Rapid Molecular Identification of Pathogens from Positive Blood Culture

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Updated Abstract

Background: Bacterial sepsis is a leading cause of death in the United States. Delays in the identification and antimicrobial resistance testing contribute to morbidity and mortality. A rapid molecular test that identifies pathogens and antimicrobial resistance immediately after a blood culture becomes positive could improve patient outcomes.

Methods: The FilmArray® (FA) Blood Culture ID (BCID) System (Idaho Technology, Inc., Salt Lake City, UT) performs automated nucleic acid purification and multiplex PCR to identify 22 pathogens at the genus or species level, and 4 antibiotic resistance genes in ~1 hour. We performed a retrospective study of archived blood culture samples from children evaluated at Primary Children’s Medical Center (Salt Lake City, UT). Positive blood culture samples were diluted 1:100 and injected into the FA BCID System. FA identification of bacteria and resistance genes was compared to conventional culture and susceptibility testing.

Results: One hundred forty-two positive blood culture samples were evaluated. One hundred fifty-six pathogens were identified by conventional culture, including 14 cultures positive for 2 pathogens each. One hundred sixty-five pathogens (96%) were identified by FA. FA-identified pathogens included: S. aureus (21), S. pneumoniae (14), S. pyogenes (8), S. pneumoniae (6), Entercoccus spp (19), Staphylococcus spp (12), coagulase-negative staphylococci (10), E. coli (14), Proteus mirabilis (9), K. oxytoca (5), P. aeruginosa (5), N. meningitidis (3), S. pneumoniae (3), and K. pneumoniae (2). Five methicillin-resistant S. aureus (MRSA) were accurately identified by mecA. vanA was detected in two Enterococcus species susceptible to vancomycin by Kirby-Bauer. Culture-negative samples showed no amplification above background.

Conclusion: The FA Sepsis System is a novel tool for the identification of bloodstream pathogens in clinical samples. Our study demonstrates the utility of this system for rapid identification of pathogens and antibiotic resistance determinants directly from positive blood culture samples. Use of this system could improve medical management of patients with sepsis.

Introduction

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Methods

The FilmArray® (FA) Blood Culture ID (BCID) System (Idaho Technology, Inc., Salt Lake City, UT) performs automated nucleic acid purification and multiplex PCR to identify 22 pathogens at the genus or species level, and 4 antibiotic resistance genes in ~1 hour. We performed a retrospective study of archived blood culture samples from children evaluated at Primary Children’s Medical Center (Salt Lake City, UT). Positive blood culture samples were diluted 1:100 and injected into the FA BCID System. FA identification of bacteria and resistance genes by melting curve analysis was compared to conventional culture and susceptibility testing.

Conclusion

The FilmArray BCID System is a novel tool for the identification of bloodstream pathogens in clinical samples. Our study demonstrates the utility of this system for rapid and accurate identification of pathogens and antibiotic resistance determinants directly from positive blood culture samples. Use of this system could improve medical management of patients with sepsis.