Cases of postoperative meningitis are rare and typically caused by other bacteria such as Staphylococcus, Escherichia coli, Pseudomonas, and Listeria monocytogenes. A recent report describes a unique case of postsurgical meningitis caused by *Pantoea calida*, an organism not previously linked to human infection. This case highlights the importance of considering uncommon pathogens in the differential diagnosis of postoperative infections.

### Introduction

*Pantoea calida* was initially identified as a species of Enterobacteriaceae after its isolation and culture from powdered infant formula [1]. It has not been associated with human infection until recently when a case involving postoperative meningitis was reported.

### Case Presentation

A 52-year-old Caucasian woman presented with fever, meningeal syndrome, and a Glasgow Coma Scale of 13 (E4V4M5). Cerebrospinal fluid analysis revealed hypoglycorrachia (1.33 mmol/L), an elevated protein level (5.88 g/L), and 4500 leukocytes/mL, predominantly polymorphonuclear leukocytes. No growth was observed on Gram staining.

Treatment with intravenous vancomycin and meropenem was started. The patient rapidly improved and was afebrile within 2 days. Meropenem was continued for a total of 14 days. At 90-day follow-up, the patient was healthy with no signs of meningitis.

The CSF was inoculated on Polyvitex and Columbia agar with 5% sheep blood and incubated under a 5% CO₂ atmosphere. After 48 hours, small white round domed colonies were observed. Partial rpoB gene sequencing confirmed the identification of *P. calida*.

### Conclusions

*Pantoea calida* must be added to the list of opportunistic Enterobacteriaceae pathogens responsible for postsurgical meningitis. It is easily identified by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry.
culture media. Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS) performed as previously described [2,3] yielded *P. calida* with identification score of 2.26, 2.17 and 2.17 for the three spots deposited on the MALDI-TOF-MS plate. Furthermore partial rpoB gene sequencing performed as previously reported [4] confirmed the identification of *P. calida* with 99.88% sequence similarity with the reference sequence (GenBank GQ892191). Antimicrobial susceptibility was performed by diffusion method in agar and incubated aerobically for 24 hours at 37°C. The isolate was resistant to ampicillin (minimal inhibitory concentration (MIC) >8mg/L), amoxicillin-clavulanate (MIC, 1mg/L), and cephalothin (MIC, 1mg/L). It was susceptible to ceftriaxone (MIC, 0.5mg/L), imipenem (MIC, 0.5mg/L), ciprofloxacin (MIC, 0.25mg/L), gentamicin (MIC<1mg/L) and co-trimoxazole (MIC<1mg/L).

**Discussion**

Here, *P. calida* was isolated from the CSF of a patient with postoperative meningitis [5]. The isolate was firmly identified by using two different complementary approaches: MALDI-TOF-MS which is an advanced proteomics method [2,3] relying on the analysis of unique peptidic signatures; and partial rpoB gene sequencing which relies on the analysis of unique nucleotidic signatures [6]. These two technical approaches yielded unambiguous, concordant identification. In particular, MALDI-TOF-MS proved to be efficient to identify this species, despite the fact that no clinical isolate was previously included in the database.

The absence of any bacteria other than *P. calida* on the culture of CSF, as well as the fact that it was the first identification of this microorganism in our laboratory, secure the conclusion that *P. calida* was responsible for this postoperative meningitis. Accordingly, the patient was rapidly cured after an effective antibiotic treatment was administrated. In this case, the source of infection remained unknown. Indeed, *P. calida* has been documented only in powdered infant formula [1] and our patient had no contact with such formula. Of interest, the *Cronobacter* species (formerly *Enterobacter sakazakii*) causing health-care-associated meningitis in neonates [7] is also contaminating powdered infant formula [8,9].

Indeed, *P. calida* is closely related to members of the Enterobacteriaceae genus *Erwinia, Tatumella, Kluvera, Citrobacter* and *Cronobacter*, which also comprise opportunistic pathogens causing meningitis, mainly in newborns [1]. Whereas *Erwinia* and *Tatumella* organisms have not been associated with central nervous system infection, *Kluvera* meningitis has been reported in a newborn [10]. Also *Citrobacter* bacteria are opportunistic pathogens seldom reported as causing meningitis in neonates [11], children [12] and adults with cancer [13]. Recently, one case of *Citrobacter koseri* meningitis has been reported after free-diving [14]. Lastly, *Cronobacter* species along with *Enterobacter* species have been reported as causes of health-care-associated meningitis [15].

**Conclusions**

*P. calida* should be added to the list of Enterobacteriaceae pathogens responsible for infectious postoperative meningitis. Sources different from powdered infant formula should be investigated. *P. calida* meningitis can be cured by appropriate antibiotic treatment. This new pathogen can easily be identified by using MALDI-TOF-MS [2,3].

**Consent**

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

**Abbreviations**

CSF: Cerebrospinal fluid; MALDI-TOF-MS: Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry; MIC: Minimal inhibitory concentration.

**Authors’ contributions**

NC, RN, SDLR and PHR took care of the patient. SF and MD took care of the microbiology of the specimens. SF, NC, RN, and SDLR wrote the case. PHR and MD evaluated the draft and suggested revisions. All authors read and approved the final manuscript.

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**Competing interests**

The authors declare that they have no competing interests.

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