Case Report

Shock caused by multidrug-resistant *Erysipelothrix rhusiopathiae* bacteremia: a rare case report and literature review

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**Abstract**

*Erysipelothrix rhusiopathiae* infection occurs in animals and humans. It manifests primarily as a local skin lesion, which can be treated with antibiotics. Systemic infection with *E. rhusiopathiae* is rare, with low occurrence of bacteremia. We describe a case of *E. rhusiopathiae* bacteremia leading to shock and rash all over the body in a 49-year-old man with a history of finger puncture by a puffer fish bone. Interestingly, the *E. rhusiopathiae* cultured in this patient’s blood was resistant to multiple drugs, including penicillin G, vancomycin, and gentamicin. The patient was treated successfully with ertapenem and ceftriaxone. Although a few cases of *E. rhusiopathiae* bacteremia have been reported recently, cases of multidrug-resistant *E. rhusiopathiae* bacteremia are extremely rare.

**Key words:** *Erysipelothrix rhusiopathiae*; bacteremia; multi-drug resistance.


(Received 20 July 2015 – Accepted 09 March 2016)

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**Introduction**

*Erysipelothrix rhusiopathiae* (*E. rhusiopathiae*), a Gram-positive bacterium, is found ubiquitously in nature and mainly infects domestic animals such as swine. Infection in humans occurs mainly due to occupational exposure to animals or other organic matter including swine, chickens, dogs, sheep, horse, cattle, and fish [1]. The infected patients typically present with one or a combination of the following symptoms: localized skin lesion (erysipeloid), diffuse cutaneous eruptions with systemic symptoms, or bacteremia [2]. However, less than 1% of cases with *E. rhusiopathiae* infection can progress to bacteremia with life-threatening risk [3]. Penicillin was the preferred antibiotic for *E. rhusiopathiae* infection, and most of the infected cases were treated successfully. We here described a case of multidrug-resistant *E. rhusiopathiae* bacteremia leading to shock and rash all over the body in a 49-year-old man after finger puncture by a puffer fish bone. Luckily, the patient was treated successfully with ertapenem and ceftriaxone. We also searched PubMed and Web of Science for articles published from 1 Jan 2001 to 31 Dec 2015 using search queries "*Erysipelothrix rhusiopathiae*" and "bacteremia" or "septicemia" in humans. The findings from the literature included are summarized subsequently.

**Case report**

A previously healthy 49-year-old male fish handler in an aquatic products processing plant presented to the emergency department with one-day history of rash over his whole body. His right third finger was injured during puffer fish processing eight days prior. Initially, pain and swelling in the penetrated finger developed at that time, and he was administered 1 g amoxicillin twice daily orally for two days. Since his condition did not improve in the first two days, he was admitted to a local hospital with a complaint of nausea and fever and was prescribed penicillin G (8 million U every 12 hours) intravenously for the following 5 days. However, the patient's condition deteriorated and shock and rash over his body presented at the 8th day after his finger injury. Due to the severity of the disease, he was transferred to our hospital urgently.

Physical examination revealed that he was conscious with a general malaise. Vital signs were as follows: temperature of 38.8°C, blood pressure of 83/46 mmHg, pulse of 113 bpm, respiratory rate of 18 bpm, and pulse oxygen saturation (SpO2) of 95%. The wound in the injured finger was partially healed. Flaky erythema was distributed extensively over his body, including his belly, feet, and inguinal region. No other systemic symptoms and signs were detected. After he was admitted to the emergency department, blood tests and bacterial culture in blood were carried out
promptly. Laboratory blood tests revealed that a leukocyte count of $10.4 \times 10^9/L$ (neutrophils percentage 92.0%) and a platelet count of $59 \times 10^9/L$. The blood coagulation results showed that prothrombin time (PT) was 15.2 seconds, prothrombin time activity (PTA) was 55%, and activated partial thromboplastin time (APTT) was 43 seconds. The markers of hepatic and renal functions were as follows: alanine aminotransferase (ALT) was 93 U/L (0–40 U/L), aspartate aminotransferase (AST) was 59 U/L (5–34 U/L), cholinesterase was 2955 U/L (4,000–11,700 U/L), total bilirubin was 52.0 μmol/L (4–20.5 μmol/L), direct bilirubin was 46.1 μmol/L (0–8.6 μmol/L), indirect bilirubin was 5.9 μmol/L (3.4–11.9 μmol/L), urea was 7.8 mmol/L (3–9.2 mmol/L), and creatinine was 75.5 μmol/L (59–104 μmol/L). Transthoracic cardiac ultrasound and computed tomography (CT) scanning of the lungs and abdomen showed no positive results.

