

Laboratory and Epidemiology Communications

An Unusual Outbreak of Infusion-Related Bacteremia in a Gastrointestinal Disease Ward

Keizo Torii, Yasunobu Noda¹, Yutaka Miyazaki² and Michio Ohta*

Department of Bacteriology, Graduate School of Medicine, University of Nagoya, Nagoya 466-8550,

¹Division of Pulmonology, Department of Internal Medicine, Toyohashi Municipal Hospital, Toyohashi 441-8570 and

²Aichi Prefectural Institute of Public Health, Nagoya 462-8576

Communicated by Yutaka Miyazaki

(Accepted August 29, 2003)

Pseudomonas putida, *P. aeruginosa*, and *Serratia marcescens* are Gram-negative bacteria frequently found in hospital environments. *P. aeruginosa* and *S. marcescens* have been recognized as important pathogens of nosocomial infection. They cause serious infections, including meningitis, bacteremia, and pneumonia. Many outbreaks due to these organisms have been reported (1,2).

On June 18 and 19, 2000, five patients in the ward of a city hospital developed high fever. On June 17, they had all been administered anticoagulants or diuretics via the central or peripheral vein. On June 20, suspecting iatrogenic infection, the infection control team of the hospital started an investigation including environmental surveillance and interviews with the ward staff members.

Blood was drawn from the patients for microbiological examination before antibiotic therapy was initiated. From the patients' blood, *P. putida*, *P. aeruginosa*, and *S. marcescens* were isolated (Table 1). Bacterial cultures were also obtained from various sites of the ward, including a basket for placing syringes, the ward's sink, sponges, disinfectant solutions, room surfaces, and staff members' hands. The culture specimens were sent to Aichi Prefectural Institute of Public Health for pulsed-field gel electrophoresis (PFGE). PFGE was performed as

described by Nakano and colleagues (3).

Upon identification of pathogens, the patients were immediately moved to an intensive care unit. In the ward, several control measures were implemented. Glass syringes used for preparing intravenous injection fluids (IV fluids) were replaced by disposable plastic syringes. Infected and non-infected areas were strictly separated. Education of the staff in the ward was strengthened, including hand washing before and after each patient contact and cleaning of environmental surfaces with disinfectants.

The team's investigation indicated that the repeated use of glass syringes was the cause of this outbreak. In this hospital, as a convenience, IV fluids were prepared by using glass syringes. Usually, used syringes are washed in the ward's storeroom before returning them to the cleaning unit on every Saturday. In the present outbreak, used syringes were washed on Friday, and returned to the basket. To make matters worse, the basket was returned to the original position without being properly labeled "used". The IV fluids were prepared using these syringes. This could have been a cause of the error.

S. marcescens was isolated from four patients, *P. putida* from four patients, and *P. aeruginosa* from two patients (Table 1). All these bacterial species were isolated from the sink.

The PFGE patterns of the *SpeI*-digests of DNA from the six *S. marcescens* isolates, four from the patients, one from the sink, and one from a basket were identical except for one (Fig. 1). The PFGE patterns of *P. putida* and *P. aeruginosa* were almost identical among the patients' isolates, but were

*Corresponding author: Mailing address: Department of Bacteriology, Graduate School of Medicine, University of Nagoya, Tsurumai-cho 65, Showa-ku, Nagoya 466-8550, Japan. Tel: +81-52-744-2106, Fax: +81-52-744-2107, E-mail: mohta@med.nagoya-u.ac.jp

Table 1. Results of blood culture from patients with sepsis

| Patient no. | Isolates | Outcome |
|-------------|--|----------|
| 1 | <i>S. marcescens</i> , <i>P. putida</i> | survival |
| 2 | <i>S. marcescens</i> , <i>P. putida</i> , <i>P. aeruginosa</i> | survival |
| 3 | <i>S. marcescens</i> , <i>P. putida</i> , <i>P. aeruginosa</i> | survival |
| 4 | <i>P. putida</i> | dead |
| 5 | <i>S. marcescens</i> | survival |

