**Raoultella planticola** bacteremia following consumption of seafood

Philip W Lam BScPhm MD1,2, Irving E Salit BSc FRCPC MD1,2

**CASE PRESENTATION**

A 56-year-old woman presented to hospital with a one-day history of chills, fatigue, and right upper quadrant abdominal pain. She had stage IV non-small cell lung cancer with bone and liver metastases, hypertension and remote cholecystectomy. She had completed her second cycle of pemetrexed chemotherapy two weeks before admission. Four days before onset of symptoms, she attended a wedding and consumed a seafood salad containing squid and octopus. She was successfully treated with intravenous ceftriaxone followed by oral ciprofloxacin. Recent chemotherapy, proton pump inhibitor use and altered biliary flow secondary to hepatic metastases may have been contributing factors to the pathogenesis of disease.

**DISCUSSION**

*Raoultella planticola* is a Gram-negative bacillus commonly found in water, soil and aquatic environments. There have only been 16 cases of *R. planticola* infection documented in the literature to date. *R. planticola* possesses the ability to convert histidine to histamine and can produce symptoms of scombroid poisoning when poorly prepared seafood is consumed in large amounts. The present report describes a case involving a 56-year-old woman who presented with *R. planticola* bacteremia and symptoms consistent with cholangitis four days after consuming a seafood salad containing squid and octopus. She was successfully treated with intravenous ceftriaxone followed by oral ciprofloxacin. Recent chemotherapy, proton pump inhibitor use and altered biliary flow secondary to hepatic metastases may have been contributing factors to the pathogenesis of disease.

**Key Words:** Bacteremia; Cholangitis; Raoultella planticola; Seafood

**DIAGNOSIS**

Both blood cultures grew bacteria identified as belonging to the genus *Raoultella* using the VITEK MS (bioMérieux, France) matrix-assisted laser desorption/ionization – time-of-flight mass spectrometry technique. The bacteria were further identified as *Raoultella planticola* using the VITEK-2 (bioMérieux) automated bacterial identification system. The isolate was resistant to amoxicillin and trimethoprim/sulfamethoxazole and susceptible to amoxicillin/clavulanic acid, ceftriaxone, ciprofloxacin, gentamicin, tobramycin and piperacillin/tazobactam (Table 1). Based on her clinical presentation and laboratory results, a diagnosis of cholangitis was suspected but abdominal imaging did not demonstrate biliary abnormalities. She was successfully treated with ceftriaxone intravenously for three days followed by oral ciprofloxacin for an additional seven days. Definitive imaging of the biliary tract was not obtained because the patient’s symptoms and laboratory abnormalities improved with antibiotic therapy. She was discharged home eight days after admission.

**DISCUSSION**

*R. planticola* is an encapsulated, aerobic, nonmotile, Gram-negative bacillus commonly found in water, soil and aquatic environments. Infections in humans have been rarely reported. *R. planticola* is a difficult organism to isolate in the laboratory and has been commonly been mistaken for *Klebsiella* species.

*R. planticola* (along with *Raoultella ornithinolytica*) possesses the ability to convert histidine to histamine via decarboxylation. This can lead to scombroid poisoning when there is consumption of poorly refrigerated histidine-containing seafood (not only scombroid fish) (1). The bacterial conversion of histidine to histamine results in symptoms that include the acute onset of facial flushing, nausea, vomiting, diarrhea, hives and generalized pruritus that subsides in a few hours.