Considering the severity of disease, ertapenem (1.0 g once per day) was selected empirically and injected intravenously immediately, in addition to fluid administration. The patient responded well and became afebrile within 48 hours. Three days after admission, *E. rhusiopathiae* was identified using VITEK 2 Compact automatic microbiology analyzer (BioMerieux, Craponne, France). The cultured *E. rhusiopathiae* in

Table 1. Reports of *Erysipelothrix rhusiopathiae* bacteremia or septicemia in humans (2001–2015).

<table>
<thead>
<tr>
<th>Author</th>
<th>Sex</th>
<th>Age (year)</th>
<th>Underlying disease</th>
<th>Epidemiological factors</th>
<th>Clinical presentation</th>
<th>Antibiotics</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birutiu [5]</td>
<td>M</td>
<td>54</td>
<td>Lymphocytic leukemia treated with methylprednisolone and cladrine</td>
<td>Not documented</td>
<td>Chest, pain, cough with purulent sputum, chills, dyspnea</td>
<td>Penicillin</td>
<td>Recovered</td>
</tr>
<tr>
<td>Hua et al. [6]</td>
<td>M</td>
<td>65</td>
<td>Smoking</td>
<td>Bitten by mosquito</td>
<td>Chest tightness, palpitation, fever, shortness of breath</td>
<td>Penicillin</td>
<td>Recovered</td>
</tr>
<tr>
<td>Campbell et al. [7]</td>
<td>M</td>
<td>51</td>
<td>Moderate alcohol use</td>
<td>Homeless, but no exposure to animals</td>
<td>Shortness of breath, chest pain, fever, rash on fingers</td>
<td>Ampicillin and ceftriaxone</td>
<td>Recovered</td>
</tr>
<tr>
<td>Drekonja [8]</td>
<td>M</td>
<td>59</td>
<td>Healthy</td>
<td>Gardener</td>
<td>Fever, rash over palms, multiple abrasions</td>
<td>Moxifloxacin</td>
<td>Recovered</td>
</tr>
<tr>
<td>Kichlwo et al. [2]</td>
<td>M</td>
<td>64</td>
<td>Hypertension, diabetes, bronchial asthma, alcoholism</td>
<td>Purchased poultry and fish frequently</td>
<td>Fever, epigastric and left flank pain</td>
<td>Penicillin</td>
<td>Recovered</td>
</tr>
<tr>
<td>Sinclair et al. [9]</td>
<td>M</td>
<td>39</td>
<td>Crohn’s disease treated with azathioprine</td>
<td>Fisherman, hand cut on fishing wire</td>
<td>Febrile, chest pain, fever, headache</td>
<td>Benzylpenicillin</td>
<td>Recovered</td>
</tr>
<tr>
<td>Joo et al. [10]</td>
<td>F</td>
<td>56</td>
<td>Epilepsy and idiopathic thrombocytopenic purpura</td>
<td>No exposure to animals</td>
<td>Fever, chills, altered mentality</td>
<td>Ceftriaxone</td>
<td>Recovered</td>
</tr>
<tr>
<td>Yamamoto et al. [12]</td>
<td>M</td>
<td>58</td>
<td>Alcohol abuse</td>
<td>Fisherman</td>
<td>Fever, edema, pruritic skin rash on legs</td>
<td>Meropenem, ipenem/betamipron</td>
<td>Died</td>
</tr>
<tr>
<td>Surrun et al. [13]</td>
<td>F</td>
<td>67</td>
<td>Diabetes, hyperlipidemia, hypertension, ischemic heart disease</td>
<td>Wearing slippers in a fish market</td>
<td>Redness and swelling of left foot, fever, chills</td>
<td>Ceftriaxone and cloxacillin</td>
<td>Recovered</td>
</tr>
<tr>
<td>Mahavanakul et al. [14]</td>
<td>M</td>
<td>44</td>
<td>Alcoholic cirrhosis</td>
<td>Rice farmer</td>
<td>Fever, cough, productive sputum, breathlessness</td>
<td>Cefazidime and penicillin</td>
<td>Died</td>
</tr>
<tr>
<td>Luca et al. [15]</td>
<td>F</td>
