

CONCISE COMMUNICATION

Outbreak of Bloodstream Infections Associated with Multiuse Dialyzers Containing O-Rings

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This report details an outbreak investigation conducted by the Los Angeles County Department of Public Health of 3 cases of bacterial infection among patients receiving hemodialysis who were treated at the same dialysis center in 2011. Improper disinfection of reusable dialyzers was hypothesized as the source of transmission.

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Hemodialysis is a procedure that uses an artificial kidney, or dialyzer, to remove waste from blood. It is often used to treat end-stage renal disease (ESRD). Reuse of dialyzers is common and thought to result in economic and medical waste savings. Dialyzer reuse reduces the risk of first-use syndrome, a reaction to the disinfectant in new dialyzers. As of 2005, 40% of dialysis centers use multiuse dialyzers.¹ Use of multiuse dialyzers has been associated with an increase in hospitalization rates when compared with use of single-use dialyzers.² We describe an outbreak investigation of *Stenotrophomonas maltophilia* and *Candida parapsilosis* infections among patients with ESRD who underwent hemodialysis in Los Angeles County, California.

METHODS

In 2011, the Los Angeles County Department of Public Health was notified of 3 patients with *S. maltophilia* infections among patients who received hemodialysis services from the same free-standing dialysis center. One of the patients with *S. maltophilia* infection also had *C. parapsilosis* in the blood. A comprehensive review of case medical and microbiologic records was conducted, and environmental cultures from the treatment area and the dialyzer reprocessing room were obtained. Pulsed-field gel electrophoresis (PFGE) and microsatellite DNA fingerprinting were conducted for *S. maltophilia* and *C. parapsilosis*, respectively, by the Centers for Disease Control and Prevention (CDC) on blood culture isolates from each of the 3 case patients, dialyzer isolates for 2 of the cases that were collected by the facility laboratory from primed and reprocessed dialyzers, and the environmental isolates.³⁻⁵ The antibiotic susceptibility pattern was reviewed for all blood culture isolates from the case patients.

The investigation team reviewed dialyzer reprocessing history, facility reprocessing and infection control policies and procedures, patient hospitalization and adverse event logs,

dialysis posttreatment flow sheets for the 3 months before positive blood culture results were obtained, and dialysis machine logs and staffing records.

RESULTS

A case patient was defined as a patient who underwent hemodialysis from May 1 to July 31, 2011, who was *S. maltophilia* blood culture positive with isolates indistinguishable by PFGE. Three case patients were identified. All case patients were male, had received a diagnosis of ESRD, had an arteriovenous fistula for dialysis access, and received hemodialysis services for 6 years or more. All case patients were determined to have been assigned to the same treatment area during the outbreak period. Evaluation of patient dialysis schedules showed that case patients 2 and 3 received dialysis treatment on the same daily schedule, in the same treatment area, but not at the same time or station. Case patient 1 was consistently scheduled on opposing days but in the same treatment area as case patients 2 and 3. Additionally, all case patients used the same type of multiuse dialyzer with an O-ring header, as shown in Figure 1; the case patients were the only patients who used this dialyzer in the facility. Ages ranged from 31 to 65 years with a mean of 45 years. Of note, case patient 2 received a diagnosis of *S. maltophilia* bacteremia in 2009 and was considered to have chronic colonization.

Blood cultures from case patient 2 were also positive for *C. parapsilosis*. The dialyzers for case patients 2 and 3 were culture positive for both *S. maltophilia* and *C. parapsilosis*. The facility indicated that the specimens were obtained from under the O-ring. The dialyzer used for case patient 1 was not available for testing. Genotypic analysis indicated that the blood isolates from cases 1, 2, and 3 and dialyzer isolates from cases 2 and 3 had indistinguishable PFGE patterns for *S. maltophilia* with zero band differences, indicating a common source.

Comparison of the *C. parapsilosis* profiles obtained by microsatellite analysis showed that the positive blood isolate from case patient 2 and the isolate obtained from the dialyzer used by case patient 2 as well as an environmental isolate collected from the reprocessing room reverse ultrafiltration faucet were indistinguishable at 5 loci. These results further suggested that a common source was likely. The dialyzer *C. parapsilosis* isolate for case 3 did not match the dialyzer isolate from case 2 or the environmental isolate.

