EDITORIAL

MARISA TUNGSIRIPAT, MD
Head, Section of HIV, Department of Infectious Disease, Cleveland Clinic

Follow-up blood cultures are often needed after bacteremia

Bacteremia is common and associated with significant morbidity and mortality. Bloodstream infections rank among the leading causes of death in North America and Europe.[1]

See related article, page 89

In this issue, Mushtaq et al[2] contend that follow-up blood cultures after initial bacteremia are not needed for most hospitalized patients. Not repeating blood cultures after initial bacteremia has been proposed to decrease hospitalization length, consultations, and healthcare costs in some clinical settings. However, without follow-up cultures, it can be difficult to assess the adequacy of treatment of bacteremia and associated underlying infections.

GRAM-NEGATIVE ORGANISMS

Results of retrospective studies indicate that follow-up cultures may not be routinely needed for gram-negative bacteremia. In a review by Canzoneri et al of 383 cases with subsequent follow-up cultures,[3] 55 (14%) were positive. The mean duration of bacteremia was 2.8 days (range 1 to 15 days). Of the 55 persistently positive blood cultures, only 8 (15%) were caused by gram-negative organisms. Limitations to this study included the lack of patient outcome data, a low event rate, and the retrospective design.[4]

In a retrospective case-control study of follow-up cultures for 862 episodes of *Klebsiella pneumoniae* bacteremia,[5] independent risk factors for persistent bacteremia were intra-abdominal infection, higher Charlson comorbidity index score, solid-organ transplant, and unfavorable treatment response.

These studies confirm that persistent bacteremia is uncommon with gram-negative organisms. They also support using comorbidities and treatment response to guide the ordering of follow-up blood cultures.

WHEN IS FOLLOW-UP CULTURE USEFUL?

Although follow-up blood cultures may not be needed routinely in patients with gram-negative bacteremia, it would be difficult to extrapolate this to gram-positive organisms, especially *Staphylococcus aureus*.

In Canzoneri et al,[3] 43 (78%) of the 55 positive follow-up cultures were due to gram-positive organisms. Factors associated with positive follow-up cultures were concurrent fever, presence of a central intravenous line, end-stage renal disease on hemodialysis, and diabetes mellitus. In addition, infectious disease consultation to decide the need for follow-up cultures for *S aureus* bacteremia has been associated with fewer deaths, fewer relapses, and lower readmission rates.[6,7]

Without follow-up cultures, assessing the adequacy of bacteremia treatment and associated underlying infections can be difficult

In certain clinical scenarios, follow-up blood cultures can provide useful information, such as when the source of bacteremia is endocarditis or cardiac device infection, a vascular graft, or an intravascular line. In the Infectious Diseases Society of America guidelines for diagnosis and management of catheter-related bloodstream infections, persistent or relapsing bacteremia for some organisms is a criterion for removal of a long-term central venous catheter.[8]

Follow-up cultures are especially useful when the focus of infection is protected from antibiotic penetration, such as in the central nervous system, joints, and abdominal or oth-

doi:10.3949/ccjm.86a.18114

er abscess. These foci may require drainage for cure. In these cases or in the setting of unfavorable clinical treatment response, follow-up blood cultures showing persistent bacteremia can prompt a search for unaddressed or incompletely addressed foci of infection and allow for source control.

The timing of follow-up cultures is generally 1 to 2 days after the initial culture. Although Mushtaq et al propose a different approach, traditional teaching has been that the last blood culture should not be positive, and this leads to ordering follow-up blood cultures until clearance of bacteremia is documented.

REFERENCES

1. **Goto M, Al-Hasan MN**. Overall burden of bloodstream infection and nosocomial bloodstream infection in North America and Europe. Clin Microbiol Infect 2013; 19(6):501–509. doi:10.1111/1469-0691.12195
2. **Mushtaq A, Bredell B, Soubani A**. Repeating blood cultures after an initial bacteremia: when and how often? Cleve Clin J Med 2019; 86(2):89–92. doi:10.3949/ccjm.86a.18001
3. **Canzoneri CN, Akhavan BJ, Tosur Z, Andrade PEA, Aisenberg GM**. Follow-up blood cultures in gram-negative bacteremia: are they needed? Clin Infect Dis 2017; 65(11):1776–1779.doi:10.1093/cid/cix648
4. **Jones RB, Paruchuri A, Shah SS**. Prospective trials are required to alter practice for follow-up blood cultures for gram-negative bacilli bacteremia. Clin Infect Dis 2018; 67(2):315–316. doi:10.1093/cid/ciy070
5. **Kang CK, Kim ES, Song KH, et al**. Can a routine follow-up blood culture be justified in *Klebsiella pneumoniae* bacteremia? A retrospective case-control study. BMC Infect Dis 2013; 13:365. doi:10.1186/1471-2334-13-365
6. **Honda H, Krauss MJ, Jones JC, Olsen MA, Warren DK**. The value of infectious diseases consultation in *Staphylococcus aureus* bacteremia. Am J Med 2010; 123(7):631–637. doi:10.1016/j.amjmed.2010.01.015
7. **Fowler VG Jr, Sanders LL, Sexton DJ, et al**. Outcome of *Staphylococcus aureus* bacteremia according to compliance with recommendations of infectious diseases specialists: experience with 244 patients. Clin Infect Dis 1998; 27(3):478–486. pmid:9770144
8. **Mermel LA, Allon M, Bouza E, et al**. Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 Update by the Infectious Diseases Society of America. Clin Infect Dis 2009; 49(1):1–45. doi:10.1086/599376

***ADDRESS**: Marisa Tungsiripat, MD, Department of Infectious Disease, G21, Cleveland Clinic, 9500 Euclid Avenue, Cleveland, OH 44195; tungsim@ccf.org*