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# Vibriosis (any species other than Cholera)

## Surveillance and Investigation Protocol

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# Vibriosis (any species other than Cholera)

## Surveillance and Investigation Protocol

### I. ABOUT THE DISEASE

#### A. Clinical Presentation

Non-cholera *Vibrio* bacteria causes vibriosis, a group of infections with varying clinical manifestations depending on the *Vibrio* species, route of infection, and susceptibility of the patient. Ingestion of non-cholera *Vibrio* from raw or undercooked contaminated food can lead to gastroenteritis or primary septicemia (bloodstream infection). Exposure of broken skin to contaminated water can cause skin infections which can lead to secondary septicemia.

Gastroenteritis is the most common syndrome of vibriosis and is characterized by watery diarrhea, abdominal cramps, nausea, vomiting, low grade fever, and chills. Patients can spontaneously recover in 2 to 5 days. When the *Vibrio* bacteria enters the bloodstream (septicemia), the patient can develop fever, chills, hypotension, and blistering skin lesions. Vibrio skin infections can present with fever and cellulitis which can progress to development of vesicles, bullae, necrosis, and in some cases necrotizing fasciitis of the affected site. Some *Vibrio* species, such as *Vibrio vulnificus*, can cause severe and life-threatening infections (*i.e.* necrotizing fasciitis), and even death.

*Vibrio alginolyticus* has been known to cause ear infections after swimming in salt water.

#### B. Etiologic Agent

*Vibrio* genus is divided into two major groups: cholera and non-cholera infections. Infections by non-cholera bacteria cause vibriosis.

*Vibrio* are gram-negative bacteria that are naturally found in warm (typically $\geq 15^{0}$C), salty marine environments, such as salt water and brackish water. About a dozen species are pathogenic to humans. The most common species causing vibriosis in the United States are:

A. *Vibrio parahaemolyticus* (40% of cases)
B. *Vibrio vulnificus*
C. *Vibrio alginolyticus* (20% of cases)

#### C. Reservoir

The main reservoirs for the *Vibrio* bacteria are marine and estuarine environments, where it naturally lives. *Vibrio* bacteria are found in salt and brackish water, which is a mixture of fresh and salt water. They thrive in warm water, so they are more likely to cause infections during the summer months.
*Vibrio* bacteria are often found in shellfish (oysters, mussels) since they filter the water containing the bacteria. They also take up residence in the intestines of fish.

#### D. Incubation Period

The incubation period for vibriosis ranges from 4–96 hours, usually 12–24 hours. *V. vulnificus* infections are characterized by an average of 48-hour incubation period between ingestion and onset of symptoms, and an average of 16-hour incubation period for wound exposure.

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### E. Mode of Transmission

*Vibrio* infections often occur following ingestion of contaminated water, consumption of raw or undercooked contaminated seafood, or wound exposure to contaminated water. The infection is not transmitted person-to-person.

Risk Factors: Anyone can get a vibriosis. However, some medical conditions and treatments can increase the risk for infection and severe complications. These include liver disease, cancer, diabetes, HIV, or thalassemia; receipt of immune-suppressing therapy for the treatment of disease; intake of medicine to decrease stomach acid levels; and recent stomach surgery. Some behaviors can also increase the risk of infection, such as eating raw seafood (especially oysters), exposure of open wound to coastal waters, and exposure of an open wound to raw seafood or its drippings.

### F. Period of Communicability

Since *Vibrio* infection is not considered to be transmissible person-to-person, there is no carrier state and no defined period of communicability.

## II. DISEASE INVESTIGATION

### A. Case Definition and Case Classification (2017):

**Clinical Criteria**

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.
- **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.

**Epidemiologic Linkage**

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

**Criteria to Distinguish a New Case from an Existing Case**

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.

