

***Vibrio* and *Grimontia hollisae* Infections**

Investigative Guidelines

May 2018

1. DISEASE REPORTING

1.1 Purpose of Reporting and Surveillance

1. To identify potential outbreaks and to mitigate future transmission.
2. To identify the source of *Vibrio* and *Grimontia hollisae* infection in Oregon.
3. To reduce the risk of *Vibrio* and *Grimontia hollisae* infection from food available for consumption in Oregon.

1.2 Laboratory and Physician Reporting Requirements

Laboratories and physicians are required to report all confirmed, presumptive or suspect cases within one working day of identification/diagnosis. Reports should not be delayed for serotyping or final laboratory confirmation. Note that isolation or otherwise identifying (e.g., by polymerase chain reaction [PCR] test) any *Vibrio* species (not just *V. parahaemolyticus*) from any site is reportable. Suspected or confirmed cases of infection by *Vibrio cholerae* strains O1 or O139 (toxigenic *Vibrio cholera*) are immediately reportable.

1.3 Local Health Department Reporting and Follow-Up Responsibilities

1. Report all confirmed and presumptive (but not suspect) cases to the Public Health Division (PHD) by the end of the calendar week of initial report. Begin follow-up investigation within one working day. Epidemiologists within the PHD's Acute and Communicable Disease Prevention (ACDP) section will typically be involved, as will the Shellfish Program within the Oregon Department of Agriculture's Food Safety Program, in most vibriosis case investigations and outbreaks. See Section 7, *Vibrio* Investigation Process, for guidance on typical investigation responsibilities.
2. Complete case investigation, enter case data into Orpheus, and fill out a CDC Cholera and Other *Vibrio* Illness Surveillance (COVIS) form, which is available at <http://public.health.oregon.gov/DiseasesConditions/CommunicableDisease/ReportingCommunicableDisease/ReportingForms/Pages/index.aspx>.
3. Ensure that labs forward the first isolate from each patient to the Oregon State Public Health Laboratory (OSPHL) for confirmation of *Vibrio* spp. or *Grimontia hollisae* and serotyping of any *Vibrio cholerae* (if identified); shipping these isolates to OSPHL is required by OAR 333-018-0018(1)(a)(A).

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Interview each case to identify potential sources of exposure and any close contacts with gastrointestinal illness who may have shared these exposures. Notify ACDP by phone at 971-673-1111 if an outbreak is suspected.

2. THE DISEASE AND ITS EPIDEMIOLOGY

2.1 Etiologic Agent

Vibrio spp. are Gram-negative bacilli best known because of *V. cholerae* serogroups O1 and O139, the causative agents of toxigenic (epidemic) cholera. The reservoir for these strains is in humans and also waterways. Epidemic cholera is not endemic in the United States. CDC carefully distinguishes cholera from the illnesses caused by all other strains of *Vibrio*, namely *V. parahaemolyticus*, *V. vulnificus* and non-toxicogenic *V. cholera*: these other illnesses are called vibrioses.¹

The bacteria that cause vibrioses are halophilic (salt-requiring) organisms that naturally inhabit saltwater or brackish waters (where fresh- and saltwaters meet) along the coasts of the United States and Canada and elsewhere in the world.¹ They are present at higher concentrations in these waters (and in the filter-feeding mollusks living in them) during summer and during periods of ocean warming. Gastrointestinal illness may occur after eating raw or undercooked molluscan shellfish contaminated with *Vibrio* (typically *V. parahaemolyticus* and *V. mimicus* but also non-toxicogenic cholera). Localized wound infection is typically associated with *V. alginolyticus* and severe illness (septicemia and death) is typically caused by *V. vulnificus* (a bug not currently endemic in Oregon waters). Importantly, *Vibrio* bacteria present in shellfish are colorless and tasteless. Non-toxicogenic *V. cholerae* is also known to cause wound infections and gastrointestinal infections among those who consume shellfish, shrimp and fish contaminated with these bugs.¹ Other routes of infection (75% of reported infections in the literature do not have a vehicle associated with them) are possible.¹ *Grimontia hollisae* resembles *V. parahaemolyticus* in terms of where it lives and how it causes illness and was, until recently, considered to be part of the genus *Vibrio*. *G. hollisae* is now understood to be phylogenetically very different from *Vibrio* and has now been awarded its very own genus.² Nevertheless, for the purposes of this document, however, we will consider *G. hollisae* infection a vibriosis.

