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There are numerous publications pointing to high rates of BSI in haemodialysis patients [6–8]. The majority of them show a predominant role of S. aureus to the risk of bacteraemia [7]. Among the most important determinants for BSI is the type of dialysis access—whether a catheter or a fistula is in use [6, 8]. Central venous catheters (CVCs) associate with an 8-fold increase in the risk for bacteraemia [6]. This may be an important factor contributing to the enhanced mortality risk that the DOPPS study found for patients being treated by catheter rather than fistula [9]. A recent large analysis confirmed impressively that starting dialysis treatment with a catheter rather than a fistula strongly predicts the risk of bacteraemia [10]. In addition, starting with a catheter also predicts continued use of a catheter as dialysis access at 1 year. More than 13% of all patients had at least one positive blood culture within 1 year of dialysis initiation, the risk being 3-fold higher in catheter compared to fistula patients [10]. Interestingly, the probability of catheter-related bacteraemia seems to be age-related [11]. Surprisingly, the elderly had lower rates of BSI than the younger patients, which might be related to less physical activity in the former.

Still, the problem of BSI may be largely underestimated in every day clinical work. Dialysis doctors see single cases and since BSI remains an infrequent incident they usually do not have a feeling for the incidence in their dialysis programme. Nevertheless, it is alarming that cardiologists already identify haemodialysis as an important predisposing condition for the development of bacterial endocarditis [12]. Again, S. aureus is
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ted by the use of antibacterial catheter lock solutions (meta-analysis in [19]). Thus, part of the problem is obviously preventable.

Blood stream infections due to dialysis access contamination can be addressed effectively by hygienic precautions [15–17]. Among them, hand hygiene is the most important single measure. Optimal work flow organization and regular (re-)training can improve compliance of staff with hand hygiene [18] and thus reduce bacteraemia rates. In addition, rather simple interventions such as disinfection of a catheter exit with chlorhexidine and catheter hub disinfection by 70% alcohol can reduce blood stream infection and the need for antibiotic therapy [17]. These measures already achieve significant benefit particularly for patients with central venous catheters. They are complemented by the use of antibacterial catheter lock solutions (meta-analysis in [19]). Thus, part of the problem is obviously preventable.

In this issue, Murray and coworkers [20] present extensive data on Gram-negative bacteraemia in dialysis patients. They used data covering more than 500 000 haemodialysis days and comprehensive microbiological data on blood stream infection occurring during nearly 3 years of observation. Up until now, Gram-negative bacteraemia has been studied less thoroughly than Gram-positive. It is important to pay attention to this problem for several reasons, as beautifully illustrated by the Murray study. First, Gram-negative BSI is not actually rare. Although earlier data from the group [21] showed that Gram-positive infection is still in the lead, the rate of 0.175 events per 1000 patient-days miss relevant numbers of BSI cases. If this occurs in the ICU, how many BSI cases are then missed in out-patient haemodialysis? Of course, these patients will mostly be treated; however, sometimes with delay, potentially with suboptimal antibiotic regime, and they will not be recognized and entered into statistics on BSI in dialysis.

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Gram-negative BSI deserves particular attention since in recent years the rate of antibiotic resistance has increased. While rates of methicillin resistant S. aureus remained stable or start to decrease in many countries at least in Europe [22], multiresistant Gram negatives are on the rise. Although the study of Murray does not yet provide evidence for a relevant resistance problem (only 6/99 bacterial isolates were carriers of extended spectrum beta lactamases and no carbapenem resistance was reported) multiresistant gram negatives already emerge in dialysis patients as well [23]. Recent studies [24] showed high colonization rates of dialysis patients with multiresistant Gram-negative pathogens. Risk factors for such colonization are the widespread use of antibiotics and contact with healthcare institutions and/or hospitalization. Thus, haemodialysis patients are a typical risk group for the acquisition of such pathogens. The increasing prevalence will probably lead to more resistant BSI and influence the choice of empiric antibacterial therapy in the future.

In summary, Gram-negative BSI should receive more attention in dialysis patients. First, the diagnosis should be formally made whenever possible. Therefore, deliberate use of blood cultures in patients with rather unspecific symptoms is advocated. They will provide microbiological information to guide anti-
bacterial therapy. This is the second consequence of alertness to Gram-negative bacteraemia: use antimicrobial drugs as target-oriented as possible. Blood stream infection—even with CVC in use—is not always caused by S. aureus. Empiric therapy should start with Gram-positive and Gram-negative coverage and then be narrowed down as soon as the identification of the relevant pathogen and its antimicrobial resistance profile becomes available. And third, further alertness should be promoted by BSI statistics to be maintained by individual dialysis facilities or—preferably—covering multiple single dialysis centres in regional collaboration.

CONFLICT OF INTEREST STATEMENT

The author does not have conflicts of interest regarding this paper. The results presented in this paper have not been published previously in whole or part, except in abstract format.


REFERENCES


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