**Comment:**
The use of CIDTs as stand-alone tests for the direct detection of *Vibrio* in stool is increasing. Specific performance characteristics such as sensitivity, specificity, and positive predictive value of these assays likely depend on the manufacturer and are currently unknown. It is therefore useful to collect information on the type(s) of testing performed for reported vibriosis cases. When a specimen is positive using a CIDT it is also helpful to collect information on all culture results for the specimen, even if those results are negative. Culture confirmation of CIDT positive specimens is ideal, although it might not be practical in all instances. State and local public health agencies should make efforts to encourage reflexive culturing by clinical laboratories that adopt culture-independent methods, should facilitate submission of isolates/ clinical material to state public health laboratories, and should be prepared to perform reflexive culture when not performed at the clinical laboratory as isolates are currently necessary for serogrouping and cholera toxin testing as well as biotype and antimicrobial susceptibility testing.

### B. Case Classification:

**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.

### C. Reporting Timeframe to Public Health
Report within 72 hours of notification to the local health department.

### D. Outbreak Recognition
An outbreak is defined as two or more cases of vibriosis following exposure to the same contaminated food or water. Because individual cases of vibriosis potentially spur product traceback, it seems like cluster and outbreak detection for vibriosis cases would be common. Unfortunately, since vibriosis case-patients often report consuming multiple shellfish varieties or don't even recall what kind of shellfish they consumed, vibrio outbreak identification is not common.

Another way to identify vibriosis clusters and outbreaks is through whole genome sequencing (WGS). Case-patient isolates that are highly genetically related may point to a common shellfish as the source of illness. However, WGS data should always be interpreted in tandem with shellfish traceback data.

Traceback data can show that case-patients infected with a highly genetically related strain of Vibrio consumed shellfish that were grown and harvested hundreds (or even thousands) of miles apart. There are several reasons this might happen:

- Shellfish are often moved from one growing area to another (for example, from a higher risk area for Vibrio parahaemolyticus to a lower risk area) and the Vibrio strains in the shellfish also get moved around.
- Certain related strains ("clones") of Vibrio organisms may become either the predominant strain of one species (Vibrio parahaemolyticus, for example) in a region, or just the strain most likely to cause illness (the most "pathogenic") in a region.
- Oysters grown in different regions sometimes share the same wet storage prior to harvest. What the shellfish may have in common is the same wet storage, not the same growing area.
- Infections that are highly related via WGS may also be a result of cross-contamination between shellfish or between raw shellfish and ready-to-eat foods.

**E. Healthcare Provider (HCP) Responsibilities**

1. Be familiar with vibriosis clinical presentation.
   a. Consider *Vibrio* as a possible cause of infection in patients with watery diarrhea who have recently eaten raw or undercooked seafood, especially oysters.
   b. Consider *Vibrio* as a possible cause of infection in wounds that were exposed to coastal waters, especially in patients with increased risk for *Vibrio* infection.
2. If *Vibrio* wound infection is suspected, immediately begin treatment. Do **not** wait for consultation or laboratory confirmation.
3. Depending on the clinical presentation, obtain clinical specimens (stool, wound, blood) from patients suspected with vibriosis and send for *Vibrio* testing. Notify the laboratory if *Vibrio* infection is suspected as special techniques are used to identify the organism. Multiplex PCR panels are available but specificity is low. The infection should be confirmed by bacterial culture and the isolate (or clinical specimen) should be forwarded to the state public health laboratory for molecular characterization.
4. Inform the commercial or hospital laboratory to send *Vibrio* isolates to the state public health laboratory, the WV Office of Laboratory Services (OLS), tel. number: (304) 558-3530.
   a. **Testing:** *Vibrio* can be detected by culture-independent diagnostic testing (CIDT) or by isolating the bacteria from a clinical specimen by culture.
      - If CIDT is positive, order a culture confirmation, when possible. CIDTs do not differentiate between non-cholera *Vibrio*, which is necessary to make treatment decisions.
      - If a *Vibrio* isolate is available, request the laboratory to send it to OLS.
      - If a *Vibrio* is not isolated, request the laboratory to send the specimen to OLS for further testing.

