

Fatal Foodborne Bacteremia due to *Chromobacterium violaceum* and *Corynebacterium jeikeium*

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Keywords: *Chromobacterium violaceum*; *Corynebacterium jeikeium*; Foodborne; Bacteremia

Introduction

Chromobacterium violaceum and *Corynebacterium jeikeium* are saprophyte bacteria, observed human infections that can be very serious. *C. violaceum* is a gram negative, facultative anaerobe, oxidase and catalase positive bacillus found in both aquatic and soil environments. The exposure to water and/or soil is among the factors within the clinical history of affected patients. *C. jeikeium* is a gram-positive pleomorphic bacillus of the coryneform family, present within human flora and can cause different forms of infection in patients with risk factors and comorbidities including immunocompromised pathologies. We present a rare and fatal case of bacteremia due to *Chromobacterium violaceum* and *Corynebacterium jeikeium* in an immunocompetent patient after food-borne infection.

Case Report

41 y/o male, computer technician, without any known diseases, allergies, or drug abuse. The patient consulted ER services due to feelings of nausea over a period of one week, causing him to vomit 8-10 times per day, along with diarrhoea, abdominal pain and fever after eating chicken and salad. He also complained of chills, malaise and weight loss. He was febrile at admission, tachycardic, and normotensive and had no abnormal finding during his physical examination. The routine laboratory showed: hemoglobin, 14.4 g/dl; a total white blood cell count of 28,300 cells/mm³, with 60% neutrophils, bands of 16%, platelets of 77,000 cells/mm³, normal kidney and liver function, RCP of 39.77 mg/dL and procalcitonine of 2.95 ng/mL. Blood cultures were also taken. After these results he was put on cefotaxime.

During his hospitalization stool, urine, and cerebrospinal fluid samples were collected, and a sexually transmitted disease test

was administered-all coming back negative. A bone marrow aspirate was taken which showed granulocytic hyperplasia. Chest X-rays came back normal, while hepatomegaly was noted in the abdomen scan.

After 81 and 100 h the two blood cultures taken showed a gram negative bacillus. The bacillus identified did not grow in aerobic conditions. The laboratory had difficulties identifying the bacillus, so the specimen was sent to another hospital for further testing.

The patient received cefotaxime for 7 days, and then levofloxacin IV for 5 days, and was discharged with cefixime PO. At discharge, the patient was asymptomatic, afebrile for more than 4 days, and had a high white blood count of 20900 cells/mm³, platelets of 268000 cells/mm³ and procalcitonine in 1.15 ng/mL.

Three weeks later he consulted ER services again due to a severe cough, shortness of breath, and hemoptysis. In the ER, the patient was hypotensive, tachycardic, hypoxemic and afebrile. The Chest X-ray showed multiple opacities, especially in the right lung and the thorax. The abdominal CT scan documented multiple alveolar infiltrates, especially in the upper lobes, the middle right lobe, and bilateral pleural effusion.

The blood cultures from the previous hospitalization were finally completed, showing two unusual bacteria: *C. violaceum* and *C. jeikeium* (without antibiotic susceptibility testing). The patient was given Vancomycin and Meropenem for treatment.

During hospitalization an ET ECO was administered after a thrill was heard, which showed severe mitral insufficiency and cord tendineae ruptura. The patient was transferred to the Coronary Care Unit to manage the cardiac insufficiency and severe pneumonia. The new blood cultures came back negative.

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Received date: March 09, 2019; Accepted date: April 01, 2019; Published date: April 09, 2019

Citation: Tommy Alfaro, Natalia Solis, Manuel Villalobos, Nicole Vargas, Boris DeGracia (2019) Fatal Foodborne Bacteremia due to *Chromobacterium violaceum* and *Corynebacterium jeikeium*. Appli Microbiol Open Access 5:159. Doi: 10.35248/2471-9315.19.5.159

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At the beginning, the patient required high flow nasal cannula oxygen, but his condition rapidly worsened, with an increase in sputum, a lower oxygen saturation, and an increase in white blood count, RCP; therefore, a few days later he was intubated. The patient was evaluated by a cardiac surgeon who agreed to a valve replacement. The patient's condition progressively worsened, necessitating an increase in vasopressors since he had presented a decrease in the urine output. He was evaluated by an Infectious Disease Specialist and he was treated with Imipenem, Vancomycin, Amikin, and Cotrimoxazol. The patient's condition improved after these new antibiotics. The mitral valve was subsequently replaced. After surgery he was admitted in the Intensive Care Unit. His hemodynamic parameters rapidly deteriorated, with an increase in the need of vasopressors, having poor urinary output. TT ECO demonstrated severe left ventricular and atrial dilatation. A left ventricular ejection of 10% BAL was administered which came back positive for *S. malthophilia*. The lung and mitral valve biopsy showed lung abscess with no inflammation infiltrate in the valve. The patient was sent to another hospital for further support. The patient was put on ECMO to treat his cardiogenic and septic shock. He was then operated upon due to his worsening condition in order to control his lung infection. The lungs showed huge bullae, massive destruction, and air leaks. Unable to control the infection, his heart became compromised. He was proposed both a heart and lung transplant; nevertheless, he passed away.

