

## 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.

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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 (SpO<sub>2</sub>) 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  $\mu\text{mol/L}$  (4–20.5  $\mu\text{mol/L}$ ), direct bilirubin was 46.1  $\mu\text{mol/L}$  (0–8.6  $\mu\text{mol/L}$ ), indirect

bilirubin was 5.9  $\mu\text{mol/L}$  (3.4–11.9  $\mu\text{mol/L}$ ), urea was 7.8 mmol/L (3–9.2 mmol/L), and creatinine was 75.5  $\mu\text{mol/L}$  (59–104  $\mu\text{mol/L}$ ). 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).

Author	Sex	Age (years)	Underlying disease	Epidemiological factors	Clinical presentation	Antibiotics	Outcomes
Birlutiu [5]	M	54	Lymphocytic leukemia treated with methylprednisolone and cladribine	Not documented	Chest pain, fever, cough with purulent sputum, chills, dyspnea	Penicillin	Recovered
Hua <i>et al.</i> [6]	M	65	Smoking	Bitten by mosquito	Chest tightness, palpitation, fever, shortness of breath	Penicillin	Recovered
Campbell <i>et al.</i> [7]	M	51	Moderate alcohol use	Homeless, but no exposure to animals	Shortness of breath, chest pain, fever, rash on fingers	Ampicillin and ceftriaxone	Recovered
Drekonja [8]	M	59	Healthy	Gardener	Fever, rash over palms, multiple abrasions	Moxifloxacin	Recovered
Kichloo <i>et al.</i> [2]	M	64	Hypertension, diabetes, bronchial asthma, alcoholism	Purchased poultry and fish frequently	Fever, epigastric and left flank pain	Penicillin	Recovered
Sinclair <i>et al.</i> [9]	M	39	Crohn's disease treated with azathioprine	Fisherman, hand cut on fishing wire	Febrile, chest pain, fever, headache	Benzylpenicillin	Recovered
Joo <i>et al.</i> [10]	F	56	Epilepsy and idiopathic thrombocytopenic purpura	No exposure to animals	Fever, chills, altered mentality	Ceftriaxone, vancomycin, and ampicillin	Recovered
Blaich <i>et al.</i> [11]	F	46	Healthy	Cuts on fingers	Fever, hand swelling, headache	Ceftriaxone	Recovered
Yamamoto <i>et al.</i> [12]	M	58	Alcohol abuse	Fisherman	Fever, edema, pruritic skin rash on legs	Meropenem, ipenem/betamipron	Died
Surrin <i>et al.</i> [13]	F	67	Diabetes, hyperlipidemia, hypertension, ischemic heart disease	Wearing slippers in a fish market	Redness and swelling of left foot, fever, chills	Ceftriaxone and cloxacillin	Recovered
Mahavanakul <i>et al.</i> [14]	M	44	Alcoholic cirrhosis	Rice farmer	Fever, cough, productive sputum, breathlessness	Ceftazidime and penicillin	Died
	F	50	Nephrotic syndrome and diabetes mellitus	Rice farmer	Fever, chills, cough	Ceftazidime	Recovered
	F	42	End-stage renal disease, on hemodialysis	Housewife	Fever, chills diffuse erythematous lesions on limbs	Cefazolin and ceftazidime	Died
Luca <i>et al.</i> [15]	F	75	Mitral regurgitation	Not documented	Fever	Ampicillin	Recovered
McNamara <i>et al.</i> [16]	F	43	Alcohol abuse	Penetration injury to the finger by spine	Finger pain and swelling, malaise, nausea, loose stools, myalgias	Not documented	Recovered
Carson <i>et al.</i> [17]	M	54	Disabling knees arthritis	Homeless, but no exposure to animals	Progressive weakness and severe weight loss	Antibiotics (not documented)	Died
Hardman <i>et al.</i> [18]	M	49	Renal failure on ambulatory peritoneal dialysis	Not documented	Abdominal pain, rigors, multiple excoriations on hands	Ciprofloxacin	Recovered
Marañés <i>et al.</i> [19]	M	57	Moderate drinker, diabetes mellitus, psoriasis	Not documented	Presyncope, chest pain, fever	Cefotaxime	Recovered
Melero <i>et al.</i> [20]	M	38	Healthy	Butcher	Fever	Ceftriaxone	Recovered
Heidrich <i>et al.</i> [21]	F	67	Healthy	Not documented	Continuous catarrh, arthralgia, fever	Ampicillin	Recovered

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  $\beta$ -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.

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