E-BABE- A case of Providencia rettgeri sepsis biochemically misidentified as Escherichia coli

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Abstract

Introduction

Providencia rettgeri, belonging to the family Enterobacteriaceae, is a gram negative bacterium. P. rettgeri has been isolated from multiple animal reservoirs, including flies, birds, cats, dogs, cattle, sheep, guinea pigs, and penguins, and are resident oral flora in reptiles such as pythons, vipers, and boas. Providencia species are also found commonly in soil, waters and, therefore, seems to be widely distributed in nature. P rettgeri has been isolated in crocodiles with meningitis/septicemia and in chickens with enteritis.

In humans, P. rettgeri is associated with hospital acquired infections, including catheter-related urinary tract infections, bacteremia, skin infections, diarrhea, and gastroenteritis. A case report found P. rettgeri to be a cause of ocular infections, including keratitis, conjunctivitis, and endophthalmitis.

Automated identification systems that use biochemical reactions are known to accurately identify Enterobacteriaceae species. However, the accurate identification of some Enterobacteriaceae by the automated identification systems may be problematic because of their inconsistent biochemical profiles. There are some reports of misidentification of Providentia stuartii by commercial system, but there is no report for P. rettgeri. In this study, we report the case of P. rettgeri misidentified as E. coli with VITEK 2 system from patients with sepsis due to complicated urinary tract infection.

Case Report

A 77-year-old female patient admitted with drowsy mental status. She was suffering from hypertension and diabetes for 35 years, and had a history of cystostomy due to neurogenic bladder six years ago. She was diagnosed with Parkinson's disease and bedridden for 1 year.

At admission, her body temperature, pulse, respiration rate, and blood pressure were 38.2℃, 106/min, 24/min, and 66/45mmHg, respectively. Her complete blood count showed that white blood cell count was 31,000/μL (absolute neutrophil count 30,300/μL) and platelet count was 178,000/μL. The values of C-reactive protein and procalcitonin were 21.24 mg/dL and 188.51 ng/mL, respectively. Two sets of blood cultures and one urine culture were obtained before administration of antibiotics. After 24-hour incubation of blood culture bottles, gram negative rods were detected, subculture showed non-hemolytic grayish colonies on blood agar and colorless colonies on MacConkey agar.

The VITEK 2 Gram-negative (GN) identification card (bioMerieux, Marcy l'Etoile, France) was used to identify the strain. The VITEK 2 system identified this strain as E. coli with an ambiguous confidence level (85% probability). The same result was obtained when the GN card was repeated. Additional biochemical tests showed urease positive and alkaline slant/acidic butt with gas production for triple sugar iron test. In addition, matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) was conducted by Bruker Biotyper (Bruker Daltonics, Leipzig, Germany) and we could obtain result of P. rettgeri. The sequence analysis of 16S rRNA gene confirmed P. rettgeri (Genbank: NR042413.1).

Antimicrobial susceptibility testing was performed by using VITEK 2 system. This strain was resistant to ertapenem and imipenem. Further, modified Hodge test was negative and carbapenemase inhibition test was positive for phenylboronic acid positive but negative for ethylenediaminetetraacetic acid. PCRs for five carbapenemase-encoding genes (NDM-1, KPC, VIM, IMP, GES and OXA-48) were all negative.

In spite of administration of antibiotics and supportive care, she expired due to heart failure 29 days after admission.

Discussion

P. rettgeri is in the genus Providencia, along with P. stuartii, Providencia alcalifaciens, Providencia heimbachae, and Providencia rustigianii. The first species of the genus now known as Providencia was isolated by Rettger in 1904. However, the bacterium was not submitted to detailed study until 14 years later, when it was further characterized and named Bacterium rettgeri by Hadley et al. Then, Kauffmann first proposed the genus name Providencia in 1952.

In this case, two biochemical test results of the VITEK 2 GN card (negative for adonitol fermentation and citrate utilization) varied between the current strain and previously identified P. rettgeri strains. It was demonstrated that nearly 0% of P. rettgeri is negative for adonitol fermentation, whereas 95% of E. coli is negative for the adonitol fermentation. Moreover, it was demonstrated that 4-5% of P. rettgeri is negative for citrate utilization, whereas 99% of E. coli is negative for the citrate utilization. The infrequent negative results for adonitol fermentation and citrate utilization may mislead the GN card to misidentify P. rettgeri as E. coli. This shows that we have to be aware of the limits on the automated VITEK 2 system to

identify some strains which have variable biological characteristics.

Providencia infections are uncommon and are usually nosocomial. They represent an emerging problem because of the increasing prevalence of antibiotic resistance secondary to extended-spectrum beta-lactamase (ESBL). Many Providencia isolates are resistant to numerous antibiotics. However, according to the knowledges about the antibiotic susceptibility, P. rettgeri strains are less resistant than other Providencia strains to aminoglycosides, cephalosporins and substituted penicillins. On the other hand, multi-resistant P. rettgeri strains and carbapenem-resistant P. rettgeri strain were also described. While carbapenem-resistant Enterobacteriaceae (CRE) remained uncommon in our health care system, the frequency of CRE increased. In this case, the strain was resistant to carbapenem and this is the first report of CRE of P. rettgeri in Korea. However, we failed to identify carbapenem resistance mechanism.

In summary, we report the case of P. rettgeri, which was not exactly identified by automated identification system that use biochemical reactions but confirmed by MALDI-TOF analysis and 16s rRNA gene sequence analysis.

Biography:

Soohyun Kim is pursuing his research at Seegene Research foundation, South Korea

15th International Conference on Allergy and Clinical Immunology, August 13-14, 2020 (Webinar)

Abstract Citation:

Soohyun Kim, E-BABE- A case of Providencia rettgeri sepsis biochemically misidentified as Escherichia coli, Allergy 2020, 15Th International Conference on Allergy and Clinical Immunology, August 13- 14, 2020 (Webinar) (https://allergy.immunologyconferences.com/)