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Elizabethkingia meningoseptica Bacteremia in a Newborn at the University Hospital Yalgado Ouedraogo, Burkina Faso: A Case Report

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Authors' contributions

This work was carried out in collaboration among all authors. Authors ZH, HK, CY, OGA wrote the case description. Authors HK and ZH wrote the first draft of the manuscript. Authors ZA, ID, and ASO reviewed the article. All authors read and approved the final manuscript.

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Case Report

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ABSTRACT

Elizabethkingia meningoseptica is a Gram-negative, aerobic bacillus found in the environment. It is an important hospital-acquired bacterium, mainly affecting newborn and immunocompromised patients. It is naturally resistant to many standard antibiotics, making it difficult to choose the right probabilistic antibiotic therapy. We report the first case of *E. meningoseptica* bacteremia in a newborn in a tertiary care university hospital in Burkina Faso, with the aim of raising awareness among practitioners to reduce morbidity and mortality attributable to infections caused by this emerging bacterium.

Keywords: Elizabethkingia meningoseptica; bacteremia; antibiotic resistance; Burkina Faso.

1. INTRODUCTION

Elizabethkingia meningoseptica, formerly known as *Chryseobacterium meningosepticum*, is a Gram-negative, non-fermenting, oxidase-positive, immobile aerobic bacillus first defined by King in 1959 [1]. It is a ubiquitous bacterium, associated with a variety of nosocomial infections [2]. In the pediatric population, the lethality of invasive *E. meningoseptica* infections is estimated at more than 50%, and survivors may face multiple complications and psychomotor sequelae [2,3]. Immunocompromised people also pay a heavy price, due to the increased risk of developing serious infections caused by this bacterium [4].

E. meningoseptica's natural resistance to a number of antibiotic families, including beta-lactams and aminoglycosides, makes it a highly feared bacterium in invasive infections [5,6]. In sub-Saharan Africa, data on this pathogen remain very limited, as it has rarely been isolated. We therefore need to raise awareness of this emerging opportunistic pathogen that can cause serious infection in a context of antimicrobial resistance. We report a case of *E. meningoseptica* bacteremia, with the aim of raising awareness among microbiologists and clinicians to reduce morbidity and mortality attributable to infections caused by this emerging bacterium.

2. CASE PRSENTRATION

This was a male newborn at D-19 of life, admitted to the pediatric emergency department of the University Hospital Yalgado Ouedraogo on 22/07/2024 for respiratory distress with an inability to suckle. He was born of a twin pregnancy of 31 weeks of amenorrhea, during which the mother would have benefited from a single prenatal consultation. He was born vaginally, with no evidence of cyanosis or resuscitation. In addition, he was hospitalized immediately after birth in neonatology for extreme prematurity and hypotonia, with no apparent sequelae.

On admission, clinical examination revealed an altered state of consciousness. Weight 1500g and height 39cm. Respiratory distress with bradypnea, respiratory pauses averaging 15 seconds, signs of respiratory struggle and desaturation of 80% on room air; frank cutaneous icterus and systemic inflammatory response syndrome. Biological investigations revealed a negative thick drop and dengue serology; the blood count showed leukopenia at 2560/mm^3, normochromic normocytic anemia with a hemoglobin level of 11.2 g/dL; C-reactive protein was 142.93 mg/L. Total and direct bilirubinemia were 143.7 and 5.8 µmol/L respectively.

The diagnosis of late neonatal infection was accepted and the patient was transferred to the intensive care unit (ICU). After conditioning, he received oxygen therapy, a 5 mL bolus of 10% hypertonic glucose, a fluid intake of 80 mL/Kg/24H, phytotherapy and probabilistic antibiotic therapy with gentamicin injection 5 mg/24H combined with cefotaxime 100mg/8H.

