LETTERS TO THE EDITOR

Enterococcus Species and the Central Line–Associated Bloodstream Infection Surveillance Definition: Evaluating the Importance of Blood Culture Contamination

To the Editor—We read with interest the article by Steinberg et al.[1] These authors analyzed 310 episodes of National Healthcare Safety Network (NHSN)–defined central line–associated bloodstream infection (CLABSI) at 2 hospitals and compared the frequencies of recovery of different bacterial species in patients with and without neutropenia. *Escherichia coli*, *Streptococcus*, and *Enterococcus* were more common among neutropenic patients. Thus, the authors concluded that, for the purposes of CLABSI surveillance, such organisms should be attributed to gastrointestinal translocation rather than CLABSI when recovered from neutropenic patients with a central vascular line in place.

Similar findings were reported in another study of neutropenic patients by investigators who used differential time to positivity as a gold standard.[2] However, recovery of *Enterococcus* species was relatively uncommon in this study. One possible explanation for this singular difference was that, unlike in the study by Steinberg and colleagues, 2 positive blood cultures with *Enterococcus* species collected within a 2-hour period were required to define the presence of BSI. Another study that included patients with 1,355 blood cultures positive for enterococci showed that the probability of recovering *Enterococcus* from a second set of blood cultures was reduced by approximately 50% when the initial enterococcal isolate was recovered in combination with typical contaminants, such as coagulase-negative staphylococci.[3]

Notably, this situation was relatively common in the preceding study; 17% of all blood cultures containing *Enterococcus* species also had common contaminants in one set and no evidence of growth in a second set of cultures. These findings led us and other investigators to suggest that a small but important proportion of patients with blood cultures containing enterococci in 1 of 2 sets of cultures are not actually bacteremic. Thus, we agree with the findings of other investigators that inclusion of blood cultures with enterococci and typical skin organisms is likely to diminish the specificity of any standard CLABSI surveillance definition regardless of whether patients are neutropenic.[4,5]

In light of these considerations, we are writing to ask Steinberg and colleagues several questions. First, how many of the 52 patients in their study who were deemed to have enterococcal bacteremia had more than 1 positive blood culture containing the same enterococcal species? Second, how many of their 52 patients with blood cultures positive for enterococci also contained 1 or more typical skin contaminants, such as coagulase-negative staphylococci? Finally, what proportion of cultures from these 52 patients had blood cultures collected from existing central lines with or without concurrent collection of blood from a peripheral vein? These data are important because the probability of contamination is higher when cultures are obtained from preexisting central vascular catheters.[6]

Answers to these questions may help other readers of the journal analyze the data presented by Steinberg and colleagues and assess their conclusion that the presence of *Enterococcus* species in blood cultures from neutropenic patients may be due to gastrointestinal translocation. We continue to believe that *Enterococcus* species are often contaminants when isolated from a single set of blood cultures, and thus these organisms may be a less common cause of central line infection than is currently assumed. If this is indeed the case, then a more general and more widely applicable modification of the NHSN CLABSI definition may be needed.

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REFERENCES

1. Steinberg JP, Robichaux C, Tejedor SC, Reyes MD, Jacob JT. Distribution of pathogens in central line–associated bloodstream infections among patients with and without neutropenia following chemotherapy: evidence for a proposed modification to the current surveillance definition. *Infect Control Hosp Epidemiol* 2013;34:171–175.
2. Freeman JT, Elinder-Camburn A, McClymont C, et al. Central line–associated bloodstream infections in adult hematology patients with febrile neutropenia: an evaluation of surveillance definitions using differential time to blood culture positivity. *Infect Control Hosp Epidemiol* 2013;34:89–92.
3. Freeman JT, Chen LF, Sexton DJ, Anderson DJ. Blood culture

contamination with enterococci and skin organisms: implications for surveillance definitions of primary bloodstream infections. *Am J Infect Control* 2011;39:436–438.
4. Weinstein MP, Towns ML, Quartey SM, et al. The clinical significance of positive blood cultures in the 1990s: a prospective comprehensive evaluation of the microbiology, epidemiology and outcome of bacteremia and fungemia in adults. *Clin Infect Dis* 1997;24:584–602.
5. Weinstein MP, Reller LB, Murphy JR, Lichtenstein KA. The clinical significance of positive blood cultures: a comprehensive analysis of 500 episodes of bacteremia and fungemia in adults. I. Laboratory and epidemiologic observations. *Rev Infect Dis* 1983; 5:35–53.
6. Everts RJ, Vinson EN, Adholla PO, Reller LB. Contamination of catheter-drawn blood cultures. *J Clin Microbiol* 2001;39:3393–3394.

