

A Case of Fatal Food-borne Septicemia: Can Family Physicians Provide Prevention?

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Background: *Vibrio vulnificus*, a common bacteria found in undercooked seafood and seawater, is the leading cause of food-borne death in Florida. Fatal cases of *V vulnificus* infection have also been reported in most states.

Methods: The literature was searched using the key words "*Vibrio vulnificus*," "septicemia," "wound infections," "seafood," "immunocompromise," and "patient education." A case of fatal *V vulnificus* septicemia is described.

Results and Conclusions: *V vulnificus*, part of the natural flora of temperate coastal waters and one of the most abundant microorganisms found in seawater, has been isolated from waters off the Gulf, Pacific, and Atlantic coasts of the United States. Infections in noncoastal regions have been traced to consumption of seafood derived from Gulf Coast waters. Seawater exposure and consumption of inadequately cooked seafood are routes most commonly associated with *V vulnificus* infection. Exposure to *V vulnificus* is life-threatening for chronically ill or immunocompromised patients, who are most likely to develop fatal septicemia. Currently a combination of doxycycline and intravenous ceftazidime is recommended treatment. Mortality rates from *V vulnificus* continue to be high in immunocompromised patients. Family physicians can help prevent this outcome by counseling high-risk patients. (J Am Board Fam Pract 2000;13:197-200.)

Vibrio vulnificus, a common bacteria found in seawater and undercooked seafood, is the leading cause of food-borne mortality in Florida. Fatalities from *V vulnificus* infection, however, have been reported in most states as a result of the popularity and availability of shellfish. Chronically ill or immunocompromised patients are predisposed to develop fulminant, fatal *V vulnificus* septicemia. Mortality rates from *Vibrio* sepsis remain high, even with prompt diagnosis and appropriate treatment. A key to preventing deaths from *V vulnificus* infection is primary prevention by family physicians to recognize and counsel high-risk patients.¹

Methods

MEDLINE was searched using the key words "*Vibrio vulnificus*," "septicemia," "wound infections," "seafood," "immunocompromise," and "patient education." A case of fatal *V vulnificus* septicemia in a 65-year-old woman with cirrhosis of the liver and end-stage renal disease is reported.

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Case Report

A 65-year-old woman came to the emergency department complaining of acute onset of right calf pain lasting several hours. She denied trauma or other complaints. Her medical history was notable for cirrhosis of the liver and end-stage renal disease requiring peritoneal dialysis.

At her physical examination her temperature was 100.6°F, pulse 60 beats per minute, respirations 20/min, and blood pressure 65/48 mm Hg, and she had normal oxygen saturation. The patient was alert, oriented, and in mild distress secondary to pain. Findings of the patient's heart and lung examination were unremarkable, her abdomen was soft, and nontender, and the dialysis catheter site showed no sign of infection. There was notable right calf tenderness to palpation, but no edema, erythema, rash, or skin lesions. The patient received intravenous saline and had prompt improvement in her blood pressure to 108/67 mm Hg, and she was admitted for further evaluation.

Initial laboratory results were hemoglobin 9.4 g/dL, hematocrit 27.7%, platelet count 158,000/mL, and white blood cell count 5900/ μ L with a left shift. A Gram stain of the peritoneal fluid was negative. Doppler sonography of her lower extremities showed no evidence of deep venous thrombo-

phlebitis. Findings from a chest radiograph and an electrocardiogram were unremarkable.

The patient remained stable but continued to complain of calf pain that seemed out of proportion to her examination findings. Approximately 24 hours after her admission, she suddenly developed respiratory distress, hypotension, and mental status deterioration. At this time her pulse was 97 beats per minute, respirations 40/min, and blood pressure 80/44 mm Hg, and her oxygen saturation was normal. Arterial blood gases showed a severe metabolic acidosis with a pH of 6.9. The patient was transferred immediately to the intensive care unit. In the intensive care unit, a nasogastric lavage showed coffee-ground gastric material. Notable laboratory results at this time were hemoglobin 4.0 g/dL, a positive D-dimer test, and increased levels of fibrin split products. She was aggressively treated for gastrointestinal hemorrhage, hypotension, and disseminated intravascular coagulopathy. She remained hypotensive and died approximately after 32 hours of hospitalization.