2.2 Description of Illness

The illness associated with vibriosis depends upon the route of infection and the bug:

- Foodborne vibriosis is an acute bacterial enteric disease characterized by watery diarrhea, abdominal cramping, nausea, vomiting, fever and chills.

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In Oregon this infection is typically associated with *V. parahaemolyticus*, *V. mimicus*, *G. hollisae* and some strains of non-toxigenic *V. cholera*.

- Non-foodborne vibriosis typically consists of wound infection that may be characterized by bullae, cellulitis, fever and muscle pain; in immunocompromised patients — especially those with cirrhosis — sepsis and death may ensue rapidly. In Oregon, wound infections are typically associated with *V. alginolyticus*; infection with *V. vulnificus* and some strains of non-toxigenic *V. cholera* can cause severe more severe illness.
- Toxigenic cholera is characterized by profuse, painless, watery diarrhea (up to 20 L/d! “Rice-water” stools are classically described) and occasional vomiting and, in untreated cases, rapid dehydration, acidosis, circulatory collapse, hypoglycemia in children, and renal failure. In severe, untreated cases of cholera, death may ensue within a few hours of onset, and the case-fatality rate (CFR) may exceed 50%; with aggressive hydration, the CFR is <1%.

2.3 Reservoirs

Marine coastal waters (and the fish and shellfish living in these coastal waters) are the reservoir for the pathogenic species of *Vibrio* found in the Pacific Northwest. The amount of *Vibrio* in these waters increases with temperature. In cooler weather, when infections are uncommon, *Vibrio* typically lives in marine silt; in warmer weather, the bacteria are found in the waters themselves. Cases of *V. vulnificus* in the Pacific NW are typically associated with travel to the Gulf Coast or home preparation of warm water fish (such as tilapia).

The reservoir for *V. cholerae* serogroups O1 and O139 is generally thought to be humans, although environmental reservoirs, such as brackish water or estuaries are another known source. Cholera can be foodborne — often through contamination by water at some point during food preparation. Cases of cholera in the United States are usually associated with international travel.

2.4 Modes of Transmission

In Oregon, *V. parahaemolyticus* is the most common cause of vibriosis and is almost always acquired through the ingestion of raw or inadequately cooked seafood. Commonly recognized vehicles or mechanisms of transmission for enteric vibriosis include:

1. Inadequately cooked or raw molluscan shellfish;
2. Contact with infected ocean water; and
3. Other foods cross-contaminated with any of the above.

In addition to these, cholera can also be acquired through:

4. Contaminated produce;
5. Contaminated and inadequately treated drinking water; and

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6. Person-to-person spread, when an infected person fails to wash hands thoroughly after defecation — though this is surprisingly uncommon (reflecting high infectious dose). Person-to-person spread is more likely when the infected person has diarrhea, rather than during the carrier state.

Vibrio wound infections are acquired through contact with *Vibrio*-contaminated water.

2.5 Incubation Period

For *V. parahaemolyticus* and *G. hollisae*, usually 12–24 (range, 4–96) hours. The incubation periods of infections by other *Vibrio* spp. are shorter: up to 72 hours for *V. vulnificus* and up to 36 hours for *V. cholerae* O1 or O139.

2.6 Period of Communicability

No cases of person-to-person transmission have been identified for vibriosis, but toxigenic cholera may be communicable from person to person for up to 14 days in asymptomatic cases and in symptomatic cases for only a few days after symptom resolution.

2.7 Treatment

Hydration, which almost always can be done orally, is the mainstay of treatment for gastroenteritis caused by vibriosis and cholera. As for antibiotic treatment, it depends on the specific pathogen. There is no evidence that antibiotic treatment decreases the severity or the length of illness associated with *V.*

parahaemolyticus, although antibiotics such as tetracycline, ampicillin or ciprofloxacin can be used in severe cases. However, antibiotic treatment is recommended for infection with *V. vulnificus* and toxigenic *V. cholerae* O1 and O139. In such cases, the choice of antibiotics should be based on antimicrobial susceptibilities of the organism.

2.8 Testing

In 2017, the Council for State and Territorial Epidemiologists changed its guidance and adopted culture-independent diagnostic testing (CIDT; typically PCR) as an indicator of presumptive case status. Currently, two types of CIDT are in use in the U.S.:

- VERIGENE® Enteric Pathogens Test (EP) by Luminex (Austin, Texas); this test was recently also called Nanosphere.
- BioFire FilmArray® GI Panel by BioFire Diagnostics, LLC (Salt Lake City, Utah).

