

# Preventing Foodborne and Non-foodborne Illness: *Vibrio vulnificus*<sup>1</sup>

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## What is *Vibrio vulnificus*?

*Vibrio vulnificus* occurs naturally in warm brackish and saltwater environments. During the warmer months, this bacterium can reach particularly high concentrations in filter-feeding shellfish that inhabit coastal waters. Foodborne illness from *V. vulnificus* is almost exclusively associated with consumption of raw oysters. Properly cooking the shellfish can totally eliminate the risk. Although most cases are likely underreported and unrecognized, infection from *V. vulnificus* is still quite rare. From 2008 to 2014, the Florida Department of Health reported between 16 and 41 cases per year for the state. About one third of these cases resulted in fatalities, mostly from consumption of raw oysters ([http://www.floridahealth.gov/diseases-and-conditions/vibrio-infections/vibrio-vulnificus/index.html?utm\\_source=ac](http://www.floridahealth.gov/diseases-and-conditions/vibrio-infections/vibrio-vulnificus/index.html?utm_source=ac)).

## Who is at risk for *Vibrio vulnificus* infection?

In general, exposure of healthy individuals to this bacterium causes no symptoms, although abdominal pain, vomiting, and diarrhea are occasionally reported. However, people with some underlying conditions are at higher risk for life-threatening complications that could quickly become fatal. These conditions include **liver disease, hemochromatosis (iron overload), diabetes, alcoholism, or immune system dysfunction due to AIDS or medications.**

Symptoms include fever, chills, and an extreme decrease in blood pressure (septic shock), all due to bacteria multiplying rapidly in the bloodstream. Blistering skin lesions are also diagnostic of this disease. Even though foodborne illness associated with *V. vulnificus* is extremely rare, close to 50% of these cases have been fatal, and some within 24 hours of the consumption of associated shellfish.

*V. vulnificus* can also cause illness by infection through open wounds. The bacterium can enter an open wound or skin abrasion through contact with warm seawater or when a person is shucking raw oysters or handling fish, shrimp, crabs, or lobsters. The resulting infection around the wound causes breakdown of skin tissue and possible ulceration, which is why *V. vulnificus* is sometimes referred to as a “flesh-eating bacterium.” However, there is no evidence that it can penetrate through skin. Unfortunately, wound infections can also lead to infection of the blood, known as septicemia, particularly in those who have immune system disorders or other diseases described above. Thus, persons at higher risk for oyster-related foodborne disease are also the most susceptible to serious and possibly fatal wound infections caused by *V. vulnificus*. According to the Centers for Disease Control and Prevention (2014), the fatality rate for immunosuppressed patients presenting with *V. vulnificus* wound infections is about 20%.

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## When do I seek medical treatment?

Illness due to *V. vulnificus* is very rare, but if you experience symptoms beyond simple diarrhea, such as abdominal pain, high fever and chills, after eating raw oysters or if you have exposed wounds that become swollen and painful, **seek immediate medical attention**. The disease can progress very rapidly, especially if you have any underlying conditions described above. When in doubt, call your physician and explain your exposure.

## What are the diagnostic signs and symptoms associated with *Vibrio vulnificus*?

Illness due to *V. vulnificus* is often diagnosed with symptoms of fever, gastrointestinal illness, or septic shock after consumption of contaminated food or exposure of an open wound to seawater or marine life. Skin lesions resembling blisters may also appear on the arms and legs as the disease progresses.

Diagnosis of this illness can be done through testing blood, wound cultures, or stool samples for presence of the organism. A *Vibrio*-specific growth medium is used to culture the organism and confirm the diagnosis.

## What activities can cause illness related to *Vibrio vulnificus*?

Eating raw oysters or lightly cooked seafood or exposing an open wound to seawater harboring *V. vulnificus* can result in infection. The bacterium is often found (i.e., isolated) in oysters and other shellfish as well as in their habitats during the summer months in warm, coastal waters. There is no evidence, however, of person-to-person transmission.

## What foods have been most commonly associated with *Vibrio vulnificus* and why?

The food most commonly associated with *V. vulnificus* is raw oysters. Contamination does not affect oyster odor, taste, or appearance even when *Vibrio vulnificus* is present in high concentrations. Unlike many other human pathogens, the presence of *V. vulnificus* is not linked with presence of fecal material that may contaminate recreational waters through human or agricultural wastes. *V. vulnificus* is a natural inhabitant of seawater environments and can be

recovered throughout the year from sediment, water, and marine life samples, but its numbers greatly increase in the warmer months, as does the number of reported illnesses associated with this organism. Thus, persons at risk for this disease should be particularly cautious to avoid exposure to uncooked seafood or exposure of wounds to seawater, brackish water, or raw seafood during summer months.

