



Case report

Novel case of penicillin resistant *E. rhusiopathiae* septicemia: Case report with review of the literature

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Background

Erysipelothrix Rhusiopathiae is a fastidious pathogen that was first isolated by Koch in 1878 and later identified as a pathogen by Rosenbach in 1909. Is a facultative anaerobic, non-spore forming, and non-motile gram positive bacillus which causes infection in several species of mammals and other animals. *E. rhusiopathiae* is an occupational illness; 89% of the cases are linked to high-risk epidemiological situations [1]. It causes infections in humans through exposure with contaminated animals or animal products [2]. In humans, the infections can take three forms: a localized cutaneous form (erysipeloid) caused by traumatic penetration of *E. rhusiopathiae*, a generalized cutaneous form, and a septicemic form. Systemic infection with bacteremia is relatively uncommon and mainly encountered in immunocompromised patients or patients with chronic alcoholism or other risk factors. Diffuse cutaneous and septic forms occur rarely, and the septic form has been previously associated with endocarditis [3]. A previous study reviewing invasive infection cases since 1912 reported that about 90% of cases of *E. rhusiopathiae* bacteremia result in endocarditis [4]. This association has been recently questioned, since some cases of *E. rhusiopathiae* bacteremia without subsequent endocarditis have been reported in the most recent literature [3,5–9]. Here our case adds up to the latter literature, and describes a case of *E. rhusiopathiae* bacteremia which started as a localized erysipeloid form and lead to septicemia without endocarditis.

Case presentation

A 49 year old Afro-Cuban male with a history of chronic alcoholism and hypertension presented with a three day history of fever (106 ° F), change in mental status, and body aches in August, 2016. On admission, he was febrile 103.1 ° F, with a heart rate of 137 beats per minutes, blood pressure of 156/79 mm of Hg, and respiration rate of 32 breaths per minute. The patient's laboratory results on admission included white cell count 9.2×10^3 /microL, platelets 71×10^3 /microL, PT 28 s, PTT 43 s, INR 2.62, albumin 3.1, Tblb (total bilirubin) 13.6 mg/dl, AST

(aspartate transaminase) 133, and ALT (alanine transaminase) 56. Lactic acid was 6.2 mmol/L, and blood alcohol level checked the next day was less than 10 mg/dl. In addition, he showed left lower extremity cellulitis, left great toe ulceration, and 2nd right toe dark discoloration. Five days prior to admission, the patient ruptured a lesion on his left great toe which caused blistering and limping when he walked. Two days later, he walked outside without footwear in soil contaminated by chickens and hens. The animals are unrestrained in the yard, and the patient's spouse reports that the area is not cleaned or sanitized. It happened as well that his backyard was flooded earlier that week, after a recent hurricane hit this area.

The patient has a history of poor hygiene and self-care, and was only brought to the hospital by insistence of the spouse.

During the first day of his hospital stay, the patient went into septic shock and intravenous vancomycin and piperacillin/tazobactam were started empirically. Blood cultures were collected and sent to the microbiology laboratory. Head CT showed no abnormalities and chest X-ray showed no cardiopulmonary disease. Ultrasound of the lower extremities showed indurations at the left pretibial regions about 4 cm–5 cm. X-ray of the left foot showed soft tissue swelling over the dorsum of the foot without osseous or joint pathology. The next day preliminary blood culture results revealed gram positive rods. Given patient's critical condition and encephalopathic state, the piperacillin/tazobactam treatment was changed to meropenem out of concern of central nervous system infection – mainly listeria given newly diagnosed liver cirrhosis this admission. However, on the third hospital day blood cultures grew the more infrequently seen *Erysipelothrix Rhusiopathiae*. The patient was evaluated by cardiology and a 2D transthoracic echocardiogram was negative for endocarditis. Susceptibility testing was done so that the antibiotic coverage could be adjusted for the most effective treatment (Table 1). The susceptibility profile showed susceptibility to ceftriaxone but resistance to penicillin. Ceftriaxone was then added to the patient's regimen at 2 g intravenously daily. Patient's clinical condition dramatically improved on day two antibiotics, and his repeat blood cultures on day two of

Abbreviations: *E. rhusiopathiae*, *Erysipelothrix rhusiopathiae*; Tblb, total bilirubin; AST, aspartate transaminase; ALT, alanine transaminase; CT, computed tomography; *E. coli*, *Escherichia coli*; EINT, EINT; EDIL, EDIL

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Table 1
E. Rhusiopathiae susceptibility profile.

Drug	EINT	EDIL
Ceftriaxone	S	1
Penicillin	R	0.5

Data on other antibiotic susceptibilities was not available for this patient.

EINT –.

EDIL –.

antibiotics were negative. Patient completed four weeks of intravenous ceftriaxone. He was evaluated by our team two months later for extended spectrum *E. coli* urinary tract infection, and his blood cultures were negative.

Discussion

This report describes a case of *E. rhusiopathiae* bacteremia that presented without endocarditis and was successfully treated with ceftriaxone. The patient was found to have decompensated alcoholic liver cirrhosis and likely had this bacteremia as a result of his left lower extremity skin and soft tissue infection. The occurrence of *E. rhusiopathiae* septicemia from localized cutaneous infection and without endocarditis is relatively uncommon in the literature, limited mainly to case reports. Bacterial infection usually occurs from primary infection rather than dissemination from a localized cutaneous lesions; although, there is growing evidence in the literature supporting this infectious pathway. Previous literature reported by Gorby and Peacock showed that about 90% of cases of *E. rhusiopathiae* bacteremia result in endocarditis. Most recent literature, report a much lower rate (34.4%) of infective endocarditis with invasive *E. rhusiopathiae* infections developed endocarditis [3]. This supports a different clinical picture for the infectious process. Our patient did not have any peripheral stigmata of endocarditis on his physical exam, his blood cultures cleared promptly, and echocardiogram revealed no endocardium involvement.

