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Principles and Procedures for Blood Cultures; Approved Guideline

This document provides recommendations for the collection, transport, and processing of blood cultures as well as guidance for the recovery of pathogens from blood specimens taken from patients who are suspected of having bacteremia or fungemia.

A guideline for global application developed through the Clinical and Laboratory Standards Institute consensus process.



Clinical and Laboratory Standards Institute

Advancing Quality in Healthcare Testing

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- the revision of documents in response to comments by users
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Abstract

Clinical and Laboratory Standards Institute document M47-A—*Principles and Procedures for Blood Cultures; Approved Guideline* addresses the laboratory detection of bacteremia and fungemia by use of blood cultures. Included in this guideline are recommendations for the: 1) clinical importance of blood cultures; 2) specimen collection and transportation; 3) critical factors in the recovery of pathogens from blood specimens; 4) special topics, including pediatric blood cultures, catheter-related bloodstream infections, infective endocarditis, patients receiving antimicrobial therapy, rare and fastidious pathogens, and test of cure; 5) reporting results; 6) interpreting blood culture results; 7) safety issues; and 8) quality assurance.

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Foreword

The incidence of sepsis continues to increase in the United States: the most recent published data indicate that as many as 660,000 cases occur annually.¹ Because the morbidity and mortality attributable to sepsis is high, the prompt and accurate detection of bacteremia and fungemia is important for improving patient care. The laboratory test that is used to detect the presence of bacteria (bacteremia) or fungi (fungemia) in the blood is the blood culture.

During the past 30 years, a number of studies have been conducted to: 1) define the clinical significance of blood cultures; 2) define the critical factors in the recovery of pathogens from the blood; 3) establish the best medium formulations and other laboratory practices; 4) evaluate and compare commercial blood culture systems; and 5) develop interpretive criteria. Because of the clinical importance of bacteremia and fungemia, and therefore the importance of blood cultures, guidelines are needed so that laboratories and providers use optimal laboratory methods and interpret the results correctly. To date there has not been a single document that incorporates these data into consensus guidelines. Such guidelines are also needed to help control healthcare costs, as the costs attributable to the recovery of contaminants from blood cultures are high.

Key Words

Bacteremia, bacteria, blood culture, bloodstream infection, fungemia, fungi, mycobacteria, sepsis

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1 Scope

The laboratory detection of bacteremia and fungemia remains one of the most important functions of clinical microbiology laboratories. During the past 30 years, a number of studies have defined the critical factors in the recovery of pathogens from blood and the optimal laboratory methods for recovering specific pathogens, and have established the performance characteristics of blood culture systems. Despite this information, there remains a need for guidelines for the collection, processing, and interpretation of blood cultures.

Several *in vitro* blood culture devices are cleared by the United States Food and Drug Administration (FDA) for use in the United States. These devices typically are available for use in other countries.

This guideline is intended to provide guidance to clinical microbiologists and other laboratorians (e.g., pathologists, laboratory supervisors, laboratory managers) for the recovery of pathogens from blood specimens taken from patients who are suspected of having bacteremia or fungemia. Specific recommendations will be offered for the collection, transport, and processing of blood cultures. The existing blood culture technology will be reviewed and the relative benefits of these technologies will be compared. Procedures for the identification of pathogens will not be addressed. Antimicrobial susceptibility testing of bacteria is addressed in CLSI documents M2—*Performance Standards for Antimicrobial Disk Susceptibility Tests*,² M7—*Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically*,³ and M11—*Methods for Antimicrobial Susceptibility Testing of Anaerobic Bacteria*.⁴ Antimicrobial susceptibility testing of fungi is covered in CLSI/NCCLS documents M27—*Reference Method for Broth Dilution Antifungal Susceptibility Testing of Yeasts*⁵ and M38—*Reference Method for Broth Dilution Antifungal Susceptibility Testing of Filamentous Fungi*.⁶

2 Standard Precautions

Because it is often impossible to know what isolates or specimens might be infectious, all patient and laboratory specimens are treated as infectious and handled according to “standard precautions.” Standard precautions are guidelines that combine the major features of “universal precautions and body substance isolation” practices. Standard precautions cover the transmission of all infectious agents and thus are more comprehensive than universal precautions which are intended to apply only to transmission of blood-borne pathogens. Standard and universal precaution guidelines are available from the US Centers for Disease Control and Prevention.⁷ For specific precautions for preventing the laboratory transmission of all infectious agents from laboratory instruments and materials and for recommendations for the management of exposure to all infectious disease, refer to the most current edition of CLSI document M29—*Protection of Laboratory Workers From Occupationally Acquired Infections*.⁸

3 Definitions

antiseptic - a substance that inhibits the growth and development of microorganisms without necessarily killing them.⁹

automated blood culture system - a blood culture system that uses mechanical systems to incubate, agitate, and/or monitor blood culture bottles for microbial growth.

bacteremia – the presence of bacteria in the bloodstream; **NOTE:** Bacteria isolated from blood may be the cause of sepsis, indeterminate as a cause of sepsis, or contaminants.¹⁰