

Delftia acidovorans Isolated from the Drainage in an Immunocompetent Patient with Empyema

¹Department of Internal Medicine, Seoul National University Hospital, Seoul, Departments of ²Internal Medicine, ³Laboratory Medicine, ⁴Microbiology, School of Medicine, Jeju National University, Jeju, Korea

Jaeyoung Chun, M.D.¹, Jaechun Lee, M.D.², Jaeseok Bae, M.D.², Miyeon Kim, M.D.², Jae-Geun Lee, M.D.², Sang-Yop Shin, M.D.², Young Ree Kim, M.D.³, Keun-Hwa Lee, Ph.D.⁴

Delftia acidovorans is a gram-negative motile rod found ubiquitously in soil and in water. Confirmed isolation from clinical infections is rare, and has been documented mostly in immunocompromised patients or those with indwelling catheters. A 53-year-old man was referred for the evaluation of a huge mass-like lesion found incidentally by chest X-ray. The lesion occupied more than half of the right lung and was diagnosed as a large loculated pleural effusion by CT scan. Bloody pus was drained through a percutaneous catheter, and *D. acidovorans*, identified by the Vitek GN card and confirmed by amplification of 16S ribosomal RNA and sequencing analysis, was isolated repeatedly from the drained pus. The patient was treated with imipenem/cilastatin to which the organism was sensitive. This is a rare report of chronic empyema associated with *D. acidovorans* in the respiratory system of an immunocompetent patient.

Key Words: *Delftia acidovorans*, Pleural empyema, Immunocompetence

Introduction

Delftia acidovorans, formerly called as *Comamonas acidovorans*, is a gram-negative aerobic rod found ubiquitously in soil and water¹, and has seldom been implicated in human infections. It has occasionally been reported in cases of catheter-related bacteremia^{2,3}, peritonitis in patients on continuous ambulatory peritoneal dialysis⁴, ocular infection⁵, endocarditis⁶, and infections in patients with AIDS⁷. It was also identified from some isolates referred to as "*Burkholderia cepacia*" from cystic fibrosis clinics and research⁸.

We report a rare isolation of *D. acidovorans* from an immunocompetent patient with chronic empyema.

Case Report

A 53-year-old man was referred for evaluation of a mass-like lesion in his right lung, detected by a chest X-ray. He was a 50 pack-year, current smoker and had no symptoms except for mild intermittent chest discomfort. He had been injured while working in the construction industry about 25 years earlier and was tapped repeatedly at the incident site for a pleural effusion. Thereafter, he felt healthy and reported no medical problems.

On admission, the patient's body temperature was 36.7°C and chest expansion on breathing was asymmetric with decreased breath sounds on the right lung. In the initial laboratory tests, the leukocyte count (4,900 cells/mm³), erythrocyte sedimentation rate (9 mm/h), and C-reactive protein (0.08 mg/dL) were within normal limits. On chest X-ray, there was a huge mass-like lesion in the right lower lung field (Figure 1A). On a CT scan of the chest, there was a 15×19×26 cm sized, multiloculated lesion with low-attenuated components and thickening of the calcified wall, indicating chronic

Address for correspondence: Jaechun Lee, M.D.

Department of Internal Medicine, School of Medicine, Jeju National University, 66, Jejudaeahak-ro, Jeju 690-756, Korea
Phone: 82-64-754-3915, Fax: 82-505-244-5588
E-mail: doc4u@hanmail.net

Received: Aug. 5, 2009

Accepted: Sep. 1, 2009

empyema (Figure 1B).

Chocolate-like bloody pus was drained from the lesion by diagnostic thoracentesis. It showed a protein of 10.2 g/dL, LDH of 3,287 U/L, hemoglobin of 2.7 g/dL and the leukocyte count of 188,500 cells/mm³. Gram stain and culture using agar-based culture media were negative. AFB stain and culture, and tuberculosis PCR of the pus were also negative, and the pus was drained by two percutaneous catheters. The catheter in the anteromedial septated cavity was removed on the eighth day of hospitalization but the other in the inferolateral side was left in place because 100~200 mL of pus daily continued to drain.

