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Case Report

Pantoea Agglomerans Septicemia in Infants: The First Case Report from Iran and Review of Literature

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Abstract

Pantoea agglomerans (*P. agglomerans*) is a gram-negative , aerobic and bacilli shape in the Enterobacteriaceae family. The species *P. agglomerans* was considered primarily as an environmental bacterium that can present both commensal and pathogenic organism role. A wide range of infections by this bacterium can be caused from sepsis to liver abscesses. We report the first identified case of infant bacteremia due to *P. agglomerans* in Iran.

Keywords: *Pantoea Agglomerans; Neonatal Septicemia*; Infant Blood Stream Infections; Iran

Abbreviations

NICU: Neonatal intensive care unit; CLSI: Clinical and Laboratory Standards Institute

Introduction

Pantoea agglomerans (*P. agglomerans*) is a gram-negative, aerobic, and bacilli-shape bacterium in the Enterobacteriaceae family. The species *P. agglomerans* has been primarily considered as an environmental bacterium which can play both commensal and pathogenic organism roles. This bacterium can induce a wide range of infections ranging from sepsis to liver abscesses. We report the first identified case of bacteremia in an infant due to *P. agglomerans* in Iran.

Pantoea is a genus from the family of *Enterobacteriaceae* and includes gram-negative, aerobic and bacilli-shaped bacteria. It can be isolated from abiotic sources such as soil, water, plants, animals, and humans. It has been considered as both commensal and pathogenic in human hosts and animals [1]. It is a catalase-positive, oxidase-, indole and sulfide hydrogen negative, positive citrate, motile, and lactose-fermenter bacterium. About 20 different species lie in this genus such as *P. dispersa, P. brenneri, P. ananatis, P. agglomerans, P. eucrina,* and so on. *Pantoea* sp. are isolated from plant and herbal products, animals, and even from human feces. *P. agglomerans* is the type species of this genus [2,3]. Antibiotic biosynthesis is a unique metabolic capability of *P. agglomerans*; this property can use in food preservation, as well as in human and plant or animal control infections [3]. In 2013, *P. anthophila* was isolated from drinking water sources [4]. demonstrating that *Pantoea* spp. are environmental bacteria. Up to now, *Pantoea* strains have been often isolated from different clinical sources in humans including knee laceration [5], urethra, blood, trachea, and stool [6]. Further, *P. calida* and *P. gavinae* were isolated from powdered infant formula (Table 1) [7].

In literature review, the infections of children with *P.agglomerans* have been reported in the underlying diseases such as hypotonic conditions, systemic lupus erythematosus, hemolytic uremic syndrome, prematurity, cystic fibrosis, chickenpox, and intestinal perforation; The attendant pathogens that were reported as concomitant with this bacterium were *Enterococcus faecium, Pseudomonas aeruginosa,* and *Aspergillus fumigatus* [18]. Here, we describe the clinical case of *Pantoea agglomerans* septicemia from an infant in Iran.

Species	Site of colonization	Related to human disease/condition	References
P. ananatis		Bacteremia, Corneal infiltration	[8,9]
P. brenneri		Abscesses, wounds, sputum, groin and urethral swabs	[6,10]
P. agglomerans	Wounds, fractures, knee laceration, sputum, ear and oropharynx swab	Septic arthritis, Osteomyelitis, Bacteremia, Septicemia, Peritonitis, Joint infection, Liver abscess, Pneumonia, Respiratory distress, Endophthalmitis	[5,10-14]
P. calida	Urine, dialysate		[10]
P. conspicua	Wounds, Blood		[10,15,16]
P. dispersa	Blood	Nosocomial infection	[10,17]
P. eucrina	Blood, spinal fluid, cysts, trachea samples		[6,10]
P. septica	Urine, stool, blood, skin, sputum		[6,10]
Pantoea sp.		Dacryocystitis, nosocomial infection, sepsis	[12]

Table 1: Strains of *Pantoea* associated with human colonization and disease.