The facility is a free-standing dialysis center that sees 109 patients monthly. Review of hospitalization and adverse event logs did not find additional cases. All dialyzer reuse was in compliance with facility policy and federal dialysis standards, which included a policy requiring header and O-ring removal and cleaning before being placed on reprocessing equipment.⁶ The center undertook several control measures, including

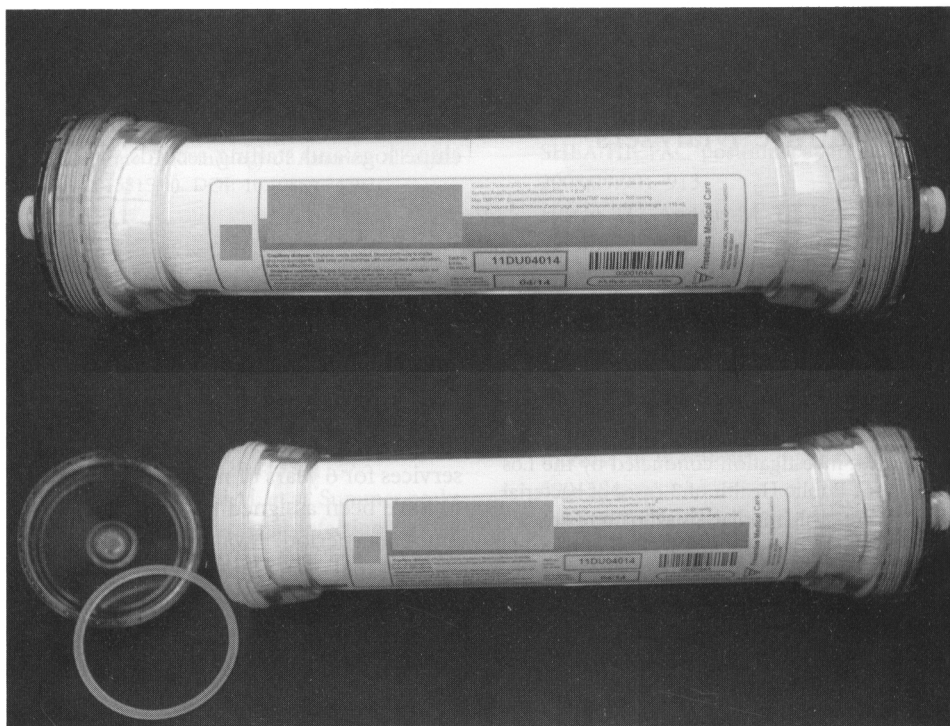


FIGURE 1. Photograph of dialyzers, intact (*top*) and with header and O-ring removed (*bottom*).

suspension of dialyzer reuse, enhanced staff education, daily management meetings to address facility policies, and posting a letter of notification to patients.

DISCUSSION

This report describes an outbreak investigation in a dialysis center involving bacteremic and fungemic patients infected with *S. maltophilia* and *C. parapsilosis*. Analysis of DNA fingerprinting for *S. maltophilia* from the 3 case patients and dialyzer isolates from cases 2 and 3 indicate that transmission from a common source was likely. Additionally, blood and dialyzer *C. parapsilosis* isolates from case 2 were genetically related to the environmental isolate from the reprocessing room faucet.

We hypothesize that transmission of *S. maltophilia* and *C. parapsilosis* occurred as a result of cross contamination and improper cleaning and disinfection of dialyzer headers with O-rings in the reprocessing room. Multiuse dialyzers and improper reprocessing have been implicated in a number of bacteremia clusters in dialysis centers.⁷ Of the 16 outbreaks of bacteremia or pyrogenic reactions investigated by the CDC among patients receiving hemodialysis between 1980 and 1999, 8 were related to dialyzer reuse, and half of those resulted from errors in dialyzer disinfection.⁸ In California, a study of dialysis centers found a strong association between *S. maltophilia* bloodstream infections and reprocessing dialyzers.⁹ O-ring contamination of the reprocessed dialyzer may

occur when disinfectant cannot reach portions of the O-ring that are compressed against the header or fiber bundle of the dialyzer. Therefore, the reprocessing technician must completely remove the O-ring during disinfection. Furthermore, past outbreaks and mock dialyzer trials have demonstrated that, during dialysis, organisms found under the O-rings are able to enter the bloodstream.⁴ Both *C. parapsilosis* and *S. maltophilia* are known for the ability to adhere to plastic materials, such as the walls of the dialyzer.¹⁰ Careful consideration is needed in the decision to reprocess dialyzers with O-rings, even with necessary disinfection procedures in place. Because of the added step of removing the O-ring during disinfection as well as the increased surface area, use of multiuse dialyzers with O-rings is strongly discouraged.

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