Table 1. results of the antibiotics susceptibility testing performed on the BD Phœnix M50 automated system

Antibiotics	Minimum inhibitory concentration (MIC)	Interpretation
Amikacin	> 32	Resistant
Amoxicillin-clavulanic acid	> 16	Resistant
Ampicillin	> 16	Resistant
Ampicillin-sulbactam	> 8/8	Resistant
Cefazolin	> 32	Resistant
Cefepime	> 8	Resistant
Ceftazidime	> 8	Resistant
Cefuroxime	> 16	Resistant
Ciprofloxacin	**0,25**	**Susceptible**
Colistin	> 4	Resistant
Ertapenem	> 1	Resistant
Gentamicin	> 8	Resistant
Imipenem	> 8	Resistant
Levofloxacin	**< 0,5**	**Susceptible**
Pipéracillin-tazobactam	> 16/4	Resistant
Sulfametoxazole-trimetoprim	**< 2/38**	**Susceptible**

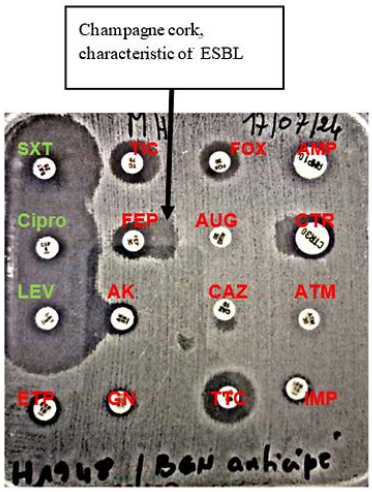

Fig. 1. Result of anticipated antibiotic susceptibility testing on blood culture broth

TIC = ticarcillin, TTC = ticarcillin-clavulanic acid, AMP = ampicillin, AUG = Amoxicillin-clavulanic acid, FOX = cefoxitin, CTR = ceftriaxone, CAZ = ceftazidime, ATM = aztreonam, FEP = cefepime, IMP = imipenem, ETP = ertapenem, AK= amikacin, GN= gentamicin, CIP = ciprofloxacin, LEV = levofloxacin, SXT = sulfamethoxazole-trimetoprim

A blood culture taken prior to initiation of probabilistic antibiotic therapy in a pediatric bottle of the BD BACTEC FX40 system (Becton Dickinson, New Jersey) was positive after an incubation time of 10 hours 30 minutes. Microscopic examination of the positive broth smear revealed the presence of fine Gram-negative bacilli, suggesting non-fermenters. These preliminary results prompted the substitution of cefotaxime for ceftazidime. The blood culture was plated on chocolate agar, Cysteine lactose electrolyte deficient agar and MacConkey, and an anticipatory antibiotics susceptibility testing targeting Gram negative bacilli was performed on the broth following the procedure described in EUCAST 2023 [7]. After incubation in the oven for 18h, the strain grew on chocolate agar and Cysteine lactose electrolyte deficient agar but not on MacConkey. Anticipated antibiogram showed a strain producing extended-spectrum beta-lactamases (ESBL), with resistance to beta-lactams and

aminoglycosides. However, fluoroquinolones (ciprofloxacin, levofloxacin) and cotrimoxazole were active, With inhibition diameters of 34 mm for cotrimoxazole, 30 mm for levofloxacin and 29 mm for ciprofloxacin (Fig. 1). Final identification and susceptibility testing on BD Phœnix M50 (Becton Dickinson, New Jersey) using Gram-negative panels (NMIC) confirmed the anticipated susceptibility test and the species involved, *Elizabethkingia meningoseptica* (Table 1). *Escherichia coli* ATCC 25922 was used as a reference strain for antibiogram quality control.

Under probabilistic antibiotic therapy, the patient died 24 hours after admission in respiratory distress and sepsis despite the resuscitation measures taken.