It is important to note that usually most infections of *E. rhusiopathiae* occur from occupational exposure. Thus butchers, farmers, slaughterhouse workers, aquarium workers, veterinarians, and fishermen are at risk for infection with *E. rhusiopathiae* [10]. This patient had other several risk factors for *E. rhusiopathiae* infection including alcoholic liver cirrhosis, poor hygiene, contact with live animals and mainly the contaminated soil, in addition to several open skin wounds on his feet. It is believed that soil becomes contaminated with *E. rhusiopathiae* via animal excrements [4] leading to infection of open sores if good hygiene and footwear are not utilized. In addition, its occurrence following the hurricane-related flooding, may be explained by the fact that the soil was heavily contaminated previously with large amounts of animal wastes from domestic or wild animals, which may have been a major key factor in his case. Domestic animals may be roaming around, and rats are common after hurricanes. Decaying organic material may also have been present. Such conditions would seem to be suitable for *E. rhusiopathiae* contamination. We postulate that the patient described herein acquired *E. rhusiopathiae* infection because he was exposed to heavily contaminated soil as a result of the poor hygienic conditions in his backyard and his left foot skin breakdown [11]. This non-occupational exposure in addition to our patient's poor backyard condition after the flooding make this case of *E. rhusiopathiae* unique.

Gram-positive rods that are recovered from blood cultures may not always be diptheroids/skin contaminant and further identification is warranted when *E. rhusiopathiae* is suspected based on the epidemiological setting. Biochemical differentiation of *E. rhusiopathiae* from other Gram-positive rods may be aided by a positive test for hydrogen sulfide on triple sugar iron agar [12]. *Erysipelothrix* and *Bacillus* species can be differentiated by the absence and presence of spores, respectively. Unlike other Gram-positive nonsporulating rods (*Lactobacillus* species,

Listeria monocytogenes, *Corynebacterium* species), *E. rhusiopathiae* produces hydrogen sulfide on triple sugar iron media [13].

Treating *E. rhusiopathiae* can be particularly difficult in the emergent setting. This bacteria has an intrinsic resistance to vancomycin, a common first treatment choice for skin and soft tissue infections as well as Gram positive sepsis in the hospital. *E. rhusiopathiae* also has resistance to aminoglycosides, such as gentamycin, which is often added to increase coverage in septic bacteremic patients. For these reasons, patients with cutaneous or systemic gram positive infections can be undertreated for the uncommon *E. rhusiopathiae* infection while presuming a more common culprit such as methicillin resistant staphylococcus aureus. Fortunately *E. rhusiopathiae* has previously been highly susceptible to penicillins and cephalosporins. Results from in vitro susceptibility tests have shown that *E. rhusiopathiae* is most susceptible to penicillin and imipenem, followed by piperacillin, cefotaxime, ciprofloxacin, and clindamycin. Some resistance was observed with erythromycin, tetracycline, and chloramphenicol. However, vancomycin daptomycin, polymixin B, trimethoprim-sulfamethoxazole, gentamicin should not be used due to poor or absent activity [4,14]. Our patient was originally treated with vancomycin and piperacillin/tazobactam. Shortly after cultures were finalized as *E. rhusiopathiae*, the sensitivity report showed resistance to penicillin with sustained susceptibility to ceftriaxone. Given that penicillin is considered as the drug of choice for all forms of *Erysipelothrix rhusiopathiae*, this may be one of the first cases reported where *E. rhusiopathiae* is resistant to penicillin showing an evolution of its resistance to first line antibiotics.

Conclusion

One of the important factors we would like to highlight in this case is that *E. rhusiopathiae* may be under reported, diagnosed, and undertreated in cases of cutaneous or systemic gram positive infections given the tendency to empirically cover the more common pathogens using mainly vancomycin in hospital settings. Gram positive rods also may be dismissed as diptheroids and not fully identified [3]. Our case emphasize the importance of a good history taking where occupational exposure should be included, and hence be vigilant to add coverage for this uncommon rather fastidious organism when suspected. Our case has exceptional clinical value due to three key factors that we would like to highlight again: first – our patient had invasive *E. rhusiopathiae* from a localized cutaneous infection, without endocarditis; second – it was a non-occupational exposure and rather a case of exposure to contaminated soil as a result of hurricane-related flooding; third – literature reviewed, this is the first reported human case of *E. rhusiopathiae* resistant to penicillin. Further research and reports will be needed to ascertain the emerging resistance to penicillin given it being considered as first line treatment based on in vitro data.

Finally, this case highlights the need for high index of suspicion in a patient with cutaneous infections and an epidemiological risk factors for *E. rhusiopathiae* especially if it fails to respond to vancomycin. In addition, it emphasize the importance of prompt diagnosis in patients with risk factors for invasive, fulminant diseases since any delay of treatment can be life threatening in this population.

Consent for publication

The patient in the case study agreed to and signed a consent form to be in this case report.

Available data and material

Not applicable.

Competing interest

The authors have no competing interest to disclose.

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Authors contributions

AH, SG, and NR were all responsible analysis and drafting this case report. NR and AH performed literature research. NR interviewed and treated this patient. SG helped in collecting patient data and compiled chart information. NR is the corresponding author and oversaw all editing and changes for publication. All authors read and approved the final manuscript.

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