The day after her death, blood cultures from samples taken when she was admitted to the hospital grew *V vulnificus*. Later it was learned she had consumed crabmeat the day of admission.

Discussion

V vulnificus, a gram-negative bacillus that thrives in brackish water along subtropical coastal areas, was first described in 1979 and today is the leading cause of food-borne mortality in Florida.¹ The number of reported cases continues to increase yearly. Between 1981 and 1993, *V vulnificus* was responsible for 80% of reported food-borne deaths in Florida, making it the most common food-borne cause of death in Florida during that period.² *V vulnificus* is part of the *Vibrio* genus, which includes the well-known pathogens *V cholerae* and *V parahaemolyticus*.¹ In the United States, *V vulnificus* has been isolated from waters off the Gulf Coast and the Pacific and Atlantic coasts of the United States, and off the coast of Hawaii.³ Nearly 50% of oyster lots from Florida estuaries are culture-positive for *V vulnificus*, making it part of the natural flora of Florida coastal waters and one of the most abundant microorganisms found in seawater.^{4,5} Fatalities caused by this organism have occurred in most states along the Gulf Coast, and in California, Utah, Kentucky, Oklahoma, and Arkansas. Infec-

Table 1. Findings Associated With *Vibrio vulnificus* Infection.

Abdominal cramps	Leg pain
Bulla formation	Localized cellulitis
Chills	Male sex
Diarrhea	Nausea
Fever	Shock
Hypotension	Vomiting

Adapted from Shapiro et al⁸ and Kumamoto and Vukich.⁹

tions in noncoastal regions have been traced to consumption of seafood derived from Gulf Coast waters.

Exposure to *V vulnificus* results in several different outcomes based on the degree of immunocompromise of affected persons.⁶ *V vulnificus* infection has three distinct clinical syndromes: gastroenteritis, wound infection, and primary septicemia. Patients with liver disease or immunocompromised states are at risk of developing severe infections, whereas healthy persons experience mild illness. Seawater exposure and consumption of inadequately cooked seafood are routes most commonly associated with *V vulnificus* infection. Immunocompetent persons can develop a self-limited gastroenteritis after ingestion of raw or undercooked oysters, crabs, shrimp, or mussels. Skin infections are caused by penetration of the organism through preexisting skin lesions or through lesions incurred during seawater-related activities, such as cleaning fish or shucking oysters. Often no identifiable abrasions or lacerations are discovered at the time of hospital admission. Skin infections, however, can progress to necrotizing fasciitis and require surgical intervention.⁷

In immunocompromised hosts, exposure to *V vulnificus* is associated with life-threatening primary septicemia, either through the gastrointestinal tract or through wounds. Onset of severe illness with fulminant septicemia is rapid. Symptoms include fever, chills, lower extremity pain, nausea, vomiting, and bulla formation, as well as others listed in Table 1.^{8,9} In immunocompromised patients, *V vulnificus* infection is associated with a greater than 40% mortality overall, and nearly 100% mortality when untreated or when sepsis develops. In cases of most fatal infections, patients had preexisting risk factors listed in Table 2.^{8,10} The pathophysiologic basis underlying why liver disease is a serious risk factor for infection is unclear.

Table 2. Conditions Leading to Increased Risk of Fatal *Vibrio vulnificus* Infection.

Alcoholic liver disease	Hepatitis B
Cancer	Hepatitis C
Chemotherapy	Hypochlorhydria
Chronic corticosteroid use	Immunodeficiency syndromes
Chronic renal disease	Jaundice
Cirrhosis	Liver transplant
Diabetes mellitus	Sickle cell disease
Hemochromatosis	Splenectomy
Hemolytic anemia	Thrombocytopenia

Adapted from Shapiro et al.⁸ and Kumamoto and Vukich.⁹

The outcome of *V vulnificus* sepsis infection in immunocompromised patients is poor because of the rapid course of the illness and its elusive clinical signs and symptoms. Debate continues about the appropriate antimicrobial therapy. No single regimen has been shown to be superior, as evidenced by the continued high case fatality rate. Mortality has been reported by some authors to be 60% or greater, even though many antimicrobials have been shown to be effective at preventing growth of the organism in vitro. Currently a combination of intravenous or oral doxycycline, 100 mg twice a day, and intravenous ceftazidime, 2.0 g every 8 hours, is recommended. Other treatment options are listed in Table 3.⁹ Because treatment is often initiated too late or is incapable of overcoming the infection once the patient is symptomatic, reducing exposure of immunocompromised patients to the organism is the best means of preventing fatal *V vulnificus* infections.

