Vibrio vulnificus Infections Associated with Handling of Farm-Raised Tilapia Purchased from Live Fish Tanks — King County, WA, 2016–2017

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Two reports of confirmed *V. vulnificus* skin infection associated with handling tilapia in King County, WA

- Results of clinical and environmental testing
- Tilapia traceback
- Public health response
Background: *Vibrio vulnificus* in the US

- About 205 cases reported in the U.S. annually
- Typical risk factors:
  - Consumption of raw or undercooked shellfish
  - Skin/wound exposure to brackish water primarily in the Southeast
  - Only reported Washington State case occurred in a man who developed an infection after a wound was exposed to brackish water on the Florida Gulf Coast
<table>
<thead>
<tr>
<th>Clinical Manifestations</th>
<th>Predisposing Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Skin and soft-tissue infection</td>
<td>- Chronic liver disease</td>
</tr>
<tr>
<td>- Necrotizing fasciitis</td>
<td>- Immune suppression</td>
</tr>
<tr>
<td>- Sepsis</td>
<td>- End-stage renal disease</td>
</tr>
<tr>
<td>- Gastroenteritis</td>
<td>- Gastrointestinal disorders</td>
</tr>
<tr>
<td></td>
<td>- Diabetes</td>
</tr>
<tr>
<td></td>
<td>- Hematological disorders</td>
</tr>
</tbody>
</table>
Patient #1: November 2016

- 55 year-old female
- History of insulin-dependent diabetes, chronic heart disease, stage 4 renal disease
- Sliced finger while preparing farm-raised tilapia purchased from a live tank at Supermarket A
- Presented to emergency department <24 hrs with abscess on left index finger, diarrhea
- *V. vulnificus* isolated from wound by culture
Previous Reports of *V. vulnificus* Infections Associated with Farm-Raised Tilapia

- **Israel, 1996–97**: Outbreak of *V. vulnificus* Biotype 3 led to 33 confirmed cases of *V. vulnificus* wound infections and bacteremia following the handling of tilapia grown in ponds.
- **Canada, 2004**: Fatal septicemia in 58 year-old male who handled farm-raised tilapia purchased from a live tank.
Patient #2: July 2017

- 49 year-old male
- History of chronic hepatitis B infection and alcohol abuse
- Punctured palm while preparing farm-raised tilapia purchased from a live tank at Supermarket B
- Presented to emergency department one day later with bullous lesion on palm, septic shock, and diarrhea
- *V. vulnificus* isolated from wound and patient’s blood by culture
- Wife developed diarrhea within a day of eating cooked tilapia but negative by stool culture and PCR (probable)
Live Tilapia Retail and Transport in King County
Traceback

Patient #1

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

*V. vulnificus* detected
Traceback

Patient #1

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

Patient #1  Supermarket A

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

Patient #1  Supermarket A

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Patient #1

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected

Distributor A

Distributor B
Traceback

Patient #1 → Supermarket A → Distributor A → Distributor B

1+ whole tilapia
environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

Patient #1 → Supermarket A → Distributor A → Fish Farm A

1+ whole tilapia

Distributor B → Supermarket A

Fish Farm B → Distributor B

Environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

Patient #1 → Supermarket A → Distributor A → Fish Farm A

Fish Farm B → Distributor B

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

Patient #1 → Supermarket A → Distributor B → Fish Farm A

1+ whole tilapia
environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
## Laboratory Findings

<table>
<thead>
<tr>
<th>Sample</th>
<th>V. vulnificus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient #1</strong></td>
<td></td>
</tr>
<tr>
<td>Wound</td>
<td>Detected</td>
</tr>
<tr>
<td>Stool</td>
<td>Not detected</td>
</tr>
<tr>
<td><strong>Supermarket A</strong></td>
<td></td>
</tr>
<tr>
<td>Whole tilapia (n = 2/2)</td>
<td>Detected</td>
</tr>
<tr>
<td>Environmental samples (n = 8/8)</td>
<td>Detected</td>
</tr>
<tr>
<td><strong>Distributor A</strong></td>
<td></td>
</tr>
<tr>
<td>Whole tilapia (n = 1)</td>
<td>Not detected</td>
</tr>
<tr>
<td>3 tanks on truckbed</td>
<td>Not detected</td>
</tr>
<tr>
<td>Fish net/tank lid</td>
<td>Not detected</td>
</tr>
<tr>
<td><strong>Farm A</strong></td>
<td></td>
</tr>
<tr>
<td>Whole tilapia (n = 2)</td>
<td>Unable to test</td>
</tr>
<tr>
<td><strong>Farm B</strong></td>
<td></td>
</tr>
<tr>
<td>Whole tilapia (n = 2)</td>
<td>Not detected</td>
</tr>
</tbody>
</table>
Traceback