Discussion and Conclusion

C. violaceum is a Gram-negative, facultative anaerobic, oxidase and catalase-positive bacillus [1,2]. It belongs to the family of Neisseriaceae, and is a free-living saprophyte; however animal and human infections have been described [3].

Its microorganisms are widely distributed worldwide; it is sensitive to temperature and is found in both aquatic and soil environments in tropical and subtropical areas [4]. Among the factors within the clinical history of affected patients is exposure to water or soil [1].

C. violaceum produces a pigment called violacein that provides its characteristic purple colour. The pigment is insoluble in water but soluble in alcohol [2].

Corynebacterium spp. belongs to a very large group of saprophytic species colonizing the skin and mucous membranes of humans. It can cause serious infections in immunocompromised and hospitalized patients [5].

The significance of the presence of the genus *Corynebacterium* in foods is not clearly established. *Corynebacterium* species have been isolated in stored vegetables and poultry farms suggesting that the flock of birds and the consumption of the eggs and meat from the chickens are at risk of bacterial infection [5].

In this case, the patient developed symptoms after the intake of salad and chicken, which suggests the probability of the presence of these bacteria in either the chicken, the salad, or in the water used during their preparation, as proposed by the group of Pant et al. [6].

C. violaceum has been recovered from various kinds of food including salads, sometimes more than 6000 microorganisms per g of food [7].

Several reports established *C. jeikeium* as the agent that causes a variety of severe infections including endocarditis, device infection, osteomyelitis, and cellulitis [8].

The majority of patients affected by *C. violaceum* are young and the clinical picture is characterized by the progression of sepsis with skin lesions and metastatic abscesses (liver, lung, spleen) [1,9].

In this case, the patient did not present with skin lesions. The route of entry of these pathogens was through the gastrointestinal tract, with subsequent bacteremia and metastatic seeding to the lung. With regards to the tendinous chords rupture, our hypotheses are that either progressive septic compromise generated mechanical failure on a heart that already had structural pathology, or, despite the histological absence of endocarditis, *C. jeikeium* may have infected the valve apparatus: the antibiotic treatment could have masked the histologic findings of inflammation. *C. violaceum* usually manifests in the skin as cellulitis, then lymphadenitis develops with subsequent hematogenous spreading with the formation of abscesses [4]. The incubation period is usually an average of about three days. In this case, the gastrointestinal discomfort and sepsis symptoms developed in a matter of hours, which we believe is related to a high inoculum present in both the food the patient digested prior to becoming ill, and the entrance of the gastrointestinal tract.

The diagnosis of *C. violaceum* is made with culture isolate: there is no serological test. We know that *C. violaceum* grows easily on both blood agar and MacConkey agar [1]. However, in our patient, the bacterium didn't grow in aerobic conditions. This may be because, as an environmental bacterium, it grows better at room temperature. Since we expected the presence of pathogen bacteria, our blood cultures were incubated at 37°C.

C. jeikeium forms part of the group of Lipophilic *Corynebacterium*. This is a group of fastidious, slow-growing bacteria that form tiny, non-haemolytic colonies on standard media but demonstrate enhanced growth with the addition of lipids to the culture medium [10]. This could be one reason that negative aerobic blood-cultures were found in the patient. In our laboratory, blood cultures are usually cultivated on blood agar and MacConkey agar, neither of which has added lipids. For that reason, they are not the ideal culture media on which to grow *C. jeikeium*. Ideally, it should be cultured on Tween 80-supplemented sheep blood agar [10].

The initial bacterial load of *C. jeikeum* can be very low, and this could explain the absence of Gram-positive rods in the Gram stain of the blood cultures.

C. violaceum is highly resistant to penicillin and cephalosporin [6]. Most isolates show susceptibility to piperacillin/tazobactam, aminoglycosides, chloramphenicol, tetracycline, TMP/SMX, carbapenems, and fluoroquinolones. The fluoroquinolones have the highest bactericidal activity, showing favourable results

in patients treated with ciprofloxacin. There are also reports of excellent responses with meropenem [1].

A parenteral treatment of one to three months followed by an oral regimen to prevent relapse of three to six months is recommended [1].

Vancomycin was the most active antimicrobial against *Corynebacterium* species. This includes *C. jeikeium* which is usually resistant to ciprofloxacin. Only a few strains of *C. jeikeium* are resistant to doxycycline or Fusidic acid (i.e. at concentrations greater than 4 g/ml). *C. jeikeium* was also found to be resistant to gentamicin and fosfomycin [8].

Linezolid and daptomycin are broadly applicable to many Gram-positive pathogens and have recently been considered as possible antimicrobial alternatives [11].

During the first hospitalization, this patient received the optimal treatment for *C. violaceum* for a very short period of time, and he was not treated with an antimicrobial spectrum against *C. jeikeium*. Therefore, what we evidenced was the natural evolution of these pathogens, with low but persistent bacteremia level followed by the formation of pulmonary abscesses, endocardial compromise, relapse, and finally, multiple organ failure.

To our knowledge, this is the first published case of bacteremia due of *Chromobacterium violaceum* and *Corynebacterium jeikeum*. The case has several particularities. For example, the symptoms were associated to food and the patient was immunocompetent. Even though these pathogens are rare, we have demonstrated that they can cause serious infections, and, if they are not treated efficiently, rapidly and for several weeks, the possibility of eradication is very low.

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