Clinical Case report

The patient was a forty-five-day-old girl who had breastfeeding vomits for two weeks. Since the last week, diarrhea had occurred 8 times a day. The patient with the diagnosis of allergic reflux was admitted in the Akbar Children's Hospital. She presented with a high-grade fever, irritability, and poor intake. This patient was referred to NICU of the hospital. Upon physical examination, she presented respiratory rate 65/min, heart rate 142/min, temperature 38°C, and blood pressure 97/64 mmHg. The erythrocyte sedimentation rate (ESR) of her blood was about 25 mm/h. Her urine and blood were cultured suspecting that there is a possible cause of infectious disease. The result of urine culture was negative. Two bottles of blood culture were collected from the dorsal venous arch by perfect aseptic precaution which were cultured by an automated method BacT/Alert-3D (BioMérieux, Marcy-l'Etoile, France) to study the growth of aerobic and anaerobic bacteria. Empirical antibiotic therapy of this infant was initiated with a combination of vancomycin plus ceftriaxone after collecting the blood and urine samples. The first bottle was positive for a sign of growth within 72 h. The bacterium was cultured on blood agar whose purity and viability were ensured. For this gram-negative isolate, a suspension was made composed of 0.45% sodium chloride solution and adjusted to McFarland standard. Then, it was tested with VITEK® 2 Compact system (BioMérieux, Marcy l'Etoile, France). The GN25 identification card (containing 47 biochemical tests) identified *P. agglomerans* with 90% probability. Susceptibility testing was carried out using the Kirby–Bauer disc diffusion method, and the results were interpreted according to the 2019 CLSI guidelines. Antibiotic discs (Rosco, Taastrup, Denmark) contained ceftazidime, cefotaxime, piperacillin-tazobactam, amikacin, ceftriaxone, ciprofloxacin, meropenem, and cefazolin. The bacterium revealed resistance only to cefazolin. The antibiotic therapy for this patient was continued with intravenous (IV) administration of ceftriaxone for 8 days while vancomycin was discontinued. Also, amikacin was used IV for treatment. After 48 hours of this antibiotic regimen administration, the patient's fever was resolved and re-cultivation of her blood on the fourth treatment day showed no growth of any bacterium.

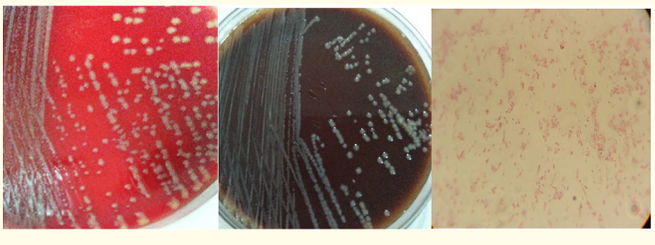

Figure 1: The non-hemolytic, yellowish, mucoid and small colonies of Pantoea agglomerans on a blood agar and chocolate agar culture plates after incubation for 24 hours, respectively (Left images; A and B). The yellow color is a specific property of this bacterium. Microscopic image of the cultured isolates from blood agar shows small gram-negative rods (right image; C) (Gram stain, ×1,000).

Discussion

In this study, we present a case of septicemia in an infant in which *P. agglomerans* was isolated from the blood culture. The infections such as osteomyelitis, septic arthritis, urinary tract infection, blood infections, and abscess are the most common episodes caused by *P. agglomerans* in children and infants [1]. Infection of

wounds by herbal materials and nosocomial acquired infections by this bacterium due to the contamination of medical devices and fluids are the main important reasons of *P. agglomerans* human infections [11]. *P. agglomerans* is generally considered noninvasive and sepsis (septicemia) due to *P. agglomerans* in neonatal is rare [19,20]. In 1975, a national epidemic septicemia occurred as a result of *P. agglomerans* [21]. Typically, in children spontaneous infections due to this bacterium atablere rare and it is considered as an opportunistic pathogen [22]. An outbreak due to *P. agglomerans* was reported by Senanayake NP., et al. in 2016 in a teaching hospital from Sri Lanka. In their study, 14 out of 55 blood bottles collected from the neonates on admission to the Neonatal Intensive Care Unit (NICU) were positive for this bacterium. Also, environmental samples from intravenous drugs and fluids, aero-humidifiers, distilled water, ventilator masks, disinfectant solutions, sinks, door handles, and other hospital devices were obtained and screened for growth of *P.agglomerans*, with all of the environmental samples being negative [23]. So as a result, *P. agglomerans* was responsible for this outbreak in the NICU. Mahapatra A., *et al.* in 2014 at a case series presented five cases of neonatal blood stream infections due to *P. agglomerans*. Intravenous catheters, thorn bite, and infectious injectable fluids were the main routes for acquisition of *P. agglomerans* as listed in the literature review; indeed, it is a known exogenous source of this bacterium which plays a major role in inducing the infections [13]. The premature rupture of membrane (PROM) and coexistence with other morbidities are dominant causes of neonatal infections especially neonatal early sepsis, bacteremia, and meningitis with this bacterium [24]. Probably in our case, according to high grade fever at the time of hospital admission, the patient had acquired the infection from an exogenous source and her underlying disease set the ground for sensitization and acquiring the infection.

Conflict of Interest

The authors have agreed that there is no conflict of interests regarding the publication of this paper.

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