

Necrotizing wound infection from a tilapia fish injury

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■ Cite as: *CMAJ* 2017 April 10;189:E539-41. doi: 10.1503/cmaj.160663

A previously healthy 48-year-old woman presented to hospital with localized pain and redness in her thumb after sustaining a puncture wound from the vertebral spine of a tilapia fish that she was descaling. She had bought the live fish from a local retail market. At the time of her injury, she described mild pain, but continued to prepare the fish and later consumed it with two other family members after thorough cooking. One of her family members reported transient mild gastrointestinal symptoms. The patient's pain continued to progress with the development of localized redness four hours later. Eight hours after her injury, the redness had moved to include her hand.

On presentation, nine hours after injury, the patient was afebrile, with a white blood cell count of 12.1 (normal 4.0 – 11.0) $\times 10^9/L$ and venous lactate of 1.1 (normal 0.5 – 2.1) mmol/L. She received ceftriaxone intravenously for presumed cellulitis and was discharged home with reassessment to occur the following day. The pain and erythema continued to migrate proximally at home, and the patient began to feel general malaise.

The patient returned to the emergency department 16 hours after the injury, at which time the erythema was extended to her axilla with lymphangitic streaking (Figure 1). Her thumb pulp was dusky and cool, with decreased sensation and no capillary refill. She remained stable and afebrile, with investigations showing a white blood cell count of $14.4 \times 10^9/L$, venous lactate of 2.2 mmol/L, and normal liver enzymes and ferritin. The differential diagnosis now included necrotizing fasciitis.

We broadened antibiotic coverage to piperacillin–tazobactam in addition to doxycycline for coverage of *Vibrio* species, after noting the history of direct contact with seafood. The patient was admitted to hospital, where her lactic acidosis resolved and lymphangitic streaking started to recede over the following two days. Bacterial culture after incision and drainage of her left thumb grew *Vibrio vulnificus* susceptible to ciprofloxacin. Her piperacillin–tazobactam was discontinued, and she was given doxycycline, then ciprofloxacin administered orally for two weeks. The patient was discharged home and made a complete recovery without any further surgical intervention.

Discussion

Vibrio vulnificus is a gram-negative bacterium that thrives in high-salt environments. It is common in tropical waters, but is naturally

KEY POINTS

- Soft-tissue infections in patients with a history of exposure to seafood or seawater can carry the risk of unusual pathogens, and timely expert consultation should be considered.
- In patients at high risk of and presentations consistent with *Vibrio vulnificus* infection, early treatment with tetracyclines should be considered.
- The risk of consuming and contact with raw seafood should be communicated to people at high risk of *Vibrio vulnificus* infection, such as those with chronic liver disease.

found along Canadian coasts during summer months when sea temperatures exceed 20°C . Reports of *V. vulnificus* have increased worldwide and have been linked to the expanded habitat made possible by global warming.¹

The organism embeds itself into the tissues of filter-feeding mollusks, which act as vectors to humans.² It was first described in 1976 after being isolated from the stool, wounds and blood of patients with acute illness. After consumption, symptoms can range from mild gastrointestinal illness to primary bacteremia via gut translocation, which almost exclusively occurs in patients with comorbid disease. Bacteremia can also develop from necrotizing wound infections after direct contact, which is also more common among people with identified risk factors (Box 1).³ The risk of consuming and contact with raw seafood should be communicated to people at high risk of *V. vulnificus* infection, such as those with chronic liver disease.

Vibrio vulnificus primarily affects men more than 40 years of age; estrogen is believed to be protective.⁴ Because the bacteria uses host transferrin-bound iron to grow, patients with elevated iron or ferritin, such as patients with chronic liver disease, can have especially large bacterial burdens, and this group has a mortality risk of more than 50%.⁵ Mortality among healthy individuals is unknown. About 60% of *V. vulnificus* infections are from primary bacteremia; 17% are from wounds.⁶

In Canada, *V. vulnificus* is not reportable and epidemiologic data are lacking. We are aware of three reported cases, the most recent being 10 years ago, when a patient died from a necrotizing wound infection sustained while handling a tilapia fish.⁷ The case was unrelated to local marine water exposure, but traced to a

freshwater fish imported from a North Dakota farm. It remains unclear how contamination occurred in our patient's case. An outbreak associated with farmed tilapia in Israel was associated with a novel *V. vulnificus* biotype unique to its freshwater pond aquaculture. The outbreak was believed to be a result of inadvertent introduction of the original bacteria to native aquaculture bacteria, where horizontal gene transfers and large organic biomass habitats acted as a melting pot for selective pressure and bacterial evolution.⁸

Our patient likely acquired the infection from a farmed tilapia fish. We were unable to identify the organism's biotype at our facility because we did not have access to polymerase chain reaction analysis. Our patient reported buying the fish from a Vancouver



Figure 1: Left hand and arm of a 48-year-old woman who had been injured by the vertebral spine of a tilapia fish 16 hours earlier. Myonecrosis at original site of injury, the thumb, with proximal migration of lymphangitic streaking can be seen.