To date, 16 cases of *R. planticola* human infection have been reported in the literature. Initially described in patients with sepsis (2), infection has since been described in a variety of settings. In 2012, Olson et al (3) published a case of cystitis caused by *R. planticola* and, within the article, summarized 10 previous cases of *R. planticola* infection. Since this publication, five additional cases of *R. planticola* infection have been reported (4-7). Of the 16 cases, three cases occurred after surgical interventions (open reduction and internal fixation for rib fracture, mitral valve replacement, coronary artery bypass graft), two cases followed skin trauma, and two cases after endoscopic retrograde cholangiopancreatography (ERCP).
TABLE 1
In vitro susceptibility profile of the Raoultella planticola isolate using VITEK-2*

<table>
<thead>
<tr>
<th>Antimicrobial agent</th>
<th>MIC (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>≥16</td>
</tr>
<tr>
<td>Amoxicillin/clavulanic acid</td>
<td>≤2</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>≤1</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>≤0.25</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>≤1</td>
</tr>
<tr>
<td>Tobramycin</td>
<td>≤1</td>
</tr>
<tr>
<td>Piperacillin/tazobactam</td>
<td>≤4</td>
</tr>
<tr>
<td>Trimethoprim/sulfamethoxazole</td>
<td>≥16/304</td>
</tr>
</tbody>
</table>

*BioMérieux, France. MIC Minimum inhibitory concentration

R. planticola bacteremia may occur following consumption of seafood. Puerta-Fernandez et al (5) described a 63-year-old man with abdominal pain and fever after consuming poorly prepared fish. Blood cultures grew a cephalosporin-susceptible R. planticola and the patient was treated with 10 days of intravenous cefotaxime (5). Neither our patient nor the aforementioned case report exhibited signs of scombroid-like poisoning.

In contrast to this previously reported case (5), our patient had several risk factors that may have increased the likelihood of developing R. planticola bacteremia. First, our patient had received chemotherapy two weeks before presentation. Of the 16 documented infections, an underlying malignancy was present in five cases (4,7-9), two of which had received recent chemotherapy (7,8). Although our patient did not have febrile neutropenia, the history of receiving pemetrexed chemotherapy likely contributed to the bacteremia, either by myelosuppression or via disruption of gastrointestinal mucosa. Hematological and gastrointestinal toxicities are common adverse effects associated with pemetrexed monotherapy in non-small cell lung cancer (10). Our patient had a more delayed onset of symptoms (three days) compared with the previous seafood-related case (5), in which the patient became symptomatic within hours of ingestion. This may be explained by a smaller number of ingested bacteria.

REFERENCES

Second, our patient was taking esomeprazole before admission. Concomitant use of proton pump inhibitors has been associated with an increased risk of bacterial gastroenteritis as a result of the increased survival of enteric pathogens in the less acidic environment (11). The combination of immunosuppression with a proton pump inhibitor may have predisposed this patient to clinically significant disease in what may have been self-limiting illness in a healthy individual. There were no documented cases of R. planticola infection in others who had consumed the seafood at the wedding.

The presence of Charcot’s triad suggested cholangitis. The two previous cases of R. planticola cholangitis reported in the literature occurred post-ERCP (4,9). Our patient did not undergo recent ERCP; thus, other factors played a role in the probable biliary tract infection. We hypothesize that the patient acquired the bacteria from seafood consumption. The bacteria were able to colonize the biliary tract secondary to altered biliary flow due to hepatic metastases and immunosuppression from the pemetrexed. Alternatively, the ingested R. planticola led to portal pyemia and bacteremia. Although pemetrexed can cause elevated liver transaminase levels, the time course of enzyme elevation and normalization with antibiotic therapy was not in keeping with a drug-induced etiology.

The susceptibility pattern of R. planticola isolated from this patient was similar to previous case reports. However, multidrug-resistant strains of R. planticola have been isolated from both patients (7,8) and the environment (12). Given the ubiquity of these bacteria in the environment, R. planticola may be an important reservoir for antimicrobial resistance genes and may facilitate the acquisition of multidrug resistance in pathogenic organisms through chromosomal and plasmid-mediated mechanisms.

SUMMARY
We present a case of R. planticola bacteremia following recent seafood consumption. The clinical presentation was consistent with cholangitis and, in contrast to previous case reports, was not associated with recent ERCP. Immunosuppression, proton pump inhibitor use and altered biliary flow secondary to hepatic metastases may have been contributing factors to the pathogenesis of disease.