A rare case of urosepsis caused by multidrug-resistant *Escherichia hermannii* in an immunocompetent toddler

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**Abstract**

*Escherichia hermannii* is a gram-negative bacillus from the Enterobacteriaceae family. The formation of a yellow pigment distinguishes *E. hermannii* from *Escherichia coli* in the laboratory. This organism is a rare cause of invasive infections, initially thought to be a colonizer microbe with low-pathogenicity. Our report discusses a case of urosepsis caused by *E. hermannii* in a 17-month-old female patient with a complaint of fever and irritability and also a history of urinary tract infection (UTI) with nephrolithiasis. The isolated bacterium from urine and blood cultures was multidrug-resistant *E. hermannii*. The patient’s symptoms were improved after treatment with cotrimoxazole and imipenem. This case provides evidence that *E. hermannii* can be pathogenic and infect the urinary tract. Moreover, the bacterium isolated from this patient indicates that more resistant *E. hermannii* strains are forming.

**Implication for health policy/practice/research/medical education:**
*Escherichia hermannii* has the potential to be pathogenic and infect the urinary tract. Even in individuals with a healthy immune system, *E. hermannii* can be pathogenic. More resistant strains of *E. hermannii* are developing.

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**Introduction**

*Escherichia hermannii* is a facultative anaerobe gram-negative bacillus that belongs to the Enterobacteriaceae family and was initially described as an *Escherichia coli*-like biogroup (1). Based on DNA relatedness and phenotypic data, in 1982, it was identified as a distinct new species within the genus *Escherichia* (2). Human infections caused by *E. hermannii* are extremely rare, and it is thought to be a co-infectors rather than the sole cause of an infection. However, in several studies, *E. hermannii* was the sole pathogen grown from cultures, indicating the bacterium’s pathogenic potential (1-3). It is believed to be an opportunistic infection that causes disease in immunocompromised hosts (e.g., cancer, diabetes, transplant and advanced age) or patients with central catheters (4,5). According to the systematic review study by Ioannou, the mean age of patients is 41.5 years and most patients are male. The most common infections by *E. hermannii* were bacteremias, urinary tract infection (UTI), central nervous system infection and gastrointestinal infections, respectively (2). *E. hermannii* is naturally resistant to penicillin, ampicillin and carbenicillin due to its ability to produce β-lactamase (6). Although *E. hermannii*’s resistance to antibiotics appears to be minor, caution is required because more resistant strains of this species are forming. We present the case of a 17-month-old girl with no history of immunodeficiency who was diagnosed with urosepsis and had positive urine and blood cultures for multidrug-resistant *E. hermannii*. These types of cases can serve to familiarize researchers with the clinical characteristics, underlying causes, antibiotic susceptibility and treatment of this less-known bacterial species. The patient’s parents provided written informed consent for this case report to be published.

**Case Presentation**

A 17-month-old girl presented to the emergency department with three days of fever, nonproductive cough,
UTIs consisted of cephalosporins, by using biochemical tests as follows: H2S production, lysine decarboxylase, citrate, and Voges-Proskauer (VP) test. The antibiogram reported resistance to amoxiclav, amikacin, ceftazidime, ceftriaxone and sensitive to gentamycin and nitrofurantoin. Due to the improvement of the patient's symptoms and decrease in temperature (37.1°C), the prior medication therapy was continued for seven days and after ten days of hospitalization, she was discharged in good general condition. After discharge, the patient continued oral cotrimoxazole for 2 weeks.

In order to treat renal stones, a double-J stent was reinserted into the right ureter and extracorporeal shock wave lithotripsy was decided upon following a negative urine culture.

**Discussion**

Urinary tract infections are the most common infectious diseases in children. They can be confined to the bladder (cystitis), extend to the kidneys (pyelonephritis), and even enter the bloodstream (urosepsis). Childhood urosepsis is the most complicated possible variation, despite its rarity. Since *E. hermannii* identification in 1982 through 2021, four cases of UTIs caused by this species have been reported (2, 5,7-9). There was only one case of urosepsis reported by Haasdijk and van Ingen: a patient with a history of diabetes mellitus and kidney and pancreas transplantation (7). In the present case, *E. hermannii* was the sole pathogen obtained from a patient with urosepsis, with the difference that the patient was immunocompetent. A substantial percentage of *E. hermannii* infections have been attributed to immunocompromised individuals. However, in some reports, including Tong et al and Compton et al, the patient had similarly no identifiable risk factor (5,10). Our patient may have acquired the pathogen following the recent urinary tract manipulation. The organism’s potential to produce biofilms, especially in the setting of catheters, could indicate that the previous insertion of the double-J catheter might have caused bacterial colonization.

Due to the small number of patients with UTIs by *E. hermannii*, there is still no detailed information on the treatment. In the review study by Ioannou, the treatments for *E. hermannii* UTIs consisted of cephalexin, cotrimoxazole, aminoglycosides, quinolones, or co-amoxiclav. Although all reported strains of *E. hermannii* were resistant to penicillin, and some were resistant to all beta-lactams or quinolones, no multidrug-resistant strains were observed (2). Interestingly in our patient, the isolated bacterial strain was extended-spectrum-beta-lactamase-producing and multidrug-resistant. The medications were prescribed based on the antibiogram, which revealed sensitivity to cotrimoxazole and imipenem, resulting in symptom regression.
Conclusion
The isolation of E. hermannii solely from the urine culture of this patient confirms its uropathogenicity potential and emphasizes the fact that it can act as a pathogen even in people with a healthy immune system. Likewise, we must be aware that drug-resistant strains are rising, and more care is needed.

Authors' contribution
Conceptualization: PY and RS; Validation, investigation, Writing—Review and Editing: PY and MK; Resources: RS; Data curation: RS and MK; Writing—Original Draft Preparation, Visualization, Project Administration: RS. Supervision: PY.

Conflicts of interest
The authors declare no conflicts of interest.

Ethical issues
This case report was conducted in accordance with the World Medical Association Declaration of Helsinki. The patient has given us written informed consent for publication as a case report. Besides, ethical issues (including plagiarism, data fabrication and double publication) have been completely observed by the authors.

Data availability
The corresponding author will provide data on the request.

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