Oregon's experience in the 2017 *Vibrio* season indicates significant differences in the performance of these two tests, necessitating a change in our case definitions; see Section 3.

3. CASE DEFINITIONS, DIAGNOSIS AND LABORATORY SERVICES

3.1 Confirmed Case Definition

Person from whom *G. hollisae* or any *Vibrio* spp. (not just *V. parahaemolyticus*) is cultured (again, from any site).

3.2 Presumptive Case Definitions

Diarrhea (≥ 3 loose stools in a 24-hour period) in someone epidemiologically linked to a confirmed case; or person positive for *G. hollisae* or any *Vibrio* spp. via VERIGENE® PCR.

3.3 Suspect Case (*not reportable to Oregon PHD*)

Any person positive for *G. hollisae* or any *Vibrio* spp. via BioFire FilmArray® PCR; or anyone with an undiagnosed, non epi-linked, diarrheal illness with likely exposure to raw or undercooked shellfish or to untreated water from an area with cholera transmission. Anyone with cellulitis or other skin infection after exposure to salt- or brackish water.

3.4 Services Available at the Oregon State Public Health Laboratory

OSPHL provides confirmation of organism identification for *Vibrio* spp. and serotyping of *Vibrio cholerae* for all clients. OSPHL also cultures all appropriately submitted stool specimens and isolates for detection of *Vibrio* spp. for public health investigations. Specimens will be cultured only if obtained before initiation of antimicrobials.

If case has only PCR test results from a private lab:

OSPHL prefers that laboratories perform in-house reflex culture on PCR-positive specimens. However, as needed, OSPHL will accept stool in Cary Blair medium to perform the reflex culture and speciation at OSPHL. OSPHL will not accept blood or wound specimens for culture.

If case has culture identification from a private lab:

OSPHL will confirm organism identification for appropriately submitted isolates for detection of *Vibrio* spp. If *Vibrio cholerae* is identified, OSPHL will serotype the isolate.

During suspected *Vibrio* outbreaks, OSPHL will accept stool in Cary Blair medium for enteric pathogen culture with approval from an ACDP epidemiologist.

4. ROUTINE CASE INVESTIGATION

Interview the case and others who may be able to provide pertinent information.

4.1 Identify the Potential Sources of Infection

Ask about potential exposures during the 7 days before onset (for noncholerae vibriosis) or 4 days before onset (for cholera), including:

1. Name, diagnosis, and telephone number or address of any acquaintances or household members with similar illnesses (*n.b.*: anyone meeting the presumptive case definition and with reported seafood consumption or exposure to natural bodies of water should be reported and investigated in the same manner as a confirmed case);
2. Enteric illness only: Consumption of any seafood, especially raw or undercooked shellfish;
3. Enteric illness only: Description of the seafood consumed (name of dish, type of menu, describe how prepared [e.g., for oysters, shucked or served on the half shell]);
4. Contact with bodies of water;
5. Date, location, and sponsor of any public gathering where food was consumed;
6. Travel outside the United States or contact with others known to have traveled outside the United States.

4.2 Identify Potentially Exposed Persons (Contacts)

If a putative vehicle (e.g., shellfish) is identified, interview others who partook of the same item.

4.3 Environmental Evaluation

If the source of infection appears to be associated with a restaurant or other commercial facility, environmental health and Oregon Department of Agriculture (ODA) investigations are warranted (refer to Section 7 for a description of the investigation process). Ideally, for a noncholerae vibriosis, an EH investigation should yield the following:

- A copy or photo of a tag from a single batch of shellfish to which the case's illness has been linked (identified through details of the meal along with documentation about when each batch of shellfish was consumed); and
- An inspection report (to document any temperature or other food-safety violations at the food facility).

Depending on the locale, county environmental health inspectors or ODA Shellfish Program inspectors will conduct the environmental health inspection. Finalized EH reports should be sent to the ODA Shellfish Program so they may conduct their own inspection, document any violations, measure physical characteristics of harvest sites and, as investigative findings warrant, close implicated shellfish beds. A copy of the report should also be sent to ACDP. Outbreaks (as defined by ODA) result in U.S. Food and Drug Administration

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involvement. Bed closure and product recall may also result from a formal declaration of an outbreak.