Reply to Freeman et al

To the Editor—We thank Freeman et al[1] for their comments and share their concerns that some enterococcal blood isolates classified as central line–associated bloodstream infections (CLABSIs) by current definitions may be contaminants. The potential for *Enterococcus* to be a contaminant in blood cultures was recognized at least 40 years ago.[2] Our study compared the microbiology of National Healthcare Safety Network (NHSN)–defined CLABSIs in patients with and without neutropenia following chemotherapy, and we proposed a list of organisms for exclusion from the CLABSI definition in the setting of neutropenia.[3] Although our study was not designed to assess the possibility that blood cultures growing a single *Enterococcus* species are contaminants, we queried our database to answer most of the questions posed by Freeman and colleagues.

Of the 52 patients in our study with CLABSIs that included enterococci, 26 (50%) had more than 1 positive blood culture with the same enterococcal species, strongly suggestive of true infection. Of the 26 patients with a single blood culture yielding *Enterococcus* species, 5 (9.6% of the total) had 1 or more typical skin contaminants defined by the NHSN in the same blood culture bottle as the *Enterococcus* species; all of these cultures were obtained through a central line. Overall, 40 patients (77%) had at least 1 positive culture growing *Enterococcus* species drawn through a central line; 23 (58%) of 40 also had the *Enterococcus* species isolated from a percutaneous culture.

We stratified this analysis by whether the enterococcal bacteremia occurred in the setting of neutropenia. Neutropenic patients were more likely to have multiple enterococcal isolates (10 [67%] of 15 with multiple isolates) and were unlikely to have blood isolates suspicious for being a contaminant. Of the 5 patients with 1 enterococcal isolate, 3 died and 1 was transferred to a hospice within 10 days of the positive culture, suggesting that the bacteremia was significant. At least 1 enterococcal isolate was obtained from a central line–drawn blood culture in all 15; in 6 patients, the organism was also isolated from a percutaneously drawn blood culture.

Sixteen of the 37 nonneutropenic patients had multiple isolates of *Enterococcus*. Among the nonneutropenic patients, 25 (68%) had at least 1 positive blood culture obtained through a central line, 12 of whom had blood cultures obtained through a central line and by peripheral venipuncture. There were 6 nonneutropenic patients who had a single enterococcal isolate where culture results and clinical context suggested that the *Enterococcus* was a contaminant. In all 6 patients, the enterococcal isolate was line drawn. These cases included 2 patients with 1 line-drawn blood culture bottle growing *Enterococcus* species and a common contaminant with another set showing no growth. As mentioned by Freeman and colleagues, this situation suggests that the *Enterococcus* does not represent true bacteremia. Interestingly, there were 4 patients with 1 line-drawn enterococcal isolate (1 with a common contaminant as well), each of whom had 2 blood cultures growing *Staphylococcus aureus*; in all 4 patients, catheter tip cultures grew more than 15 colonies of *S. aureus*. While these latter 4 cases would not change our CLABSI rate, they do highlight the potential of *Enterococcus* to be a contaminant.

Although the number of enterococcal infections in our series is small, these additional data reinforce our findings that enterococcal bloodstream infections are overrepresented in persons with neutropenia. If we censor the 6 enterococcal isolates suspected of being contaminants (all in nonneutropenic patients), the relative proportion of CLABSIs containing an *Enterococcus* species would be further skewed toward those with neutropenia (23% in the neutropenic group vs 13% in the nonneutropenic group; $P = .05$).

We agree with Freeman and colleagues that determining the significance of enterococcal blood isolates is vexing, particularly with blood cultures obtained through central venous catheters.

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