3. DISCUSSION

Elizabethkingia meningoseptica is a ubiquitous bacterium. It is responsible for healthcare-associated infections and is mainly described as the pathogen responsible for neonatal bacteremia and meningitis [8]. In newborns, prematurity is the main risk factor for *E. meningoseptica* infection, and half of all cases involve patients weighing less than 2,500g [2]. This was the case with our patient, a premature newborn with a very low birth weight (1500g). Bacteremia, as reported in this case, is the second most common clinical manifestation after neonatal meningitis in newborns [2]. *E. meningoseptica* has also been reported to cause pneumonia and very rarely urinary tract infections, soft tissue infections, osteomyelitis, septic arthritis, endocarditis, eye infection, sinusitis, bronchitis, epididymitis, dialysis-associated peritonitis [3,9]. In addition to prematurity in newborns, immunodepression and prolonged stays in intensive care units are favorable conditions for *E. meningoseptica* infections [8,10].

Several studies have shown that almost all *E. meningoseptica* bacteremia's occur in nosocomial settings in patients who generally have a history of exposure to antibiotics or who have at least one pre-existing comorbidity [11]. Our patient is no exception and his previous hospitalization in neonatology could be to blame.

Bacteremia and meningitis caused by *E. meningoseptica* are generally associated with high mortality rates, due to multiple resistance to antibiotics and the difficulty of identifying this species. Probabilistic antibiotic therapy, generally involving a combination of beta-lactams and aminoglycosides, as used in our patient's case, is an ineffective combination against *E. meningoseptica.* In this case, all the beta-lactams and aminoglycosides tested were inactive. This resistance profile is similar to that described in the literature [3]. *E. meningoseptica* is naturally resistant to most beta-lactam antibiotics due to the secretion of an extended-spectrum beta-lactamase and two metallo-beta-lactamases responsible for the hydrolysis of carbapenems [12]. It is one of the rare species described as possessing two metallo-betalactamases of chromosomal origin. Its resistance to aminoglycosides was described by Zhang et al. (2023), who reported the presence of a chromosomal aminoglycoside-6-adenyltransferase gene that may be responsible for the phenotypic expression observed in vitro [13]. Only fluoroquinolones (levofloxacin, ciprofloxacin) and cotrimoxazole were active against the isolated strain. The efficacy of these antibiotics on *E. meningoseptica* has been reported by Kirby et al. and Almatari et al. [14,15]. The efficacy of fluoroquinolones is essentially due to their good pharmacokinetic properties compared with other hydrophilic antibiotics such as beta-lactam antibiotics [14]. Bhat et al. (2016) have also reported that *E. meningoseptica* is highly sensitive to cotrimoxazole and fluoroquinolones, but also to clindamycin and erythromycin, which are generally active on Gram-positive bacteria [4]. Its sensitivity to vancomycin remains controversial in the literature, and rifampicin is potentially effective when used as part of a combined therapy [16].

Species diagnosis and the choice of appropriate probabilistic antibiotic therapy for invasive *E. meningoseptica* infections are major challenges for both physicians and microbiologists in sub-Saharan Africa, where automated bacterial identification systems are still inadequate. The vast majority of laboratories use manual identification techniques and are often faced with reagent shortages. They have difficulty identifying species and are often limited to identifying bacterial groups such as 'non-fermentative Gram-negative bacteria'. This results in insufficient epidemiological data, particularly in terms of antibiotic resistance, leading to inappropriate choices of probabilistic antibiotic therapy. This observation

could explain the therapeutic failure in our case, where the probabilistic antibiotic therapy modified after obtaining the results of the microscopic examination after Gram staining was aimed primarily at *Pseudomonas aeruginosa*.

In view of the serious consequences of invasive *E. meningoseptica* infections, oxidase-positive, multi-resistant, non-fermentative isolates from neonates, immunocompromised or seriously ill patients should be treated with a combination of a fluoroquinolone or cotrimoxazole until identification of the germ has been confirmed [4].

4. CONCLUSION

This case highlights the challenges and lessons learned in managing an *E. meningoseptica* bacteremia. It is rarely implicated in human infections, but its highly specific natural resistances make it a threat to the survival of infected patients. Only early diagnosis and improved communication between clinicians and biologists can lead to early adaptation of antibiotic therapy and a reduction in the mortality rate from *E. meningoseptica* bacteremia.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

CONSENT

We obtained written informed consent from the patient's parents for publication of this case report.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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