On the fifteenth day, the patient presented fever. The leukocyte count and C-reactive protein were elevated to 11,500 cells/mm³ and 3.12 mg/dL, respectively. After cultures of both pus drained through the catheters and blood using blood culture bottles (BACTEC™, Becton Dickinson [BD], Sparks, MD, USA), intravenous moxi-

floxacin was commenced for suspected hospital-acquired pneumonia, but clinical findings worsened with persistent fever for three days. The repeated CT scan showed that the empyematous cavity in the anteromedial side remained (Figure 1C). Another catheter was inserted into the enlarged loculated empyema, and the antibiotics was changed to imipenem/cilastin 500 mg every 6 h intravenously.

D. acidovorans was isolated from the pus after the incubation period of five days, while blood culture yielded no growth. The organism was identified by the Vitek GN card (BioMérieux Vitek Inc., Hazelwood, MO, USA). The antibiotic susceptibility was performed by the Vitek AST N055 card, an automated susceptibility testing system, and determined by Clinical and Laboratory Standards Institute (CLSI) guidelines. The antibiogram showed that the organism was susceptible to cefotaxime, ceftazidime, cefepime, piperacillin-tazobactam, trimethoprim-sulfamethoxazole and imipenem, but resis-

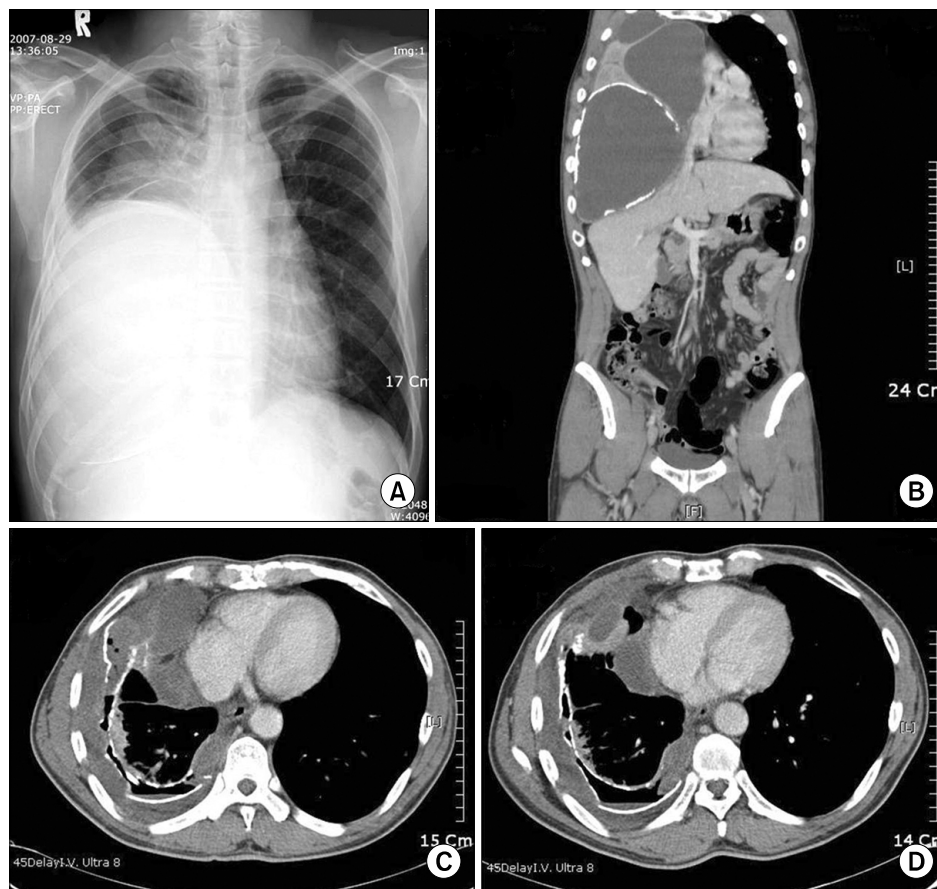


Figure 1. Radiologic examinations. (A) At admission, a huge round lesion was observed in the right lower lung field at PA view of chest X-ray. (B) The lesion was identified by chest CT scan as a huge septated empyema with thickening of the calcified wall and passive atelectasis of the right middle and lower lobes. (C) On the 18th day of hospitalization, a CT scan showed that the empyematous cavity in the anteromedial side of the right lower lung field remained. (D) A chest CT scan was repeated three weeks later, showing that the size of the cavity was decreased after insertion of percutaneous catheter in the cavity, guided by fluoroscope.

tant to amikacin, gentamycin and tobramycin, with intermediate resistance to ciprofloxacin.