   **b. *Vibrio* wound infection:**
      - Obtain wound or hemorrhagic bullae cultures and send all *Vibrio* isolates to the WV OLS.
      - Blood cultures are also recommended if the patient is febrile, has hemorrhagic bullae, or has signs of sepsis.
      - Ask the patient or family about relevant exposures. Did the patient:
        i. Have an open wound (including from a recent surgery, piercing, or tattoo) that might have come in contact with coastal water, including salt water or brackish water? Brackish water is a mixture of salt water and fresh water, such as where the river meets the ocean.
        ii. Get a scratch or a cut while in or around coastal water?

iii. Have an open wound that might have come in contact with raw or undercooked seafood or juice or drippings from raw or undercooked seafood?

- Use answers to guide treatment decisions.

5. Obtain exposure history from patients suspected with vibriosis (see item 2 above).
6. Treatment is not necessary in mild cases, but patients should drink plenty of liquids to replace fluids lost through diarrhea.
7. Antibiotics can be lifesaving for patients with severe illnesses. **For *Vibrio vulnificus* infection**, initiate treatment promptly. Do **not** wait for consultation with an infectious disease specialist or for laboratory confirmation. For treatment options, see CDC's Vibrio infection.
8. Notify the local health department of the patient's county of residence about a potential case of vibriosis.
9. Respond to requests for clinical, laboratory, and other relevant information from local health authorities.

### F. Laboratory Responsibilities

If a stool culture is performed, use selective media, such as thiosulfate citrate bile-salts (TCBS) agar, for examining stool specimens.

Commercial and hospital laboratories should send *Vibrio* isolates to OLS for submission to CDC's Enteric Diseases Laboratory Branch (EDLB). For information about sending specimens to OLS, see the WV OLS Stool Collection Form.

### G. Local Health Responsibilities

1. Be familiar with the *Vibriosis Surveillance and Investigation Protocol*.
2. Educate healthcare providers about the reporting requirements. Vibriosis is reportable to a local health department within 72 hours of diagnosis.
3. Using the standard form for Cholera and Other *Vibrio* Illness Surveillance (COVIS), complete the CDC COVIS Form and enter the information into WVEDSS. Ensure that the information entered in WVEDSS is correct and complete. Attach the completed CDC COVIS Form to the Attachments section in the Supplemental Info tab in the WVEDSS investigation.
    a. Interviewing Tips
        i. If case consumed seafood from restaurant, look up the restaurant menu online and ask:
            1. What was the date and time of meal?
            2. Which meal was eaten: dinner, brunch, happy hour, etc.?
            3. Which menu did the case order from: dinner, special oyster menu, bar or happy hour menu?
            4. What is the exact name and description of the item (the online menu can help)?
            5. How much/how many did they eat?
            6. Do they have receipts, photos, etc.?

ii. If case consumed seafood from a seafood stand or grocery store, look up the seafood stand or store online to see what they typically sell and ask:
    1. What type of seafood was purchased?
    2. The date and time of purchase
    3. The date and time of consumption
    4. How was the seafood handled between the time it was purchased and eaten?
    5. Do they have a receipt?
    6. If they purchased bivalve shellfish, do they still have the tag attached to the plastic net the shellfish was sold in?
    7. If they purchased pre-shucked bivalve shellfish, do they still have the container (jar and lid) it was sold in?

iii. If case consumed recreationally harvested seafood: Gather details about who harvested the shellfish or other seafood, when and where it was harvested, storage conditions, and how the items were prepared (served raw, if cooked, how cooked, possibilities for cross-contamination in storage or preparation).

iv. If case traveled outside the United States: Obtain travel dates and locations visited and detailed restaurant exposure as above.

v. If case had skin exposure to brackish or saltwater: Obtain date and exact location of exposure (beach name, closest intersection, etc.).