Primary prevention of disease involves realizing which patients are at risk of developing specific illnesses and informing them how to avoid exposure. Because of the relatively low incidence of *V vulnificus* infections, 0.4 to 1.9 reported cases per 1 million people, many care providers are unaware of the risk to their patients.¹¹ Most patients who are at risk of developing *V vulnificus* infection are readily

Table 3. Therapy for *Vibrio vulnificus* Infections.

1. Intravenous ceftazidime 2.0 g every 8 h, and intravenous or oral doxycycline 100 mg twice a day
2. Supportive care (for shock)
3. Active toxin removal (experimental)
4. Surgical debridement of wounds

Adapted from Kumamoto and Vukich.⁹

Table 4. Modes of Prevention of Infection Directed at Patients at Risk.

1. Patient education by family physicians and internists
2. Patient education by gastroenterologists, nephrologists, and oncologists
3. Public warnings in restaurants
4. Information packets and pamphlets in medical offices and dialysis units
5. Public announcements and advertisements

Adapted from Mouzin et al.¹²

recognizable, as shown in Table 2. No additive effect of individual risk factors has been reported in the literature, but a compilation of incidence of infection based on preexisting illnesses and conditions has been established.⁸ Because *V vulnificus* infection is a preventable disease, it is important to use preventive methods designed to target patients at risk and to develop effective methods to reduce this risk. A variety of patient education approaches for prevention of *V vulnificus* infection have been suggested, as shown in Table 4.¹⁰ In 1990, California became the first state to require restaurants that serve raw oysters to warn customers of their associated health risks. Currently, Alabama, California, Florida, Louisiana, and Mississippi require restaurants serving raw oysters to post a placard warning persons with liver disease and immunosuppressed states to avoid eating these foods. In one survey only 71% of restaurants were compliant with this law.¹² Efforts to publicize the risks of *V vulnificus* infection to health care professionals and the public have been initiated but have not been widespread. Thus far, the incidence of infection remains unchanged.

Patients at risk for *V vulnificus* infection should receive specific counseling from their family phy-

Table 5. Physician Advice for Immunocompromised Patients.

1. Avoid raw seafood, and ensure that seafood eaten in restaurants and at home is adequately cooked
2. Fry, bake, steam, or boil oysters 4–9 min or until plump. Boil shrimp until shells turn pink and meat is cooked in middle (3–5 min). Fish is adequately cooked when the thickest part is opaque. Seafood should generally be cooked to an internal temperature of 145°F or 63°C
3. Avoid exposure to ocean water in summer months or along coastal regions in the southeastern United States
4. Inform any health care professional caring for you about your medical condition, and provide a list of medications

Adapted from Department of Health and Human Services.¹³

sicians, as slight modifications in diet and activities are key to prevention (Table 5). First, patients should be advised to avoid raw oysters, clams, shrimp, and fish because of the high incidence of *V. vulnificus* in these foods. They should try to eat well-cooked seafood, being aware of the risks of eating undercooked seafood. Avoidance of seafood in summer months would also be prudent. Second, patients should avoid exposure to ocean water or ocean products in the summer or in warm climates, such as those found in the southern United States, because infection is more likely to occur in these areas. Third, patients should be advised to inform health care professionals caring for them of all underlying medical conditions and medications. A patient education brochure entitled "If You Eat Raw Oysters You Need to Know . . ." published by the Food and Drug Administration is available for physicians and patients by calling the FDA Seafood hotline, 800-FDA-4010, or contacting the FDA through its Web site at www.fda.gov.¹³

As primary care providers for many patients at high risk for *V. vulnificus* infection, family physicians have a unique opportunity to help reduce morbidity and mortality in this patient group. Through increased awareness and patient education, family physicians can provide primary prevention to at-risk patients. The family physician's role in prevention of *V. vulnificus* infection in at-risk patients is an important one.

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