As a reference testing method, the presence of *D.*

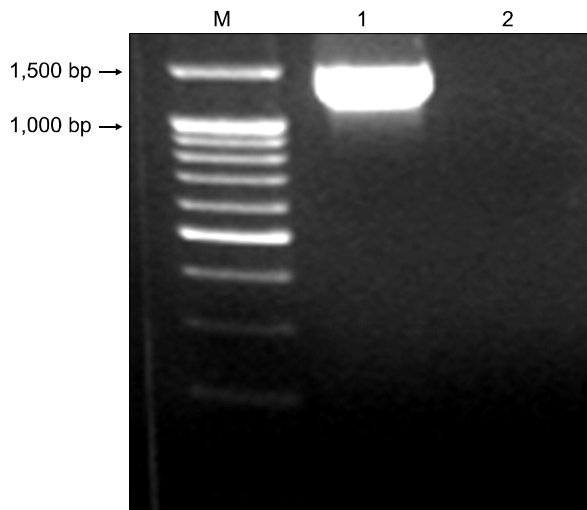


Figure 2. Amplification of 16S ribosomal DNA (1,500 bp) from *Delftia acidovorans* (Lane M: 100 bp ladder, Lane 1: *D. acidovorans*, Lane 2: negative).

acidovorans was confirmed by amplification and sequencing of 16S ribosomal RNA (rRNA). PCR was performed using universal primers (27F: 5'-AGAGTTTGATCCTGGCTCAG-3', 1492R: 5'-AAGGAGGTGATCCAGCCGCA-3') designed to anneal a conserved position in the 30 and 50 regions of bacterial 16S rRNA genes⁹. The PCR products were electrophoresed and purified with a QIAEX II gel extraction kit (QIAGEN, Hilden, Germany) (Figure 2), and sequenced with an Applied Biosystems automated sequencer (model 377) and BigDye Terminator cycle sequencing kits (Perkin-Elmer Applied Biosystems, Warrington, UK). The gene sequences were analyzed by Basic Local Alignment Search Tool (Figure 3).

D. acidovorans was repeatedly isolated from the drainage via the catheters by three additional tests using the blood culture bottles after the first isolation. No other organisms were identified from the drained pus and blood samples. Clinical symptoms were improved after administration of appropriate antibiotics and effective drainage. The percutaneous catheters were removed af-

Delftia sp. P-103 partial 16S rRNA gene, strain P-103

Length=1,431, Score = 399 bits (216), Expect = 2e-108, Identities = 217/218 (99%), Gaps = 0/218 (0%), Strand=Plus/Minus

Query 1

GGCATGCTGATCCGCGATTACTAGCGATTCCGACTTCACGCAGTCGAGTTGCAGACTGC
G 60

Sbjct 1331

GGCATGCTGATCCGCGATTACTAGCGATTCCGACTTCACGCAGTCGAGTTGCAGACTGC
G 1272

Query 61 ATCCGGACTACGACTGGTTTTATGGGATTAGCTCCCCCTCGCGGGTTGGCAA
CCCTCTGT 120

Sbjct 1271 ATCCGGACTACGACTGGTTTTATGGGATTAGCTCCCCCTCGCGGGTTGGCAA
CCCTCTGT 1212

Query 121 ACCAGCCATTGTATGACGTGTGTAGCCCCACCTATAAGGGCCATGAGGACTT
GACGTCAT 180

Sbjct 1211 ACCAGCCATTGTATGACGTGTGTAGCCCCACCTATAAGGGCCATGAGGACTT
GACGTCAT 1152

Query 181 CCCCACCTTCCTCCGGTTTGTACCCGGCAGTCTCATTA 218

Sbjct 1151 CCCCACCTTCCTCCGGTTTGTACCCGGCAGTCTCATTA 1114

Figure 3. The results in the sequencing analysis of 16S ribosomal RNA gene using Basic Local Alignment Search Tool (BLAST).

ter the loculated empyema had almost resolved, at which time imipenem/cilastin had been administered for four weeks. The patient was discharged on the 43rd day of hospitalization.