4. Educate the patient and household members about vibriosis prevention and control. See **III. C. Disease Prevention and Control Intervention** for details.
5. Inform the patient, household and close contacts to consult their healthcare provider if they are or know of anyone who was exposed (through consumption or exposure to salt water) and exhibits similar symptoms.
6. Notify the Division of Communicable Disease Epidemiology within 72 hours of detection of a case of vibriosis.
7. In the event of an outbreak (two or more cases with similar exposure), immediately notify the WV Dept. of Health Epidemiologist on-call at (304) 558-5358 ext. 2.
8. Facilitate specimen collection and submission to OLS, tel. number: (304) 558-5358. Notify OLS if an isolate is being sent from a laboratory.
9. See **III. C. Disease Prevention and Control Intervention** (below) for prevention and control strategies.
10. An Environmental Health (EH) assessment should be conducted for every vibriosis case involving a restaurant, grocery/market, food truck, or other commercial establishment. If a facility in West Virginia is implicated, the county where the restaurant is located is responsible for the investigation which includes obtaining seafood tags and/or invoices for products. If the restaurant is out of state, please notify the Food and Waterborne Disease Epidemiologist right away, so that investigation can be passed on to the appropriate state.
    a. Determining if contributing factors at the retail establishment may have contributed to the

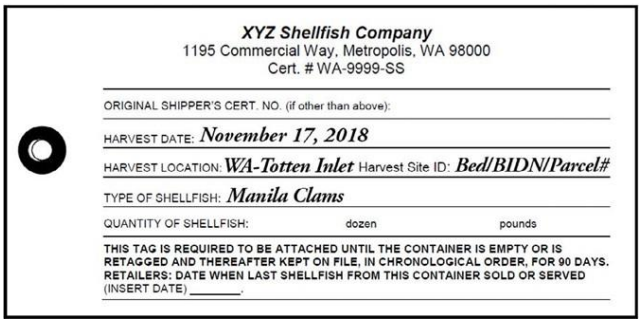
6. Was there evidence of improper handling or storage? ☐ Yes ☐ No ☐ Unknown

If yes (check all that apply): ☐ Holding temperature violation ☐ Cross-contamination ☐ Co-mingling of live and dead shellfish

☐ Improper storage ☐ Other:_____

proliferation or survival (in the case of cooked product) of Vibrio is an important component of the investigation. In the event that an illness is traced back to a particular shellfish growing area, regulatory action may not be taken unless contributing factors at the facility can be ruled out. Information regarding improper handling and storage should be completed on page 5 of the CDC COVIS form:

b. Overall, the environmental assessment should focus on:
    i. Confirming approved shellfish source (including collecting shellfish tags and invoices)
    ii. Identifying risks associated with receiving, storage, preparation, cooking, and temperature control
    iii. Investigating if cross-contamination potentially took place (if applicable)
    iv. Ensuring the appropriate consumer advisory (if required)
    v. Instituting control measures (as needed)
c. Shellstock tagging is required by the FDA through the National Shellfish Sanitation Program (NSSP). These tags are designed to allow traceback of shellfish associated with illness to the growing area and harvest date. Retailers are required to maintain tags onsite for 90 days after sale. Shellfish tags include information related to growing location, date of harvest, and shippers, distributors, etc. If tags are not available or if it is not possible to identify which shellfish tags belong with the shellfish served to the case-patient, EH investigators should collect shellfish invoices.



*XYZ Shellfish Company*
1195 Commercial Way, Metropolis, WA 98000
Cert. # WA-9999-SS

ORIGINAL SHIPPER'S CERT. NO. (if other than above):
HARVEST DATE: *November 17, 2018*
HARVEST LOCATION: *WA-Totten Inlet* Harvest Site ID: *Bed/BIDN/Parcel#*
TYPE OF SHELLFISH: *Manila Clams*
QUANTITY OF SHELLFISH: dozen pounds
THIS TAG IS REQUIRED TO BE ATTACHED UNTIL THE CONTAINER IS EMPTY OR IS RETAGGED AND THEREAFTER KEPT ON FILE, IN CHRONOLOGICAL ORDER, FOR 90 DAYS. RETAILERS: DATE WHEN LAST SHELLFISH FROM THIS CONTAINER SOLD OR SERVED (INSERT DATE) _____.

d. Once the environmental assessment has been completed, update the seafood investigation section of the CDC COVIS Report form using information gathered during the environmental health assessment and attach the shellfish tags.

