**Pantoea dispersa** bacteremia in an immunocompetent patient: a case report and review of the literature

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**Abstract**

**Background:** *Pantoea* is a Gram-negative, non-encapsulated, non-spore-forming, ubiquitous straight rod which can be isolated from geographical and ecological sources such as plant surfaces, buckwheat seeds, human feces, and the environment. The genus *Pantoea* is a rare pathogen in a clinical setting, and is divided into 20 different species such as *Pantoea agglomerans*, *Pantoea ananatis*, *Pantoea deleyi*, *Pantoea dispersa*, *Pantoea septica*, *Pantoea stewartii* or *Pantoea rwandensis*. *Pantoea dispersa* has been reported to cause other infections, including respiratory infections, neonatal sepsis, and bloodstream infections. We report a case of *Pantoea dispersa* bacteremia caused by acute cholangitis. This is the first case report of *Pantoea dispersa* bacteremia caused by acute cholangitis as far as we had searched.

**Case presentation:** A 38-year-old Japanese woman suffered from acute cholangitis; a blood culture showed that Gram-negative rod was positive. The treatment was successful with intravenously administered meropenem, and it was switched to orally administered levofloxacin according to microbiological susceptibility. The organism was identified as *Pantoea dispersa* by both genetic investigation by 16S ribosomal RNA and additional biochemical tests. To the best of our knowledge, this is the first case report of *Pantoea dispersa* bacteremia caused by acute cholangitis.

**Conclusion:** The epidemiology and clinical features of *Pantoea dispersa* are still unknown. More cases of infections caused by *Pantoea dispersa* might be revealed with advancing technical methods, such as matrix-assisted laser desorption/ionization time-of-flight mass spectrometry or 16S ribosomal RNA analysis. Physicians must know that a variety of infections caused by *Pantoea dispersa* could occur in immunocompromised as well as immunocompetent patients.

**Keywords:** *Pantoea dispersa*, Bacteremia, Gram-negative rod, Cholangitis

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**Background**

*Pantoea* is a Gram-negative, non-encapsulated, non-spore-forming, ubiquitous straight rod which can be isolated from geographical and ecological sources such as plant surfaces, buckwheat seeds, human feces, and the environment [1, 2]. The genus *Pantoea* is a rare pathogen in a clinical setting, and is divided into 20 different species named *Pantoea* eucalyptii, *Pantoea agglomerans*, *Pantoea vagans*, *Pantoea conspicua*, *Pantoea deleyi*, *Pantoea anthrophila*, *Pantoea brehneri*, *Pantoea ananatis*, *Pantoea allii*, *Pantoea stewartii*, *Pantoea cypripedi*, *Pantoea calida*, *Pantoea gavinae*, *Pantoea dispersa*, *Pantoea septica*, *Pantoea wallisii*, *Pantoea eucriina*, *Pantoea rodasii*, *Pantoea rwandensis*, and *Pectobacterium carotovorum* [2, 3]. *P. agglomerans* is the most prominent species in humans, formerly named *Enterobacter agglomerans*.

*P. dispersa* has been reported to cause other infections, including respiratory infection [4], neonatal sepsis [5],...
and bloodstream infection [6]. This microbe has been known to cause infections in immunocompromised patients but not in immunocompetent patients. Here we report a case of *P. dispersa* bacteremia caused by acute cholangitis. This is the first case report of *P. dispersa* bacteremia caused by acute cholangitis, as far as we could search.

## Case presentation

A 38-year-old Japanese woman came to our institute with a complaint of epigastric pain after meals. She had no medical history and no exposures to plants or animals prior to her hospital stay or invasive procedures. She never smoked tobacco and was not an alcohol consumer. She was diagnosed as having acute cholangitis induced by stone based on symptoms and laboratory findings (Table 1), and was admitted (Fig. 1). Her body temperature was 37.1 °C, blood pressure 97/57 mmHg, and heart rate 85/minute. She did not exhibit any jaundice. An abdominal examination revealed tenderness on the epigastric portion. No rebound tenderness was confirmed. Her cardiac, respiratory, and neurological examinations were normal. Abdominal computed tomography (CT) findings showed gallstones with gallbladder wall thickening (Fig. 2). Antibiotic therapy of sulbactam (SBT)/cefoperazone (CPZ) was started empirically at the same time. When undergoing endoscopic nasobiliary drainage, she had a high fever and two sets of blood cultures were obtained on day 6. Growth of Gram-negative rods was reported in both aerobic and anaerobic blood cultures within 24 hours on BACTEC™ (BD, Tokyo, Japan). Antibiotic therapy of meropenem (MEPM) was started empirically. Our patient’s clinical condition and laboratory data improved rapidly. After 3 days of intravenously administered MEPM, the antibiotic therapy was switched to orally administered levofloxacin (LVFX) 500 mg daily for another 7 days according to microbiological sensitivity. The infection did not recur and she was discharged on day 28. During 1 year, recurrence of the infection was not observed.