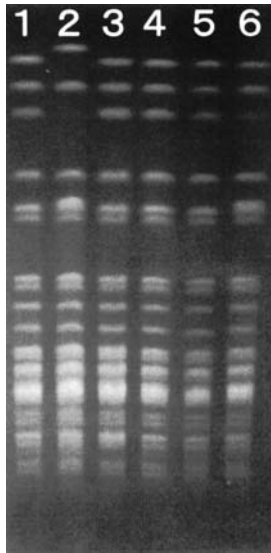


Fig. 1. PFGE profiles of *S. marcescens* isolated from patients (lanes 1 to 4), sink (lane 5), and basket (lane 6). Genomic DNA was digested with *SpeI* restriction enzyme, and the fragments were fractionated on a 1% agarose gel. Only one patient isolate (lane 2) showed a different pattern.

totally different between the patients' and environment isolates (data not shown). Therefore, in the present case, the major cause of the outbreak was probably *S. marcescens* in the environment, which was introduced into IV fluids after repeated use of syringes placed in a contaminated basket. As the PFGE patterns of *P. putida* and *P. aeruginosa* were respectively identical among the patient isolates, these two bacteria species probably expanded as clones and came to be involved in the outbreak. Though *P. putida* is generally considered less virulent than *P. aeruginosa*, there has been a report that clearly showed an outbreak caused by *P. putida* (4).

While catheter-related bacteremia is generally caused by Gram-positive bacilli, such as *Staphylococcus aureus*,

coagulase-negative *Staphylococcus* and *Enterococcus*, infusate-related bacteremia is often caused by Gram-negative bacteria, such as *Klebsiella*, *Pseudomonas*, and *Serratia*, as in the present case. In most outbreaks, the source of responsible pathogens was difficult to be identified by environmental surveillance, even if the bacteria were isolated from patients (5) or from the environment (6). The present investigation fortunately was able to establish the link between the outbreak and the environmental pathogens. As these pathogens cannot be eradicated from the hospital environment, constant infection control measures is needed in order to prevent nosocomial infections.

REFERENCES

- Gibb, A. P., Tribuddharat, C., Moore, R. A., Louie, T. J., Krulicki, W., Livermore, D. M., Palepou, M. F. and Woodford, N. (2002): Nosocomial outbreak of carbapenem-resistant *Pseudomonas aeruginosa* with a new bla(IMP) allele, bla(IMP-7). *Antimicrob. Agents Chemother.*, 46, 255-258.
- Archibald, L. K., Corl, A., Shah, B., Schulte, M., Arduino, M. J., Aguero, S., Fisher, D. J., Stechenberg, B. W., Banerjee, S. N. and Jarvis, W. R. (1997): *Serratia marcescens* outbreak associated with extrinsic contamination of 1% chlorxylenol soap. *Infect. Control Hosp. Epidemiol.*, 18, 704-709.
- Nakano, M., Miyazawa, H., Kawano, Y., Kawagishi, M., Torii, K., Hasegawa, T., Inuma, Y. and Ohta, M. (2002): An outbreak of neonatal toxic shock syndrome-like exanthematous disease (NTED) caused by methicillin-resistant *Staphylococcus aureus* (MRSA) in a neonatal intensive care unit. *Microbiol. Immunol.*, 46, 277-284.
- Weng, L. C., Liaw, G. J., Wang, N. Y., Wang, S. F., Lee, C. M., Huang, F. Y., Yang, D. I. and Chiang, C. S. (1999): Investigation of an outbreak of *Pseudomonas putida* using antimicrobial susceptibility patterns, pulsed-field gel electrophoresis of genomic DNA and restriction fragment length polymorphism of PCR-amplified rRNA operons. *J. Microbiol. Immunol. Infect.*, 32, 187-193.
- Prasad, G. A., Jones, P. G., Michaels, J., Garland, J. S. and Shivpuri, C. R. (2001): Outbreak of *Serratia marcescens* infection in a neonatal intensive care unit. *Infect. Control Hosp. Epidemiol.*, 22, 303-305.
- Jang, T. N., Fung, C. P., Yang, T. L., Shen, S. H., Huang, C. S. and Lee, S. H. (2001): Use of pulsed-field gel electrophoresis to investigate an outbreak of *Serratia marcescens* infection in a neonatal intensive care unit. *J. Hosp. Infect.*, 48, 13-19.