Other seafood, particularly other shellfish such as clams, can also become a potential hazard if they are not properly stored and prepared, and fish that eat oysters may have high levels of this bacterium in their digestive tracts. Cooking oysters through steaming, baking, or frying will readily destroy this organism. Individuals that are in any of the high-risk groups should thoroughly cook oysters and other potentially contaminated seafood, and take the utmost precautions in handling (or altogether avoid) these products. Also, skin punctures from fish or shellfish spines or claws can cause wound infections.

## Receiving and Storage of Seafood and Shellfish

Specific recommendations from the FDA's 2013 Food Code for handling and storage of seafood and shellfish in a retail or food service operation (<http://www.fda.gov/downloads/Food/GuidanceRegulation/ucm123970.pdf>). Seafood and shellfish are considered potentially hazardous foods because foodborne pathogens increase in number if temperature abuse (i.e., elevated temperatures) occurs. Most foods in this category should be kept at either above 135°F (after cooking) or below 41°F (storage), with temperatures in the middle being considered part of the "danger zone." As a rule of thumb, foods should spend no more than 4 hours in the danger zone temperature range. Shellfish are an exception and should be transported and received at 45°F.

Once a product is frozen, it is important to maintain a proper freezer temperature to avoid product thawing. Labeling properly stored foods is also helpful to ensure that others handling the food in the future will know exactly how long a food product has been stored.

Seafood in interstate commerce must be produced under the Seafood HACCP regulation. Detailed information can be found on the FDA Web site at <http://www.fda.gov/Food/GuidanceRegulation/HACCP/ucm2006764.htm>. For Florida-specific requirements, please see the Florida Department of Agriculture and Consumer Services web pages at <http://www.freshfromflorida.com/>.

## Methods to Help Prevent Infection by *Vibrio vulnificus*

These suggestions should always be followed to help prevent infection, especially for persons with underlying diseases that place them in high-risk groups.

- Do not eat raw shellfish, especially oysters, if you are immunocompromised or have hemochromatosis or diabetes.
- Cook shellfish thoroughly (CDC 2013).

### For shellfish still in the shell

- Steam until the shell opens and continue to cook for at least 9 more minutes. Do not eat if shell does not open during steaming.
- Boil until the shell opens and continue to cook for 5 minutes.

### For shucked oysters

- Boil for at least 3 minutes.
- Fry in oil at 375°F for at least 10 minutes.
- Avoid cross-contamination of other cooked foods with raw seafood or juices from raw seafood. Disinfect all surfaces, cutting boards, and utensils properly.
- Avoid exposing skin abrasions or wounds to seawater, brackish water, or raw seafood.

## References

Centers for Disease and Control and Prevention (CDC), Division of Bacterial and Mycotic Diseases. 2013. “*Vibrio vulnificus*.” Accessed September 3, 2015. <http://www.cdc.gov/vibrio/vibriov.html>

Centers for Disease Control and Prevention (CDC), Division of Emergency Preparedness and Response. 2014. “*Vibrio vulnificus* After a Disaster.” Accessed September 3, 2015. <http://www.bt.cdc.gov/disasters/vibriovulnificus.asp>

Florida Department of Health (FDH). n.d. “*Vibrio vulnificus*.” Accessed September 3, 2015. [http://www.floridahealth.gov/diseases-and-conditions/vibrio-infections/vibrio-vulnificus/index.html?utm\\_source=ac](http://www.floridahealth.gov/diseases-and-conditions/vibrio-infections/vibrio-vulnificus/index.html?utm_source=ac)

Food and Drug Administration (FDA). n.d. “Food Code 2013.” Accessed September 3, 2015. <http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/Food-Code/ucm374275.htm>

Jones, M. K. and J. D. Oliver. 2009. “*Vibrio vulnificus*: Disease and Pathogenesis.” *Infection and Immunity* 77(5): 1723–1733. doi:10.1128/IAI.01046-08.

Smith, D. C., P. H. Schmutz, and E. H. Hoyle. 1999. *Vibrio vulnificus*. HGIC 3663. Clemson Cooperative Extension. Accessed September 3, 2015. [http://www.clemson.edu/extension/hgic/food/food\\_safety/illnesses/hgic3663.html](http://www.clemson.edu/extension/hgic/food/food_safety/illnesses/hgic3663.html)