First, the pathogen by positive blood culture was identified as *Klebsiella ozaenae* by means of a MALDI

### Table 1 Laboratory findings on admission

| Parameter | Value       |
|-----------|-------------|
| WBC       | 13,200/μL   |
| Neu       | 92.4%       |
| Lym       | 5.3%        |
| Mono      | 1.9%        |
| Eos       | 0.1%        |
| RBC       | 410 x 10^6/μL |
| Hb        | 11.7 g/dL   |
| Plt       | 19.2 x 10^7/μL |
| AST       | 30 IU/L     |
| ALT       | 63 IU/L     |
| T-Bil     | 1.1 mg/dL   |
| LDH       | 180 IU/L    |
| ALP       | 341 IU/L    |
| CK        | 36 IU/L     |
| γ-GTP     | 129 IU/L    |
| Amy       | 61 IU/L     |
| TP        | 7.3 g/dL    |
| Cre       | 0.6 mg/dL   |
| Na        | 136 mmol/L  |
| K         | 4.1 mmol/L  |
| Cl        | 98 mmol/L   |
| Ca        | 9.1 mg/dL   |
| Na        | 136 mmol/L  |
| Glu       | 66 mg/dL    |
| Ca        | 9.1 mg/dL   |
| Cre       | 0.6 mg/dL   |
| Alb       | 4.2 g/dL    |
| TP        | 7.3 g/dL    |
| BUN       | 9.6 mg/dL   |
| Eos       | 0.1%        |
| γ-GTP     | 129 IU/L    |
| Amy       | 61 IU/L     |
| TP        | 7.3 g/dL    |

Abbreviations: Alb, albumin; ALP, alkaline phosphatase; ALT, alanine aminotransferase; Amy, amylase; AST, aspartate aminotransferase; BUN, blood urea nitrogen; Ca, calcium; CK, creatine kinase; Cl, chlorine; Cre, creatinine; CRP, C-reactive protein; Eos, eosinophil; γ-GTP, γ-glutamyltransferase; Glu, glucose; Hb, hemoglobin; K, potassium; LDH, lactate dehydrogenase; Lym, lymphocyte; Mono, monocyte; Na, sodium; Neu, neutrophil; Plt, platelet; RBC, red blood cell count; T-Bil, total bilirubin; TP, total protein; WBC, white blood cell count.

**Fig. 1** The clinical course of this case. CPZ, cefoperazone; ERBD, endoscopic retrograde biliary drainage; LVFX, levofloxacin; MEPM, meropenem; SBT, sulbactam.
Biotyper® (Bruker Daltonics). Subsequently, genetic investigation by 16S ribosomal RNA (rRNA) analysis was performed in order to identify this organism. Finally, the pathogen was identified as _P. dispersa_ with 100% homology (1343 of 1343 bases) on the EZ taxonomy database (http://www.ezbiocloud.net/eztaxon). We also conducted additional biochemical tests using API® 50 CH kit, according to previous reports to confirm the isolate as _P. dispersa_. The organism had no activities of esculin and salicin, and had activities of lactose, melibiose, and gentiobiose, which were consistent with _P. dispersa_ [6].

Antimicrobial susceptibility testing was performed according to Clinical and Laboratory Standards Institute (CLSI) criteria for _Enterobacteriaceae_ [7] using the newly developed, fully automated microbiology system, RAISUS (Nissui Pharmaceuticals Co., Ltd., Tokyo). The organism was susceptible to all antimicrobial agents tested, including ampicillin, cefazolin, gentamicin, LVFX, and trimethoprim-sulfamethoxazole (Table 2).

**Discussion**

_Pantoea_ is a genus of Gram-negative bacteria of the family _Enterobacteriaceae_ that was recently separated from the _Enterobacter_ genus. They have also recently been shown to cause infections in humans [1–6]. However, only a limited number of clinical cases with bacteria belonging to this genus have been described. Thus, there is not enough information on its pathogenic mechanism.

A total of five cases of infections by _P. dispersa_ including ours have previously been reported as shown in Table 3. Two of the five cases were neonates, and the other three cases were adults. The sites of infections varied such as respiratory or blood stream infections. As for the underlying diseases of the three adults, one patient with leukemia was immunocompromised and the other two were immunocompetent. In terms of the outcomes, all patients were improved. Epidemiology and clinical features of _P. dispersa_ infection are still unknown due to its rarity and the difficulty in accurate identification. A previous report documented that more than 10% of clinical isolates of _P. agglomerans_ were misidentified as species of the genus _Enterobacter_ by the VITEK® MS system [8]. In the present case, the isolate was initially misidentified as _Klebsiella ozaenae_ by MALDI Biotyper®.

