trimethoprim-sulfamethoxazole plus an aminoglycoside.
    - Necrotic tissue should be debrided; severe cases may require fasciotomy or limb amputation.

Food Handlers

Food Service Operation rules also pertain to this situation. Vibriosis is a disease, which can be transmitted through food. Persons infected with a disease that is communicable by food are not permitted to work as food handlers. For additional information, refer to Ohio Administrative Code (OAC) Chapter 3717-1 (Ohio Uniform Food Safety Code) Section 02.1, Management and Personnel: Employee Health.

Follow-up Specimens

Follow-up specimens are not necessary because secondary transmission is rare in the United States and no carrier state has been documented.

Contacts

Contacts do not need to be tested for the reasons cited under "Follow-up Specimens" above.

Prevention and Control

Special Information

Avoid raw shellfish. Cook all shellfish thoroughly (boil until shells open, plus 5 more minutes). Avoid cross-contamination of cooked food with raw seafood or juices from raw seafood. Avoid exposure of open wound or broken skin to warm salt or brackish

water or to raw shellfish. Wear gloves when handling raw shellfish. Cooking destroys these and other bacteria and viruses (e.g. *Shigella*, norovirus and hepatitis A virus).

Persons with certain high risk conditions should especially be advised to avoid raw shellfish. These conditions include liver disease of any type, hemochromatosis, diabetes, stomach problems (including antacid use), cancer, immune disorders (including HIV infection), and long-term steroid use.

The Centers for Disease Control and Prevention (CDC) recommends persons who have had diarrhea not swim for two weeks after diarrhea ceases in order to prevent spread of disease.

Vibrio parahaemolyticus and *V. vulnificus* can both cause illness; they are described below. Cholera is discussed in a separate fact sheet.

1. *Vibrio parahaemolyticus*

What is *Vibrio parahaemolyticus?*

Vibrio parahaemolyticus is a bacterium in the same family as the bacteria that cause cholera. It lives in brackish saltwater and causes gastrointestinal illness in humans. *V. parahaemolyticus* naturally inhabits coastal waters in the United States and Canada and is present in higher concentrations during summer; it is a halophilic (salt-requiring) organism.

What type of illness is caused by *V. parahaemolyticus*?

When ingested, *V. parahaemolyticus* causes watery diarrhea often with abdominal cramping, nausea, vomiting, fever and chills. Usually these symptoms occur within 24 hours of ingestion. Illness is usually self-limited and lasts 3 days. Severe disease is rare and occurs more commonly in persons with weakened immune systems. *V. parahaemolyticus* can also cause an infection of the skin when an open wound exposed to warm seawater is contaminated with the organism.

How does infection with *V. parahaemolyticus* occur?

Most people become infected by eating raw or undercooked shellfish, particularly oysters. Less commonly, skin infections result from exposure of an open wound to warm seawater.

How common is infection with *V. parahaemolyticus*?

An estimated 4,500 cases of *V. parahaemolyticus* infection occur each year in the United States. However, the number of cases reported to CDC is much lower because surveillance is complicated by underreporting. Laboratories rarely use the selective medium that is necessary to identify this organism, and it is likely that many cases are undetected. To improve our ability to monitor trends, infections caused by *V. parahaemolyticus* and other *Vibrio* species became nationally notifiable in 2007. State health departments report cases to CDC, and these reports are summarized annually.

How is *V. parahaemolyticus* infection diagnosed?

Vibrio organisms can be isolated from cultures of stool, wound, or blood. For isolation from stool, use of a selective medium that has thiosulfate, citrate, bile salts, and sucrose (TCBS agar) is recommended. If there is clinical suspicion of infection with this organism, the microbiology laboratory should be notified so that they will perform cultures using this medium. A physician should suspect *V. parahaemolyticus* infection if a patient has watery diarrhea and has eaten raw or undercooked seafood, especially oysters, or when a wound infection occurs after exposure to seawater.

How is *V. parahaemolyticus* treated?

Treatment is not necessary in most cases of *V. parahaemolyticus* infection. There is no evidence that antibiotic treatment decreases the severity or the length of the illness. Patients should drink plenty of liquids to replace fluids lost through diarrhea. In severe or prolonged illnesses, antibiotics such as tetracycline, ampicillin or ciprofloxacin can be used. The choice of antibiotics should be based on antimicrobial susceptibilities of the organism.

How do oysters become contaminated with *V. parahaemolyticus*?
Vibrio is a naturally occurring organism commonly found in waters where oysters are cultivated. When the appropriate conditions occur with regard to salt content and temperature, *V. parahaemolyticus* thrives.