Discussion

D. acidovorans is still considered as an unusual pathogen in human respiratory system. This is the rare report of its isolation from the pleural cavity in active infection.

It is important to consider whether the isolated bacterium is a true pathogen of the active infection or a contaminant of the indwelling catheters. The observations that the microorganism was isolated from the drainage when the patient was suffering from active infection, and it was the sole organism repeatedly isolated led us to believe that it was a pathogen.

D. acidovorans was not isolated from the initial drainage. It suggests that the organism was the etiologic agent of secondary infection related with a percutaneous catheter rather than that of chronic empyema. However, the bloody exudate drained by initial thoracentesis was cultured using agar-based culture media. Thereafter, the organism was repeatedly isolated by blood culture bottles. The method using the blood culture bottles produced a significant and consistent increase in the isolation rate for body fluid cultures compared to conventional method¹⁰. Therefore, we cannot exclude that *D. acidovorans* may be the causative agent for the empyema. It has been reported that *D. acidovorans* infection is associated with exposure to contaminated venous catheters¹¹. We presume that when he had a chest injury and been tapped repeatedly, the organism might be inoculated. In this case, the chronic asymptomatic empyema could progress slowly because *D. acidovorans* has a low pathogenicity to immunocompetent patients. However, the evidence about the true pathogen of empyema is limited due to no isolation of initial culture.

Because *D. acidovorans* is often resistant to a class of drugs commonly used to treat gram-negative infec-

tions such as aminoglycosides, timely identification of this organism is necessary to determine the appropriate antibiotics¹¹. In this case, imipenem/cilastatin was maintained for four weeks as a routine duration of treatment for chronic empyema, and the patient recovered from active infection after changing to susceptible antibiotics combined with effective drainage.

This is a rare report on an immunocompetent patient with chronic empyema associated with *D. acidovorans* treated with appropriate antibiotics and therapeutic drainage.

References

1. Bergogne-Bérézin E. Pseudomonas and miscellaneous gram-negative bacilli. In: Cohen J, Powderly W, editors. Infectious disease. 2nd ed. St Louis: Mosby; 2004. p. 2203-17.
2. Castagnola E, Conte M, Venzano P, Garaventa A, Viscoli C, Barretta MA, et al. Broviac catheter-related bacteraemias due to unusual pathogens in children with cancer: case reports with literature review. J Infect 1997;34:215-8.
3. Ender PT, Dooley DP, Moore RH. Vascular catheter-related *Comamonas acidovorans* bacteremia managed with preservation of the catheter. Pediatr Infect Dis J 1996;15:918-20.
4. López-Menchero R, Sigüenza F, Caridad A, Alonso JC, Ferreruela RM. Peritonitis due to *Comamonas acidovorans* in a CAPD patient. Perit Dial Int 1998;18:445-6.
5. Stonecipher KG, Jensen HG, Kastl PR, Faulkner A, Rowsey JJ. Ocular infections associated with *Comamonas acidovorans*. Am J Ophthalmol 1991;112:46-9.
6. Horowitz H, Gilroy S, Feinstein S, Gilardi G. Endocarditis associated with *Comamonas acidovorans*. J Clin Microbiol 1990;28:143-5.
7. Franzetti F, Cemuschi M, Esposito R, Moroni M. Pseudomonas infections in patients with AIDS and AIDS-related complex. J Intern Med 1992;231:437-43.
8. Henry D, Campbell M, LiPuma J, Speert D. Identification of *Burkholderia cepacia* isolates from patients with cystic fibrosis and use of a simple new selective medium. J Clin Microbiol 1997;35:614-9.
9. Massol-Deya A, Odelson D, Hickey R, Tiedje J. Bacterial community fingerprinting of amplified 16S and 16-23S ribosomal DNA gene sequences and restriction endonuclease analysis. In: Akkermans ADL, Van Elsas

- JD, De Bruijn FJ, editors. Molecular microbial ecology manual. Boston: Kluwer Academic; 1995. p.1-8.
10. Daur AV, Klimak F Jr, Cogo LL, Botao GD, Monteiro CL, Dalla Costa LM. Enrichment methodology to increase the positivity of cultures from body fluids. Braz J Infect Dis 2006;10:372-3.
 11. Perla R, Knutson E. *Delftia acidovorans* bacteremia in an intravenous drug abuser. Am J Infect Dis 2005;1:73-4.
-