Toxigenic cholera is typically imported into the U.S., and as such, does not warrant environmental evaluation.

5. CONTROLLING FURTHER SPREAD

5.1 Education

As indicated, provide basic instruction to cases and potentially exposed persons about the importance of proper food handling, adequate cooking of shellfish (see § 6.4) and avoidance of cross-contamination of other foods by raw shellfish or contaminated seawater. Debunking the myth about hot sauce or lemon juice or alcoholic beverages making shellfish safe to eat can be a highlight of this conversation. Reminding people with diarrhea about the virtues of handwashing after toilet use is always a good idea.

5.2 Isolation of Cases

Vibriosis is not transmissible from person to person (though this should not be taken as an excuse to not wash hands).

Cholera cases should be cared for using standard precautions; strict isolation is not necessary. Less severe cases can be managed on an outpatient basis with oral rehydration and an appropriate antimicrobial agent. Effective hand washing and basic procedures of cleanliness must be practiced. It's typically safe to dispose of human waste (feces, vomit) in sewage systems in the United States, but linens should be disinfected with a bleach solution (0.05%) or by boiling.

5.3 Case Follow-up

Generally not indicated.

5.4 Protection of Contacts

Not applicable for vibriosis.

Contacts of cholera cases should be monitored for 5 days after sharing food or drink with a case of cholera. However, chemoprophylaxis is not recommended for these contacts.

5.5 Environmental Measures

Although oysters can be harvested legally only from waters free from fecal contamination, even legally harvested oysters can be contaminated with *Vibrio* spp. because these bacteria are naturally present in marine environments. *Vibrio* does not alter the appearance, taste, or odor of oysters.

6. MANAGING SPECIAL SITUATIONS

6.1 Case is a Food Handler

Absent particularly suspicious circumstances, no special follow-up is warranted for noncholerae vibriosis. As with all diarrheal diseases, symptomatic food workers should be furloughed until symptoms have resolved. Consult with ACDP epidemiologists if you have concerns.

Cholera cases should not work while infectious.

6.2 Food Served at a Public Gathering is Implicated

Determine the source (harvest site, producer and distributor) of the shellfish.

6.3 Case Works at a Health Care or Residential Care Facility

Determine a) whether any shellfish had been served in the facility within the 7 days before the case's illness onset, and b) whether there had been any unusual incidence of diarrheal illness within a week of the case's illness. If other potential cases are identified, investigate these reports, too, with an eye towards identifying common vehicles and any continuing sources of exposure. If indicated, arrange for a sanitary inspection of the facility. The extent of further investigation depends on circumstances. Consult with ACDP epidemiologists.