<td>75</td>
<td>Mitral regurgitation</td>
<td>Not documented</td>
<td>Penetration injury to the finger by spine</td>
<td>Cefazolin and cefazidime</td>
<td>Died</td>
</tr>
<tr>
<td>McNamara et al. [16]</td>
<td>F</td>
<td>43</td>
<td>Alcohol abuse</td>
<td>Not documented</td>
<td>Finger pain and swelling, malaise, nausea, loose stools, myalgias</td>
<td>Cefotaxime</td>
<td>Recovered</td>
</tr>
<tr>
<td>Carson et al. [17]</td>
<td>M</td>
<td>54</td>
<td>Disabling knees arthritis</td>
<td>Not documented</td>
<td>Progressive weakness and severe weight loss</td>
<td>Ceftriaxone</td>
<td>Recovered</td>
</tr>
<tr>
<td>Hardman et al. [18]</td>
<td>M</td>
<td>49</td>
<td>Renal failure on ambulatory peritoneal dialysis</td>
<td>Not documented</td>
<td>Abdominal pain, rigors, multiple excoriations on hands</td>
<td>Ciprofloxacin</td>
<td>Recovered</td>
</tr>
<tr>
<td>Marañés et al. [19]</td>
<td>M</td>
<td>57</td>
<td>Moderate drinker, diabetes mellitus, psoriasis</td>
<td>Not documented</td>
<td>Presyncope, chest pain, fever</td>
<td>Cefotaxime</td>
<td>Recovered</td>
</tr>
<tr>
<td>Melero et al. [20]</td>
<td>M</td>
<td>38</td>
<td>Healthy</td>
<td>Butcher</td>
<td>Fever</td>
<td>Ceftriaxone</td>
<td>Recovered</td>
</tr>
<tr>
<td>Heidrich et al. [21]</td>
<td>F</td>
<td>67</td>
<td>Healthy</td>
<td>Not documented</td>
<td>Continuous catarrh, arthralgia, fever</td>
<td>Ampicillin</td>
<td>Recovered</td>
</tr>
</tbody>
</table>
blood was resistant to penicillin G, amoxicillin, streptomycin, kanamycin, tetracycline, doxycycline, lincomycin, sulfamethoxazole, vancomycin, tetracycline, and gentamicin, but was sensitive to ertapenem, ceftriaxone, and norfloxacin. Therefore, according to the principles of de-escalation therapy for serious infectious diseases, ertapenem therapy was stopped and intravenous ceftriaxone (1.0 g once per day) was administered instead in the following 12 days after admission. Due to the negative results in the following blood culture, the unremarkable clinical manifestation, and normal blood test, he was discharged from hospital on the 15th day with no disability. Ceftriaxone was orally administered in the subsequent two weeks. There were no sequelae at the six-month follow-up.

Discussion

Erysipelothrix rhusiopathiae can be isolated from a variety of animals. The excretion of organisms by infected and colonized animals is considered to result in contamination of the environment and subsequent acquisition of the bacteria by humans [2]. Veterinary surgeons and people engaged in animal breeding, animal slaughtering, and seafood handling are at particular risk of being infected [4]. According to a previous review [1] reported in 2001, occupational exposure accounted for 89% of cases. We collected the literature about E. rhusiopathiae bacteremia or septicemia in humans published from 2001 to 2015. The epidemiological factors, clinical presentation, and treatments of E. rhusiopathiae bacteremia or septicemia in humans are summarized in Table 1. Similarly, 87% (13/15) of patients had direct or indirect exposure to animals or organic matter in which E. rhusiopathiae was commonly found.