For the purpose of case investigation, ***lost to follow-up*** **(LTF)** is defined as a disease investigation outcome reported by a local health department staff in WVEDSS after:

- Three phone calls have been made on 3 separate occasions (different days and times) **AND**
- A letter was mailed to the patient's address asking them to call the local health department AND
- A medical record review has been conducted via WVHIN or obtaining medical records from the facility where the patient was seen **AND**
- Attempts to contact patient or obtain information has been clearly documented in WVEDSS *General Comments* section, **AND**

- Documentation has been completed within 30 days of the patient's laboratory report.

**H. State Health Responsibilities**

1. Provide technical assistance and training to local health departments and healthcare providers.
2. In addition to reporting through the National Notifiable Diseases Surveillance System (NNDSS), a COVIS Form needs to be completed. Ensure that LHDs know where to access the CDC COVIS Form.
3. One COVIS case report form should be submitted for each patient which includes all supportive and confirmatory laboratory evidence related to the individual.
4. Review and ascertain cases submitted in WVEDSS. Ensure information is correct and complete.
   - ***No Public Health Action*** is defined as incomplete disease investigation and no activity occurring at the local level for at least 60 days since the date of the patient's laboratory report. The state health department staff should document "no public health action" in WVEDSS *General Comments* section before administratively closing the investigation.
5. Summarize data at least annually and report back the findings and recommendations to stakeholders.

**I. Occupational Health**

Vibriosis is not transmitted person-to-person. However, practice of standard precautions is recommended.

## III. DISEASE CONTROL AND PREVENTION

**A. Disease Control Objectives**

Prevent additional cases of vibriosis through early recognition and investigation of cases so the common food source is removed from commerce in a timely manner.

**B. Disease Prevention Objectives**

Reduce the incidence of vibriosis by educating the public about the following, including recommendations under **III. C. Disease Prevention and Control Intervention.**

- Practicing proper seafood handling, including thorough cooking and avoidance of cross-contamination of ready-to-eat food.
- Avoidance of unsafe food such as raw oysters, clams, and shellfish.
- Avoidance of exposure of open wounds or broken skin to sea water or raw shellfish.

**C. Disease Prevention and Control Intervention**

1. Although vibriosis is not transmitted person-to-person, basic personal hygiene precautions for enteric illnesses should be followed.
2. Standard precautions are recommended for hospitalized patients. Contact precautions should be used for diapered or incontinent persons for the duration of the illness.
3. People sharing the same exposure as the patient should be educated about vibriosis symptoms and encouraged to alert their health care provider should they become ill.

4. Education of the patient and caregivers should include the importance of effective hand washing, particularly after using the toilet or changing diapers and before preparing or eating food. Persons with diarrhea should not be involved in food preparation.
5. Avoid consumption of raw oysters or other raw shellfish, particularly if a predisposing factor for infection exists. Persons at increased risk for infection and more severe disease include persons with immunocompromising conditions, persons with chronic liver disease, and persons using antacids, histamine receptor blockers, and proton pump inhibitors.
6. Wear gloves when handling or preparing uncooked shellfish or crustaceans.
7. Shellfish should be obtained from approved sources and should be adequately boiled or steamed (at least 15 minutes) prior to consumption.
8. Avoid cross-contamination of ready-to-eat food with raw seafood or juices from raw seafood.
9. Ensure proper temperature control of shellfish and crustaceans prior to preparation and consumption and for all leftovers.
10. Eat shellfish promptly after thorough cooking and immediately refrigerate leftovers.
11. Avoid wound/broken skin exposure to salt and brackish water and raw shellfish, especially in patients with increased risk for infection.

