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Viral Culture; Approved Guideline

This document provides guidance for viral culture and identification procedures performed in the clinical virology laboratory.

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

CLINICAL AND LABORATORY STANDARDS INSTITUTE®
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Abstract

This document provides guidance for viral culture and identification procedures that are typically performed in the clinical virology laboratory setting using commercially available cell cultures and reagents. The nature of the cell culture system is one that is inherently variable and thus remains susceptible to numerous adverse conditions that can lead to unreliable results. Several critical elements that must be addressed in devising a viral culture procedure are identified. These include: cell culture selection, assessment and maintenance; cell culture verification and quality control; culture medium preparation and quality control; specimen collection and preparation; isolate identification; and result reporting and interpretation. The intended audience includes laboratories performing either limited or comprehensive viral cultures as well as those that are considering introduction of viral culture. Regardless of the viral diagnostic testing algorithm utilized by a laboratory, the basic principles of viral culture are universal.

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Foreword

This document provides guidance for viral culture and identification procedures that are typically performed in the clinical virology laboratory setting using commercially available reagents and monolayered cell cultures and does not include procedures for isolation of agents requiring specialized cell culture systems or procedures for their cultivation. The nature of the cell culture system is one that is inherently variable and thus remains susceptible to numerous adverse conditions that can lead to unreliable results. Given this, and the number of other variables associated with culture procedures, it would be impossible to identify a consensus guideline that would not be restrictive. This document is intended to identify the many variables associated with viral culture procedures and to provide guidance regarding several critical elements that must be addressed in devising a viral culture procedure. The critical elements of a viral culture procedure include specimen collection, processing, and inoculation; cell culture selection, assessment, maintenance, and quality control; isolate detection and identification; and reporting and interpretation of test results, including information regarding potential limitations of the procedure.

This document includes procedures and guidance that are appropriate for different laboratory settings ranging from those offering a limited culture menu (e.g., herpes simplex virus [HSV]), to those performing more comprehensive viral culture. The intended audience includes not only laboratories already performing viral culture but also those that may have hesitated to introduce viral culture because of perceived difficulties of the method. This document also includes cautionary notes related to recent safety concerns regarding BSL-3 and BSL-4 agents that have been identified as either potential biologic threats (e.g., variola) or emergent infections (e.g., severe acute respiratory syndrome – coronavirus [SARS-CoV], avian influenza).

Key Words

Cell culture, viral culture, viral isolation

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Viral Culture; Approved Guideline

1 Scope

This document focuses on viral culture and identification procedures that are typically performed in the clinical virology laboratory setting using commercially available monolayered cell cultures and reagents. Guidance for specimen collection, processing, and inoculation; cell culture selection, assessment, maintenance, and quality control; isolate detection and identification; and reporting and interpretation of test results, including information regarding potential limitations of the procedure, are outlined. The intended audience includes laboratories performing either limited or comprehensive viral culture procedures, as well as those that are considering introduction of viral culture.

2 Introduction

Comprehensive diagnostic virology laboratories typically utilize a combination of culture and nonculture techniques for the detection of viral agents in clinical samples. Historically, culture methods were considered cumbersome and complex, with turnaround times that precluded their clinical utility. In addition, many microbiology laboratories have hesitated to incorporate viral culture into their test menus because of the perceived difficulties associated with handling cell cultures and identifying viral isolates. However, the commercial availability of high quality cell cultures, culture media, and culture confirmation reagents has served to expand the availability of viral cultures.

The nature of the cell culture system is one that is inherently variable and thus remains susceptible to numerous adverse conditions that can lead to unreliable results. In addition, a viral cell culture procedure may vary depending on the needs of a particular setting and the availability of complementary procedures. These variables underscore the need to develop a procedure that adequately addresses the critical elements necessary for performing a reliable viral culture procedure. This guidance document is thus intended to provide recommendations for optimizing culture results. This document also includes cautionary notes related to recent safety concerns regarding BSL-3 and BSL-4 agents that have been identified as either potential biologic threats (e.g., variola) or emergent infections (e.g., SARS-CoV, avian influenza), and that can replicate in cell lines typically employed by the diagnostic laboratory.

3 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 U.S. Centers for Disease Control and Prevention (Garner JS, Hospital Infection Control Practices Advisory Committee. *Guideline for Isolation Precautions in Hospitals.* Infection Control and Hospital Epidemiology. CDC. 1996;17(1):53-80). 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*. Categorization of biologic agents according to their biosafety level (BSL) and a detailed description of recommended facilities, practices, and protective equipment for the various levels are available at http://www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4s3.htm (Public Health Service, CDC and NIH. *Biosafety*

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