Box 1: Risk factors for *Vibrio vulnificus* infection³

- Older age
- Male sex
- Liver disease
- Immunosuppression
- Diabetes
- Kidney disease
- Intravenous drug use
- Intravenous iron therapy
- Biologic therapies
- Long-term corticosteroid use
- Primary hemochromatosis
- Secondary hemochromatosis

supermarket in March, and there were no other reports to suggest a local outbreak. Without fish remnants, we could not confirm its local origins, although it was likely a Nile tilapia (*Oreochromis niloticus*), the most common farmed species. Water used in Fraser Valley farming originates from commercially purchased freshwater from local reservoirs.

Without documented contact with marine waters, we can only speculate on the source of infection. Grocery markets often purchase marine water for their holding systems. Guidelines for the handling and separation of aquacultured species from marine fish exist, and contamination at the retail level cannot be completely ruled out in this patient's case.

In general, a history of consuming raw seafood or contaminated food should alert the clinician about the possibility of *V. vulnificus*, particularly in patients with liver disease. A history of seawater exposure with soft-tissue infections should also raise suspicions. All patients suspected of having *V. vulnificus* infection should undergo further assessment for clinical manifestations of sepsis. After consumption of raw seafood or contaminated food, the presence of hemorrhagic bullae on the lower extremities may be a sign of this infection,⁷ as in our patient's case. Timely expert consultation should be considered.

Necrotizing soft-tissue infections should not deter the clinician from considering other organisms in the differential diagnosis, including group A *Streptococcus*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Clostridium perfringens*, *Edwardsiella tarda*, *Plesiomonas shigelloides*, *Aeromonas hydrophilia*, *Erysipelothrix rhusiopathiae*, *Mycobacterium marinum* and *Streptococcus iniae*. Detection methods should be based on clinical presentation. Blood cultures have been the primary method of diagnosis in sepsis, although stool and wound cultures are also useful.³ However, the sensitivity of these measures for identifying *V. vulnificus* is currently unknown.

When *V. vulnificus* is suspected, prompt administration of antibiotics within 24 hours is recommended. During a 1981–1987 Gulf of Mexico outbreak that affected 62 patients, all deaths were associated with bacteremia and higher mortality was found with longer delays to antibiotic treatment in patients with positive blood cultures. Among the 44 patients with bacteremia, mortality was 33%, 53%, 63% and 100% after receiving antibiotics within 24, 48, 72 or more than 72 hours of illness onset, respectively. Among the reported 25 patients who died, 24 had an underlying comorbidity.²

No randomized controlled trials have assessed the optimal antibiotic treatment for *V. vulnificus*, but the high efficacy of tetracycline in mouse models has guided use of that agent.⁹ In general, first-line therapy combines a parenteral third-generation cephalosporin with a tetracycline, which should be given orally while waiting for the intravenous formulation in centres with delayed access.⁷ In addition, prompt and serial surgical evaluations for early débridement in necrotizing wound infections are critical to treatment and preventing amputation.¹⁰

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The section Cases presents brief case reports that convey clear, practical lessons. Preference is given to common presentations of important rare conditions, and important unusual presentations of common problems. Articles start with a case presentation (500 words maximum), and a discussion of the underlying condition follows (1000 words maximum). Visual elements (e.g., tables of the differential diagnosis, clinical features or diagnostic approach) are encouraged. Consent from patients for publication of their story is a necessity. See information for authors at www.cmaj.ca.

Competing interests: None declared.

This article has been peer reviewed.

The authors have obtained patient consent.

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Contributors: Both of the authors contributed to the writing and revising of the article, approved the final version to be published and agreed to act as guarantors of the results.

Acknowledgements: The authors thank Victor Leung and Michael Payne (St. Paul's Hospital), who contributed to the final publication with thoughtful edits and encouragement.

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