## IV. DISEASE SURVEILLANCE

### A. Public Health Significance

*Vibrio* species are a diverse group of human pathogens causing a spectrum of illness from mild gastroenteritis to septicemia and sometimes death. Vibriosis has been a notifiable condition in all 50 U.S. states since 2007. *Vibrio* surveillance has been very useful in providing insight into routes of exposure, changes in incidence, geographical distribution, and epidemiological characteristics of the infection. Between 1996 and 2010, the annual incidence of vibriosis increased over threefold from 0.09/100,000 population (in 1996) to 0.29/100,000 population (in 2010). In West Virginia, between 2018 and 2023, an average of 17.5 cases (min. = 9, max. = 33) per year were reported.

*V. parahaemolyticus* is a ubiquitous inhabitant of temperate and tropical coastal waters around the world. *V. parahaemolyticus* infection is characterized by sporadic infection along coastal areas, mostly associated with consumption of raw or undercooked seafood, although skin infection has been reported. The infection is not spread person-to-person or fecal-oral route.

*V. vulnificus* is a common pathogen in estuaries and has been isolated in sea water and seafood produce. In contrast with *V. parahaemolyticus*, *V. vulnificus* is an opportunistic organism, with many of the cases occurring among those with underlying illness such as liver disease, diabetes, and malignancies. It is also a highly fatal human pathogen and responsible for more than 95% of seafood related deaths in the United States. *V. vulnificus* biotype 3 has been associated with human wound infections among tilapia aquaculture workers in Israel.

### B. Disease Surveillance Objectives

1. Detect cases and track infections of vibriosis in West Virginia.

2. Determine food, patient, and other risk factors.

**C. Surveillance Indicators**

1. The proportion of cases with complete demographic, clinical, and laboratory information.
   - Count of cases and description of clinical syndromes reported
   - Types of laboratory tests performed and number of cases ascertained based on type of test
2. Proportion of cases with complete exposure information, such as seafood and shellfish consumption and/or skin exposure to salt water.
3. Proportion of cases with complete travel history.
4. Proportion of cases reported in a timely manner.

## V. REFERENCES

1. Baker-Austin, C., Oliver, J.D., Alam, M. *et al. Vibrio* spp. infections. *Nat Rev Dis Primers* **4**, 1–19 (2018). https://doi.org/10.1038/s41572-018-0005-8.
2. American Academy of Pediatrics. Vibriosis. In: Kimberlin DW, Banerjee R, Barnett ED, Lynfield R, Sawyer MH, eds. *Red Book 2024: Report of the Committee on Infectious Diseases.* American Academy of Peidatrics; 2024: 955-957
3. Rezny BR, Evans DS. Vibrio parahaemolyticus Infection. [Updated 2023 Jun 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK459164/
4. Haftel A, Sharman T. Vibrio vulnificus Infection. [Updated 2023 Jun 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554404/
5. Centers for Disease Control and Prevention. *Vibrio* infection (Vibriosis). Accessed October 1, 2024. https://www.cdc.gov/vibrio/hcp/clinical-overview/index.html
6. Centers for Disease Control and Prevention. National Notifiable Disease Surveillance System (NNDSS). Vibriosis (any species of the family *Vibrionaceae*, other than toxigenic *Vibrio cholerae* O1 or O139) 2017 Case Definition. Accessed October 1, 2024. https://ndc.services.cdc.gov/case-definitions/vibriosis-2017/
7. Vezzulli L, Colwell RR, Pruzzo C. Ocean warming and spread of pathogenic vibrios in the aquatic environment. Microb Ecol. 2013 May;65(4):817-25. doi: 10.1007/s00248-012-0163-2. Epub 2013 Jan 3. PMID: 23280498.
8. Florida Department of Health. Vibriosis. Oct. 2, 2018. Accessed Oct. 1, 2024. https://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/gsi-vibriosis-other.pdf
9. Washington Integrated Food Safety Center of Excellence. Vibriosis Outbreak Management Toolkit. Accessed Oct. 8, 2024. https://foodsafety.uw.edu/sites/foodsafety.uw.edu/files/documents/vibrio/WA-IFS-CoE-Vibrio-Toolkit.pdf.