Erysipeloid, a painful localized violaceous skin lesion, is the most common clinical manifestation of E. rhusiopathiae infection. However, E. rhusiopathiae bacteremia is rare and present with severe clinical symptoms, such as endocarditis [3,8], acute meningitis [22], arthritis [23,24], psoas abscess [25], and thoracic spondylitis [26]. According to a previous review [1], many underlying diseases, including heart disease and alcohol abuse, made the patients susceptible to E. rhusiopathiae infection and led to the occurrence of bacteremia. Other sources of immune compromise, including HIV infection, also contributed to E. rhusiopathiae bacteremia [27]. As shown in Table 1, alcohol abuse was found in 30% of patients (6/20), diabetes was found in 20% (4/20), and chronic kidney disease was found in 13% (3/20). Therefore, the basic conditions of the patients are also related to E. rhusiopathiae bacteremia.

It was reported that 90% of cases of E. rhusiopathiae bacteremia resulted in endocarditis [8]. Cases of E. rhusiopathiae bacteremia without endocarditis were also reported [8,15,28]. In the present case, the fish handler suffered from E. rhusiopathiae bacteremia after his finger was punctured by a puffer fish bone. E. rhusiopathiae bacteremia caused shock and rash over the whole body, but it did not result in endocarditis according to the cardiac ultrasound results.

The diagnosis of E. rhusiopathiae bacteremia was mainly confirmed by blood culture. The selection of antibiotics is extremely important for E. rhusiopathiae bacteremia treatment. The appropriate antibiotics regimen may achieve significant improvement of symptoms and infection control. The most strains of E. rhusiopathiae were sensitive to beta-lactam antibiotics, new fluoroquinolones, and erythromycin [8]. Typically, penicillin G was the preferred antibiotic for E. rhusiopathiae bacteremia, as it is sensitive to penicillin [18]. The recommended duration of penicillin therapy is four to six weeks. In penicillin-allergic patients, cephalosporins, including ceftriaxone, are the most appropriate alternatives since both erythromycin and clindamycin are only bacteriostatic [29]. As shown in Table 1, 94% (17/18) of patients were treated with β-lactam antibiotics, including penicillin, ampicillin, cephalosporins, and carbapenems, and only one case was administered moxifloxacin. Nevertheless, four patients died. These results showed that the prognosis of E. rhusiopathiae bacteremia was poor.

In general, E. rhusiopathiae bacteremia can be effectively controlled by sensitive antibiotics. However, the inappropriate use of antibiotics (inappropriate type, doses, and/or administration interval) may cause bacterial toxicity mutation and drug resistance. In this case, the patient’s condition was not improved significantly after amoxicillin and penicillin G therapy; instead, it was aggravated. Considering the possibility of penicillin resistance and the severity of disease, ertapenem was selected initially to control the progressive infection and the consequent multiple organ dysfunction. Subsequently, the blood culture results at 72 hours after admission indicated that the cultured E. rhusiopathiae in blood was indeed resistant to multiple drugs, including penicillin G, but sensitive to ertapenem and ceftriaxone. The patient’s condition, therefore, did not improve in the local hospital after using penicillin G possibly due to penicillin resistance. According to the principles of de-escalation therapy for infectious diseases, once the pathogen and its drug susceptibility
results are identified, narrow-spectrum antibiotics should be targeted to prevent drug resistance and reduce the risk of broad-spectrum antibiotic therapy. Ceftriaxone was administered to the patient based on the drug-susceptibility test results during the following 12 days. After these therapies, he recovered and his blood E. rhusiopathiae culture test was negative. To our knowledge, there are no similar reports about multidrug-resistant E. rhusiopathiae bacteremia.

Conclusions
We described here a case of multidrug-resistant E. rhusiopathiae bacteremia that was successfully treated with the administration of ertapenem and ceftriaxone. This report highlights the importance of paying more attention to the drug resistance of bacteria, especially for uncommon bacterial infections. Meanwhile, reasonable and appropriate antibiotics must be adopted in a timely manner.

Acknowledgements
This study is supported by the Science Research Plan of Liaoning Province Education Administration (grant No. L2014300).

References

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**Conflict of interests:** No conflict of interests is declared.