Patient #2

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

Patient #2

1+ whole tilapia

Environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

Patient #2  Leftover Tilapia

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

Patient #2  Leftover Tilapia  Supermarket B

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

Patient #2  Leftover Tilapia  Supermarket B

1+ whole tilapia  environmental swabs including tilapia tank, cutting board, fish net, drain  V. vulnificus detected
Traceback

Patient #2  Leftover Tilapia  Supermarket B

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected
Traceback

Patient #2  Leftover Tilapia  Supermarket B

1+ whole tilapia

environmental swabs including tilapia tank, cutting board, fish net, drain

V. vulnificus detected

Distributor A

Fish Farm A
Traceback

Patient #2: 1+ whole tilapia

Leftover Tilapia: environmental swabs including tilapia tank, cutting board, fish net, drain

Supermarket B: V. vulnificus detected

Distributor A: Fish Farm A
## Laboratory Findings

<table>
<thead>
<tr>
<th>Sample</th>
<th>V. vulnificus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient #2</strong></td>
<td></td>
</tr>
<tr>
<td>Wound</td>
<td>Detected</td>
</tr>
<tr>
<td>Blood</td>
<td>Detected</td>
</tr>
<tr>
<td>Stool</td>
<td>Not detected</td>
</tr>
<tr>
<td><strong>Patient #3 (wife of patient #2)</strong></td>
<td></td>
</tr>
<tr>
<td>Stool</td>
<td>Not detected</td>
</tr>
<tr>
<td><strong>Supermarket B</strong></td>
<td></td>
</tr>
<tr>
<td>Whole tilapia (n = 2)</td>
<td>Detected</td>
</tr>
<tr>
<td>Environmental samples (n = 6/8)</td>
<td>Detected</td>
</tr>
<tr>
<td><strong>Distributor A</strong></td>
<td></td>
</tr>
<tr>
<td>Whole tilapia</td>
<td>Detected</td>
</tr>
<tr>
<td>Transport tanks</td>
<td>Detected</td>
</tr>
<tr>
<td>Grey plastic buckets</td>
<td>Detected</td>
</tr>
<tr>
<td><strong>Fish Farm A</strong></td>
<td></td>
</tr>
<tr>
<td>Whole Tilapia (n = 3)</td>
<td>Not detected</td>
</tr>
<tr>
<td>Environmental samples</td>
<td>Not detected</td>
</tr>
</tbody>
</table>
Public Health Response

- Culled remaining tilapia at supermarkets
- Closed tilapia tanks temporarily
- Implemented cleaning and disinfection plan
- Posted news story on Public Health Seattle & King County website
- Developed a tilapia health warning poster
HEALTH WARNING:
Tilapia

Tilapia fish from tanks may have a bacteria (*Vibrio vulnificus*). On rare occasions, the bacteria can cause a life threatening infection.

To prevent infection when handling raw fish:

- Use gloves
- Do not handle raw fish if you have wounds on your hands
- Cook fish thoroughly to 145°F
- Wash your hands after touching raw seafood

Get medical care immediately if you develop a new skin infection, fever and chills and/or diarrhea up to 7 days after handling raw seafood.

People with *chronic liver disease* or weakened immune systems have a higher risk of infection.

More information: www.cdc.gov/vibrio
Summary

- Epidemiologic and laboratory evidence demonstrate *V. vulnificus* infections in King County resulted from wounds sustained while handling fresh tilapia.
- First reported *V. vulnificus* infections associated with handling farm-raised tilapia in the United States.
Recommendations

- Education of fish handlers and customers
  - Gloves when handling raw seafood
  - Avoid handling raw seafood when you have wounds on hands and fingers
  - Inform individuals who are at high-risk for severe disease
- Clinician education of high-risk patients
Recommendations

- Consider regulation of freshwater tanks in the food code
- Develop and provide distributors and supermarkets guidance on best practices for tank cleaning, disinfection, and maintenance
Magnitude of risk is still unknown

- How common is *V. vulnificus* in live tilapia tanks at supermarkets inside and outside King County?
- Is there a threshold bacterial load required to be infectious?
- Do certain conditions lead to higher bacterial loads in the supermarkets?
- Are there other sources of *V. vulnificus* in supermarket seafood sections?
Diversity in Filter Systems
Variable Cleaning and Maintenance Protocols
Opportunities for Cross-Contamination
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Supermarkets & Tilapia Distributors
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