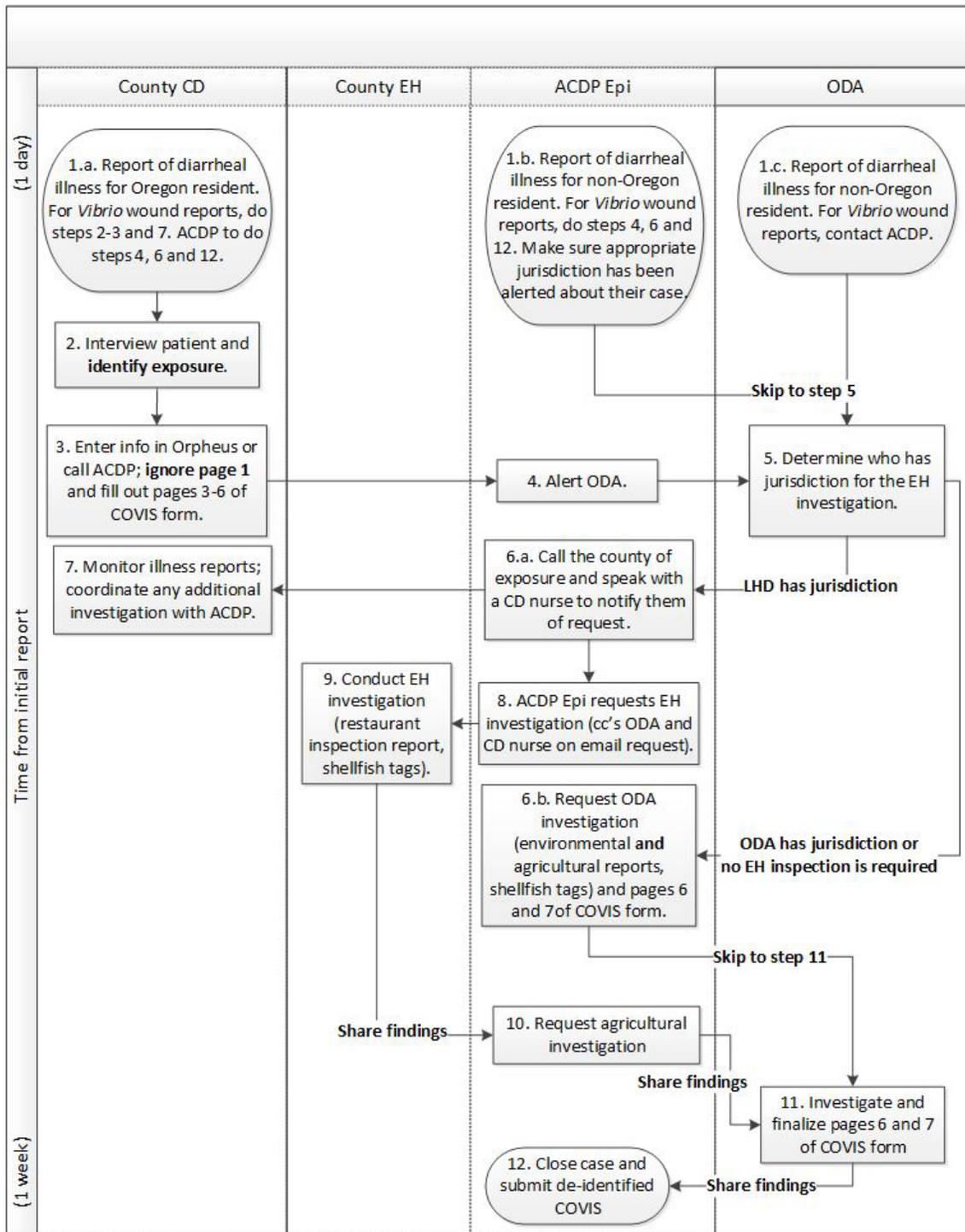
6.4 Prevention

1. Do not eat raw oysters or other raw shellfish;
2. Cook shellfish (oysters, clams, mussels) thoroughly. For shellfish in the shell, either: (a) boil until the shells open and continue boiling for 3–5 more minutes, or (b) steam until the shells open and then continue cooking for 9 more minutes. Do not eat shellfish that fail to open during cooking. Boil shucked oysters at least 3 minutes, or fry them in oil at least 3 minutes at 375°F. See www.foodsafety.gov/poisoning/causes/bacteriaviruses/Vibrio_infections;
3. Avoid cross-contamination of cooked seafood and other foods with raw seafood and juices from raw seafood;
4. Eat shellfish promptly after cooking, and refrigerate leftovers;
5. Avoid exposure of open wounds or broken skin to warm salt or brackish water, or to raw shellfish harvested from such waters; and
6. Wear gloves when handling raw shellfish.

6.5 Common Source Outbreak Suspected

Consult with ACDP epidemiologists as soon as you suspect an outbreak.

7. VIBRIO INVESTIGATION PROCESS



ACDP: Oregon Health Authority Acute and Communicable Disease Prevention

CD: Communicable Disease

COVIS: Center for Disease Control and Prevention supplemental form for *Vibrio* illnesses

EH: Environmental Health

ODA: Oregon Department of Agriculture

REFERENCES

1. Deshayes S, Daurel C, Cattoir V, Parienti J, Quilici M, de La Blanchardière A. Non-O1, non-O139 *Vibrio cholerae* bacteraemia: case report and literature review. SpringerPlus 2015;4.
2. Thompson FL, Hoste B, Vandemeulebroecke K, Swings J. Reclassification of *Vibrio hollisae* as *Grimontia hollisae* gen. nov., comb. nov. International journal of systematic and evolutionary microbiology 2003;53:1615-7.

UPDATE LOG

- May 2018. Changed case definitions because of false-positive BioFire FilmArray® tests. (Boyd)
- June 2017. Expanded document to include discussion of toxigenic and non-toxigenic *Vibrio* and *Grimontia hollisae*. Updated document with newest CSTE case definition standards for culture independent diagnostic testing. (Boyd)
- November 2015. Added PCR as a test type for confirmation. (Boyd)
- October 2014. Additional guidance and flow chart. (Boyd) 2003.
- Original version (ACDP)