



# M51-A

## Method for Antifungal Disk Diffusion Susceptibility Testing of Nondermatophyte Filamentous Fungi; Approved Guideline

This document describes the guidelines for antifungal susceptibility testing by the disk diffusion method of nondermatophyte filamentous fungi (moulds) that cause invasive disease.

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

# Clinical and Laboratory Standards Institute

*Setting the standard for quality in medical laboratory testing around the world.*

The Clinical and Laboratory Standards Institute (CLSI) is a not-for-profit membership organization that brings together the varied perspectives and expertise of the worldwide laboratory community for the advancement of a common cause: to foster excellence in laboratory medicine by developing and implementing medical laboratory standards and guidelines that help laboratories fulfill their responsibilities with efficiency, effectiveness, and global applicability.

## Consensus Process

Consensus—the substantial agreement by materially affected, competent, and interested parties—is core to the development of all CLSI documents. It does not always connote unanimous agreement, but does mean that the participants in the development of a consensus document have considered and resolved all relevant objections and accept the resulting agreement.

## Commenting on Documents

CLSI documents undergo periodic evaluation and modification to keep pace with advancements in technologies, procedures, methods, and protocols affecting the laboratory or health care.

CLSI's consensus process depends on experts who volunteer to serve as contributing authors and/or as participants in the reviewing and commenting process. At the end of each comment period, the committee that developed the document is obligated to review all comments, respond in writing to all substantive comments, and revise the draft document as appropriate.

Comments on published CLSI documents are equally essential, and may be submitted by anyone, at any time, on any document. All comments are managed according to the consensus process by a committee of experts.

## Appeals Process

When it is believed that an objection has not been adequately considered and responded to, the process for appeals, documented in the CLSI Standards Development Policies and Processes, is followed.

All comments and responses submitted on draft and published documents are retained on file at CLSI and are available upon request.

## Get Involved—Volunteer!

Do you use CLSI documents in your workplace? Do you see room for improvement? Would you like to get involved in the revision process? Or maybe you see a need to develop a new document for an emerging technology? CLSI wants to hear from you. We are always looking for volunteers. By donating your time and talents to improve the standards that affect your own work, you will play an active role in improving public health across the globe.

For additional information on committee participation or to submit comments, contact CLSI.

Clinical and Laboratory Standards Institute  
950 West Valley Road, Suite 2500  
Wayne, PA 19087 USA  
P: +1.610.688.0100  
F: +1.610.688.0700  
[www.clsi.org](http://www.clsi.org)  
[standard@cls.org](mailto:standard@cls.org)

This is a preview. [Click here to purchase the full publication.](#)

ISBN 1-56238-725-1  
ISSN 0273-3099

M51-A  
Vol. 30 No. 11  
Replaces M51-P  
Vol. 29 No. 15

---

## Method for Antifungal Disk Diffusion Susceptibility Testing of Nondermatophyte Filamentous Fungi; Approved Guideline

Volume 30 Number 11

Ana Espinel-Ingroff, MS, PhD  
Annette W. Fothergill, MA, MBA, MT(ASCP)  
Mahmoud A. Ghannoum, MSc, PhD  
Michael A. Pfaller, MD  
John H. Rex, MD, FACP  
Thomas J. Walsh, MD

### Abstract

CLSI broth dilution reference methods are available for susceptibility testing of filamentous fungi (see CLSI document M38)<sup>1</sup> and yeasts (see CLSI documents M27<sup>2</sup> and M44<sup>3</sup>). There still remains, however, a need for an alternative simple, rapid, and cost-effective approach to determine the susceptibility of nondermatophyte filamentous fungi (moulds) to various classes of antifungal agents that would make antifungal susceptibility testing more readily available to clinical microbiology laboratories. The CLSI Subcommittee on Antifungal Susceptibility Testing developed a disk diffusion method for testing filamentous fungi to amphotericin B, caspofungin, itraconazole, posaconazole, and voriconazole.<sup>4</sup> Although clinical breakpoints have not been assigned, epidemiological cutoff values (ECVs) have been developed based on a comparison of zone diameters vs minimal inhibitory concentrations (MICs) or minimal effective concentrations (MECs) using the rate bounding method; control parameters for these agents have also been determined.<sup>4</sup> ECVs are not used as clinical breakpoints, but rather to detect those isolates that are likely to have acquired resistance mechanisms or reduced susceptibility to the tested agent as compared with the wild-type distribution. One significant advantage of this method is that qualitative results can usually be determined after only 16 to 48 hours incubation as opposed to 24 to 72 hours with CLSI document M38.<sup>1</sup> There are more antifungal agents and it is expected that this document will further encourage the development of disk diffusion testing for some of these agents.