How is *V. parahaemolyticus* infection prevented?
Most infections caused by *V. parahaemolyticus* in the United States can be prevented by thoroughly cooking seafood, especially oysters. When an outbreak is traced to an oyster bed, health officials recommend closing the oyster bed until conditions are less favorable for *V. parahaemolyticus*. Wound infections can be prevented by avoiding exposure of open wounds to warm seawater.

Timely, reporting of *V. parahaemolyticus* infections to the Ohio Department of Health and local health departments will help collaborative efforts to improve investigation of these infections. When notified rapidly about cases, officials can sample harvest waters to discover possible sources of infection and may close oyster beds. Ongoing research may help us to predict environmental or other factors that increase the chance that oysters carry *Vibrios*.

2. *Vibrio vulnificus*
What is *Vibrio vulnificus*?
Vibrio vulnificus is a bacterium in the same family as the bacteria that cause cholera. It normally lives in warm seawater and is part of a group of vibrios that are called "halophilic" because they require salt.

What type of illness does *V. vulnificus* cause?
V. vulnificus can cause gastrointestinal disease in people who eat contaminated seafood. Among healthy people, ingestion of *V. vulnificus* can cause vomiting, diarrhea and abdominal pain. In immunocompromised persons, particularly those with chronic liver disease, *V. vulnificus* can infect the bloodstream, causing a severe and life-threatening illness characterized by fever and chills, decreased blood pressure (septic shock) and blistering skin lesions. *V. vulnificus* bloodstream infections are fatal about 50% of the time.

V. vulnificus can also cause an infection of the skin when open wounds are exposed to warm seawater. These infections can lead to skin breakdown and ulceration. Persons who are immunocompromised are at higher risk for invasion of the organism into the bloodstream and potentially fatal complications.

How do persons become infected with *V. vulnificus*?
Persons who are immunocompromised, especially those with chronic liver disease, are at risk for *V. vulnificus* when they eat raw seafood, particularly oysters. A recent study showed that people with these pre-existing medical conditions were 80 times more likely to develop *V. vulnificus* bloodstream infections than were healthy people. The bacterium is frequently isolated from oysters and other shellfish in warm coastal waters during the summer months. People with open wounds can be exposed to *V. vulnificus* through direct contact with seawater. There is no evidence for person-to-person transmission of *V. vulnificus*.

How common is *V. vulnificus* infection?
V. vulnificus is a rare cause of disease, but it is also underreported. Between 1988 and 2006, CDC received reports of more than 900 *V. vulnificus* infections from the Gulf Coast states, where most cases occur. Before 2007, there was no national surveillance system for *V. vulnificus,* but CDC collaborated with the states of Alabama, Florida, Louisiana, Texas, and Mississippi to monitor the number of cases of *V. vulnificus* infection in the

Gulf Coast region. In 2007, infections caused by *V. vulnificus* and other Vibrio species became nationally notifiable.

How can *V. vulnificus* infection be diagnosed?
V. vulnificus infection is diagnosed by routine stool, wound, or blood cultures; the laboratory should be notified when this infection is suspected by the physician, since a special growth medium can be used to increase the diagnostic yield. Doctors should have a high suspicion for this organism when patients present with gastrointestinal illness, fever, or shock following the ingestion of raw seafood, especially oysters or with a wound infection after exposure to seawater.

How is *V. vulnificus* infection treated?
If *V. vulnificus* is suspected, treatment should be initiated immediately because antibiotics improve survival. Take all of your medicine as directed by your health care provider. Aggressive attention should be given to the wound site; amputation of the infected limb is sometimes necessary. Clinical trials for the management of *V. vulnificus* infection have not been conducted.

How is *V. vulnificus* infection prevented?
Some tips for preventing *V. vulnificus* infections, particularly among immunocompromised patients, including those with underlying liver disease:

- Do not eat raw oysters or other raw shellfish.
- Cook shellfish (e.g. oysters, clams, mussels) thoroughly: For shellfish in the shell, either
    - boil until the shells open and continue boiling for 5 more minutes, or
    - steam until the shells open and then continue cooking for 9 more minutes.
- Do not eat shellfish that do not open during cooking. Boil shucked oysters at least 3 minutes, or fry them in oil at least 10 minutes at 375°F.
- Avoid cross-contamination of cooked seafood and other foods with raw seafood and juices from raw seafood.
- Eat shellfish promptly after cooking and refrigerate leftovers.
- Avoid exposure of open wounds or broken skin to warm salt or brackish water, or to raw shellfish harvested from such waters.
- Wear protective clothing (e.g. gloves) when handling raw shellfish.

Information about the potential dangers of raw oyster consumption is available 24 hours a day from the FDA Seafood Hotline (telephone 800-332-4010). Information is also available http://www.fda.gov/Food/ResourcesForYou/HealthEducators/ucm085164.htm.