![Abdominal computed tomography shows gallstones with gallbladder wall thickening](image)

**Table 2** Antimicrobial susceptibility of _Pantoea dispersa_ isolated from blood culture

| Antimicrobial agents                  | MIC (µg/mL) | Interpretation |
|--------------------------------------|-------------|----------------|
| Ampicillin                           | ≤ 8         | S              |
| Minocycline                          | ≤ 4         | S              |
| Amikacin                             | ≤ 4         | S              |
| Aztreonam                            | ≤ 1         | S              |
| Ceftazidime                          | ≤ 1         | S              |
| Cefazolin                            | 8           | R              |
| Cefepime                             | ≤ 2         | S              |
| Cefmetazole                          | ≤ 16        | S              |
| Ciprofloxacin                        | ≤ 0.063     | S              |
| Cefotiam                             | ≤ 2         | S              |
| Cefotaxime                           | ≤ 1         | S              |
| Fosfomycin                           | ≤ 64        | S              |
| Imipenem                             | ≤ 0.5       | S              |
| Levofloxacin                         | ≤ 0.125     | S              |
| Piperacillin                          | ≤ 16        | S              |
| Trimethoprim/sulfamethoxazole        | ≤ 2/38      | S              |
| Meropenem                            | ≤ 0.125     | S              |
| Tazobactam/piperacillin              | ≤ 4/4       | S              |

MIC minimum inhibitory concentration, _R_ resistant, _S_ susceptible
16S rRNA analysis confirmed that the isolate was *P. dispersa*. More cases could be missed due to misidentifications as *P. dispersa*. A variety of infections caused by *P. dispersa* have been reported [4–6]. More cases of infections caused by *P. dispersa* might be revealed with advancing technical methods, such as matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS) or 16S rRNA analysis.

All species of the genus *Pantoea* can be isolated from feculent material, plants, and soil [2]. However, our patient had no contact with these sources. The isolate was susceptible to amikacin, cefepime, cefotaxime, ciprofloxacin, MEPM, and aztreonam, and resistant to cefazolin. Fortunately, our patient survived because appropriate antibiotic therapy was rapidly started. These results were similar to those of previous reports [4–6]. Of note, *P. dispersa* bacteremia can occur not only in immunocompromised hosts but also in immunocompetent patients. Although all cases improved, the pathogenic and clinical importance of *P. dispersa* infection are unclear. Additional case reports of *P. dispersa* infections could help physicians understand the pathogenetic potential of this organism.

**Conclusion**

We experienced a case of *P. dispersa* bacteremia caused by acute cholangitis, which is the first report as far as we could search. Although *P. dispersa* could cause a variety of infections in immunocompromised as well as immunocompetent patients, some cases of *P. dispersa* infections might be misdiagnosed as other pathogens infection. More cases of infections by *P. dispersa* should be collected and examined to clarify the epidemiology of *P. dispersa* infections.

**Abbreviations**

CLSI: Clinical and Laboratory Standards Institute; CPZ: Cefoperazone; CT: Computed tomography; LVFX: Levofoxacin; MALDI-TOF-MS: Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry; MEPM: Meropenem; rRNA: Ribosomal RNA; SBT: Sulbactam

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**Availability of data and materials**

The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Authors’ contributions**

NA, YK, HW, YY, and HM carried out the clinical follow up. NA drafted the manuscript. AV, DS, and HS performed microbial testing and NA, YK, HW, YY, and HM performed laboratory analysis. HK, AS, and MH supervised the antibiotic and antiviral therapy. All authors read and approved the final manuscript.

**Ethics approval and consent to participate**

Not applicable.

**Consent for publication**

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

**Competing interests**

The authors declare that they have no competing interests.

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**References**

1. Gavini F, Mergaert J, Beji A, Mielcarek C, Izard D, Kersters K, et al. Transfer of *Enterobacter agglomerans* (Beierleirck 1888) Ewing and Fife 1972 to *Pantoea* gen. nov. as *Pantoea agglomerans* comb. nov. and description of *Pantoea dispersa* sp. nov. Int J Syst Bacteriol. 1989;39:337–45.

2. Walterson AM, Stavrinides J. *Pantoea* insights into a highly versatile and diverse genus within the Enterobacteriaceae. FEMS Microbiol Rev. 2015;39:968–84.

3. Mergaert J, Verdonck L, Kersters K, Transfer of *Erwinia ananas* (synonym, *Erwinia uredovora*) and *Erwinia stewartii* to the Genus *Pantoea* emend. as *Pantoea ananas* (Serrano1928) comb. nov. and *Pantoea stewartii* (Smith 1898) comb. nov., respectively, and Description of *Pantoea stewartii* subsp. indologenes subsp. nov. Int J Syst Bacteriol. 1993;43:162–73.
4. Schmid H, Schubert S, Weber C, Bogner JR. Isolation of a Pantoea dispersa-like strain from a 71-year-old woman with acute myeloid leukemia and multiple myeloma. Infection. 2003;31:66–7.

5. Mehar V, Yadav D, Sanghvi J, Gupta N, Singh K. Pantoea dispersa: an unusual cause of neonatal sepsis. Braz J Infect Dis. 2013;17:726–8.

6. Hagiya H, Otsuka F. Pantoea dispersa bacteremia caused by central line-associated bloodstream infection. Braz J Infect Dis. 2014;18:696–7.

7. Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing: twenty-fifth informational supplement. M100-S25. Wayne: Clinical and Laboratory Standards Institute; 2015.

8. Richter SS, Sercia L, Branda JA, et al. Identification of Enterobacteriaceae by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry using the VITEK MS system. Eur J Clin Microbiol Infect Dis. 2013;32:1571–8.