Clinical and Laboratory Standards Institute (CLSI). *Method for Antifungal Disk Diffusion Susceptibility Testing of Nondermatophyte Filamentous Fungi; Approved Guideline*. CLSI document M51-A (ISBN 1-56238-725-1). Clinical and Laboratory Standards Institute, 950 West Valley Road, Suite 2500, Wayne, Pennsylvania 19087 USA, 2010.

The Clinical and Laboratory Standards Institute consensus process, which is the mechanism for moving a document through two or more levels of review by the health care community, is an ongoing process. Users should expect revised editions of any given document. Because rapid changes in technology may affect the procedures, methods, and protocols in a standard or guideline, users should replace outdated editions with the current editions of CLSI documents. Current editions are listed in the CLSI catalog and posted on our website at [www.clsi.org](http://www.clsi.org). If your organization is not a member and would like to become one, and to request a copy of the catalog, contact us at: Telephone: 610.688.0100; Fax: 610.688.0700; E-Mail: [customerservice@clsi.org](mailto:customerservice@clsi.org); Website: [www.clsi.org](http://www.clsi.org).



This is a preview. [Click here to purchase the full publication.](#)

Copyright ©2010 Clinical and Laboratory Standards Institute. Except as stated below, any reproduction of content from a CLSI copyrighted standard, guideline, companion product, or other material requires express written consent from CLSI. All rights reserved. Interested parties may send permission requests to [permissions@clsi.org](mailto:permissions@clsi.org).

CLSI hereby grants permission to each individual member or purchaser to make a single reproduction of this publication for use in its laboratory procedure manual at a single site. To request permission to use this publication in any other manner, e-mail [permissions@clsi.org](mailto:permissions@clsi.org).

### **Suggested Citation**

CLSI. *Method for Antifungal Disk Diffusion Susceptibility Testing of Nondermatophyte Filamentous Fungi; Approved Guideline*. CLSI document M51-A. Wayne, PA: Clinical and Laboratory Standards Institute; 2010.

### **Previous Edition:**

June 2009

### **Reaffirmed:**

September 2016

ISBN 1-56238-725-1  
ISSN 0273-3099

## Committee Membership

### Area Committee on Microbiology

**John H. Rex, MD, FACP**  
**Chairholder**  
**AstraZeneca**  
**Cheshire, United Kingdom**

**Mary Jane Ferraro, PhD, MPH**  
**Vice-Chairholder**  
**Massachusetts General Hospital**  
**Boston, Massachusetts, USA**

Nancy L. Anderson, MMSc,  
 MT(ASCP)  
 Centers for Disease Control and  
 Prevention  
 Atlanta, Georgia, USA

Barbara Ann Body, PhD,  
 D(ABMM)  
 Laboratory Corporation of America  
 Burlington, North Carolina, USA

Betty A. Forbes, PhD, D(ABMM)  
 Medical College of Virginia  
 Campus  
 Richmond, Virginia, USA

Thomas R. Fritsche, MD, PhD  
 Marshfield Clinic  
 Marshfield, Wisconsin, USA

Freddie Mae Poole, MS, MT  
 FDA Center for Devices and  
 Radiological Health  
 Silver Spring, Maryland, USA

Fred C. Tenover, PhD, D(ABMM)  
 Cepheid  
 Sunnyvale, California, USA

John D. Turnidge, II, MD  
 SA Pathology At Women's and  
 Children's Hospital  
 North Adelaide, Australia

#### Advisors

Donald R. Callihan, PhD  
 BD Diagnostic Systems  
 Sparks, Maryland, USA

James H. Jorgensen, PhD  
 University of Texas Health Science  
 Center  
 San Antonio, Texas, USA

Jean B. Patel, PhD, D(ABMM)  
 Centers for Disease Control and  
 Prevention  
 Atlanta, Georgia, USA

Michael A. Pfaller, MD  
 University of Iowa College of  
 Medicine  
 Iowa City, Iowa, USA

Thomas R. Shryock, PhD  
 Elanco Animal Health  
 Greenfield, Indiana, USA

Jana M. Swenson, MMSc  
 Centers for Disease Control and  
 Prevention  
 Atlanta, Georgia, USA

Jeffrey L. Watts, PhD,  
 RM(AAM)  
 Pfizer Animal Health  
 Kalamazoo, Michigan, USA

Melvin P. Weinstein, MD  
 Robert Wood Johnson  
 Medical School  
 New Brunswick, New Jersey,  
 USA

Nancy Wengenack, PhD  
 Mayo Clinic  
 Rochester, Minnesota, USA

Matthew A. Wikler, MD,  
 MBA, FIDSA  
 Pacific Beach BioSciences,  
 Inc.  
 San Diego, California, USA

Michael L. Wilson, MD  
 Denver Health Medical  
 Center  
 Denver, Colorado, USA

