



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

Kobra Salimiyan Rizi<sup>1,2</sup>, Hadi Farsiani<sup>1,2\*</sup>, Simin Hradfar<sup>3</sup> and Mohammad Reza montazer Abadi<sup>4</sup>

<sup>1</sup>Department of Microbiology and Virology, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>2</sup>Antimicrobial Resistance Research Center, Mashhad University of Medical sciences, Mashhad, Iran

<sup>3</sup>Cystic Fibrosis Clinic, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>4</sup>Laboratory of Microbiology, Akbar Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

\*Corresponding Author: Hadi Farsiani, Department of Microbiology and Virology, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

Received: August 09, 2019; Published: August 19, 2019

### 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 *Pagglomerans* 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.

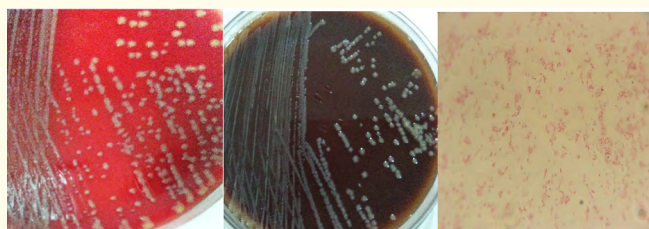
Species	Site of colonization	Related to human disease/condition	References
<i>P. ananatis</i>		Bacteremia, Corneal infiltration	[8,9]
<i>P. brenneri</i>		Abscesses, wounds, sputum, groin and urethral swabs	[6,10]
<i>P. agglomerans</i>	Wounds, fractures, knee laceration, sputum, ear and oropharynx swab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

### Bibliography

1. Siwakoti S., et al. "Pantoea agglomerans infections in children: Report of two cases". *Case Reports in Pediatrics* (2018): 4158734.
2. Barash I and Manulis-Sasson S. "Virulence mechanisms and host specificity of gall-forming *Pantoea agglomerans*". *Trends in Microbiology* 15.12 (2007): 538-545.
3. Dutkiewicz J., et al. "Pantoea agglomerans: a mysterious bacterium of evil and good. Part IV. Beneficial effects". *Annals of Agricultural and Environmental Medicine* 23.2 (2016): 206-222.
4. Pindi PK., et al. "Identification of opportunistic pathogenic bacteria in drinking water samples of different rural health centers and their clinical impacts on humans". *Biomed Research International* (2013).
5. Gavini F., et al. "Transfer of *Enterobacter agglomerans* (Beijerinck 1888) Ewing and Fife 1972 to *Pantoea* gen. nov. as *Pantoea agglomerans* comb. nov. and Description of *Pantoea dispersa* sp. Nov". *International Journal of Systematic and Evolutionary Microbiology* 39.3 (1989): 337-345.
6. Brady CL., et al. "Emended description of the genus *Pantoea*, description of four species from human clinical samples, *Pantoea septica* sp. nov., *Pantoea eucrina* sp. nov., *Pantoea brenneri* sp. nov. and *Pantoea conspicua* sp. nov., and transfer of *Pectobacterium cypripedii* (Hori 1911) Brenner et al. 1973 emend. Hauben et al. 1998 to the genus as *Pantoea cypripedii* comb. Nov". *International Journal of Systematic and Evolutionary Microbiology* 60.10 (2010): 2430-2440.
7. Popp A., et al. "*Pantoea gaviniae* sp. nov. and *Pantoea calida* sp. nov., isolated from infant formula and an infant formula production environment". *International Journal of Systematic and Evolutionary Microbiology* 60.12 (2010): 2786-2792.
8. De Baere T., et al. "Bacteremic infection with *Pantoea ananatis*". *Journal of Clinical Microbiology* 42.9 (2004): 4393-4395.
9. Manoharan G., et al. "*Pantoea ananatis* as a cause of corneal infiltrate after rice husk injury". *Journal of Clinical Microbiology* 50.6 (2012): 2163-2164.
10. Nadarasah G and Stavriniades J. "Quantitative evaluation of the host-colonizing capabilities of the enteric bacterium *Pantoea* using plant and insect hosts". *Microbiology* 160.3 (2014): 602-615.
11. Cruz AT., et al. "*Pantoea agglomerans*, a plant pathogen causing human disease". *Journal of Clinical Microbiology* 45.6 (2007):1989-1992.
12. Walterson AM and Stavriniades J. "*Pantoea*: insights into a highly versatile and diverse genus within the Enterobacteriaceae". *FEMS Microbiology Reviews* 39.6 (2015): 968-984.
13. Venincasa VD., et al. "Endophthalmitis caused by *Pantoea agglomerans*: clinical features, antibiotic sensitivities, and outcomes". *Clinical Ophthalmology* (2015): 1203-1207.

14. Kazancioglu R., *et al.* "An unusual cause of peritonitis in peritoneal dialysis patients: *Pantoea agglomerans*". *The Journal of Infection in Developing Countries* 8.07 (2014): 919-922.
15. Brady C., *et al.* "Isolation of *Enterobacter cowanii* from *Eucalyptus* showing symptoms of bacterial blight and dieback in Uruguay". *Letters in Applied Microbiology* 49.4 (2009): 461-465.
16. Brady CL., *et al.* "*Pantoea vagans* sp. nov., *Pantoea eucalypti* sp. nov., *Pantoea deleyi* sp. nov. and *Pantoea anthophila* sp. Nov". *International journal of systematic and evolutionary microbiology* 59.9 (2009): 2339-2345.
17. Schmid H., *et al.* "Isolation of a *Pantoea dispersa*-like strain from a 71-year-old woman with acute myeloid leukemia and multiple myeloma". *Infection* 31.1 (2003): 66-67.
18. Büyükcama A., *et al.* "Clinical and microbiological characteristics of *Pantoea agglomerans* infection in children". *Journal of Infection and Public Health* 11.3 (2018): 304-309.
19. Bergman KA., *et al.* "*Pantoea agglomerans* septicemia in three newborn infants". *The Pediatric Infectious Disease Journal* 26.5 (2007): 453-454.
20. Gálvez-Cuitiva EA., *et al.* "Sepsis temprana en un recién nacido pretérmino por *Pantoea agglomerans*: informe de caso y revisión de la literatura". *Acta pediátrica de México* 39.1 (2018): 52-59.
21. Maki DG., *et al.* "Nationwide epidemic of septicemia caused by contaminated intravenous products: I. Epidemiologic and clinical features". *The American Journal of Medicine* 60.4 (1976): 471-485.
22. Tiwari S and Beriha SS. "*Pantoea* species causing early onset neonatal sepsis: a case report". *Journal of Medical Case Report* 9.1 (2015):188.
23. Senanayake N., *et al.* "An outbreak of *Pantoea agglomerans* infection in the neonatal intensive care unit at Teaching Hospital, Kandy, Sri Lanka". *Sri Lanka Journal of Child Health* 45.1 (2016).
24. Cheng A., *et al.* "Bacteremia caused by *Pantoea agglomerans* at a medical center in Taiwan, 2000–2010". *Journal of Microbiology, Immunology and Infection* 46.3 (2013):187-194.

**Volume 2 Issue 9 September 2019**

**© All rights are reserved by Hadi Farsiani., *et al.***