Gail L. Woods, MD  
 Central Arkansas Veterans  
 Healthcare System  
 Little Rock, Arkansas, USA

Barbara L. Zimmer, PhD  
 Siemens Healthcare  
 Diagnostics Inc.  
 West Sacramento, California,  
 USA

### Subcommittee on Antifungal Susceptibility Tests

**Mahmoud A. Ghannoum, MSc,  
 PhD**  
**Chairholder**  
**Case Western Reserve University**  
**Cleveland, Ohio, USA**

Barbara D. Alexander, MD, MHS  
 Duke University Medical Center  
 Durham, North Carolina, USA

David Andes, MD  
 University of Wisconsin  
 Madison, Wisconsin, USA

Steven D. Brown, PhD  
 The Clinical Microbiology Institute  
 Wilsonville, Oregon, USA

Cynthia L. Fowler, MD  
 bioMérieux, Inc.  
 Durham, North Carolina, USA

Elizabeth M. Johnson, PhD  
 The HPA Centre for Infections  
 Kingsdown, United Kingdom

Cynthia C. Knapp, MS  
 Trek Diagnostic Systems  
 Cleveland, Ohio, USA

Mary R. Motyl, PhD, D(ABMM)  
 Merck & Company  
 Rahway, New Jersey, USA

Luis Ostrosky-Zeichner, MD, FACP  
 University of Texas Medical School  
 at Houston  
 Houston, Texas, USA

Michael A. Pfaller, MD  
 University of Iowa College of  
 Medicine  
 Iowa City, Iowa, USA

Daniel J. Sheehan, PhD  
 Greenwich, Connecticut, USA

Thomas J. Walsh, MD  
 National Cancer Institute  
 Bethesda, Maryland, USA

**Advisors**

Maiken Cavling Arendrup, MD,  
PhD  
Statens Serum Institut  
Copenhagen, Denmark

Beth Arthington-Skaggs, PhD  
Centers for Disease Control and  
Prevention  
Atlanta, Georgia, USA

Shukal Bala  
FDA Center for Drug Evaluation  
and Research  
Silver Spring, Maryland, USA

Ozlem Belen, MD, MPH, MSc.  
FDA Center for Drug Evaluation  
and Research  
Silver Spring, Maryland, USA

Vishu Chaturvedi, PhD  
New York State Dept. of Health  
Albany, New York, USA

Daniel J. Diekema, MD, FACP  
University of Iowa College of  
Medicine  
Iowa City, Iowa, USA

Ana Espinel-Ingroff, PhD  
Virginia Commonwealth University  
Medical Center  
Richmond, Virginia, USA

Annette W. Fothergill, MA, MBA,  
MT(ASCP)  
University of Texas Health Science  
Center  
San Antonio, Texas, USA

David S. Perlin, PhD  
New Jersey Medical School-  
UMDNJ  
Newark, New Jersey, USA

Freddie Mae Poole, MS, MT  
FDA Ctr. for Devices/Rad. Health  
Silver Spring, Maryland, USA

John H. Rex, MD, FACP  
AstraZeneca  
Cheshire, United Kingdom

Michael G. Rinaldi, PhD  
University of Texas Health Science  
Center  
San Antonio, Texas, USA

Neil S. Ryder, PhD  
Novartis Institutes for Biomedical  
Research  
Cambridge, Massachusetts, USA

Helio S. Sader, MD, PhD  
JMI Laboratories  
North Liberty, Iowa, USA

Guy St. Germain  
Institut National de Santé Publique  
du Québec  
Sainte-Anne-de-Bellevue, Canada

**Working Group on Antifungal Disk Diffusion Susceptibility Testing of Filamentous Fungi**

**Ana Espinel-Ingroff, PhD**  
**Chairholder**  
**Virginia Commonwealth**  
**University Medical Center**  
**Richmond, Virginia, USA**

Annette W. Fothergill, MA, MBA,  
MT(ASCP)  
University of Texas Health Science  
Center  
San Antonio, Texas, USA

Mahmoud A. Ghannoum, MSc,  
PhD  
Case Western Reserve University  
Cleveland, Ohio, USA

Michael A. Pfaller, MD  
University of Iowa College of  
Medicine  
Iowa City, Iowa, USA

John H. Rex, MD, FACP  
AstraZeneca  
Cheshire, United Kingdom

Thomas J. Walsh, MD  
National Cancer Institute  
Bethesda, Maryland, USA

**Staff**

Clinical and Laboratory Standards  
Institute  
Wayne, Pennsylvania, USA

Lois M. Schmidt, DA  
*Vice President, Standards  
Development*

Tracy A. Dooley, BS, MLT(ASCP)  
*Staff Liaison*

Marcy Hackenbrack, MCM, BA,  
M(ASCP)  
*Project Manager*

Melissa A. Lewis, ELS  
*Editorial Manager*