medically important FUNGI

a guide to identification

DAVISE HONIG LARONE

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Dedicated to my daughter,
Ronit

PREFACE

More than ever, clinical laboratory personnel with limited experience in mycology must culture and identify fungi isolated from clinical specimens. Even after attending a course in the subject, technologists often need guidance in identifying the great variety of organisms encountered in the lab. With the advent of proficiency testing by local and national organizations, technologists have a need and opportunity to practice and increase their skills in the medical mycology laboratory.

Most classic texts, though rich in information, are arranged according to the clinical description of the infection; the textual discussion of any particular fungus can be located only from the index or table of contents. Since the technologist doesn't know the name of an unidentified fungus and usually has little or no knowledge of the clinical picture, these texts are at best difficult to use effectively. The unfortunate result is the all-too-common practice of flipping through an entire mycology textbook in search of a picture that resembles the organism under examination. Such a practice may make the more accomplished mycologist's hair stand on end, but it is a fact to be acknowledged.

This guide is not meant to compete with these large texts, but to complement them. The material here is so arranged that the technician can systematically reach a possible identification knowing only the macro- and microscopic morphology of an isolated organism. Reference can then be made to one of the classic texts for confirmation and detailed information.

Many possible variants of organisms are found under several categories of morphology and pigment. The outstanding characteristics are listed on the page(s) apportioned to each organism, and references are suggested for further information and confirmation (see How to Use the Guide, p. xiii).

MEDICALLY IMPORTANT FUNGI avoids the jargon so commonly and confusingly used in most mycology books. Drawings are used wherever possible to illustrate organisms described in the text. To ensure clarity, a glossary of terms is included, as well as a section on laboratory techniques for observing proper morphology. Another section includes use of the various media, stains, and tests mentioned in the book.

The actinomycetes, although now known to be bacteria rather than fungi, are included because they are frequently handled in the mycology section of the clinical laboratory.

It is believed that this guide will enable students and medical technologists to culture and identify fungi with greater ease and competency and in so doing to develop an appreciation of the truly beautiful microscopic forms encountered.

I wish to acknowledge with gratitude the encouragement and advice received from my co-workers at Lenox Hill Hospital, and Dr. Norman Goodman, Mr. Gerald Krefetz, Mr. Bill Rosenzweig, Ms. Eve Rothenberg, Dr. Guenther Stotzky, Mr. Martin Weisburd, Dr. Irene Weitzman and Dr. Marion E. Wilson.

New York City
December 1975

D.H.L.

HOW TO USE THE GUIDE

Before beginning to use the guide, several points should be understood: The primary purpose of this guide is to aid in the identification of fungi in *culture*. Their appearance in the original specimen from the host, if different from that in culture, may only be mentioned briefly.

The macroscopic and microscopic morphology described pertains to that on Sabouraud dextrose agar (SDA) unless otherwise specified.

Most molds begin as white mycelial growths, and coloration occurs at the time of sporulation. Hence organisms are listed under their most likely color(s) at maturity, when the typical microscopic spore formations are more readily observed.

This book is a *guide*. The standard texts should be used for additional information. When necessary, reference laboratories should be used for confirmation (see p. xv).

Instructions are given on p. 115 for general procedures prior to identification, i.e., collection of specimen, direct microscopic examination, primary isolation, wet preps, etc.

Once the organism has been properly collected, cultured, isolated, and observed microscopically, use of the guide is quite simple:

1. Note the morphology of the unknown fungus.
   a. Is it bacteria-like, yeast-like, dimorphic, or a monomorphic mold?
   b. Record color of surface and underside of colony.
2. Using the "Guide" section of the Table of Contents, refer to a page that shows drawings of the microscopic morphology of organisms having the appropriate macroscopic appearance. Here one may see either the exact organism under examination or several possibilities.
3. Proceed to the page written in parentheses next to the likely organism(s) and find more detailed information, including pathogenicity, rate of growth, morphology, an enlarged drawing of the microscopic appearance, tests or facts that may help to differentiate between extremely similar organisms, and references for additional information and photographs. Performance of special tests is described in the latter part of the book.
4. Ordinarily the identification will be quite certain. If, however, any doubt remains, the organism should be sent to a reference laboratory for confirmation of identification as discussed on the following page.

USE OF REFERENCE LABORATORIES

After a laboratory worker arrives at a possible identification of an isolated organism, confirmation of the identification is often necessary. The lack of an extremely experienced mycologist in a laboratory often results in inability to definitely identify an isolated fungus.

When a technologist is unsure of an identification or finds a fungus never, or only seldom, encountered before, a reliable reference laboratory should be asked to confirm the identification. Because of the toxicity of antifungal medications, it is especially important to confirm the identification of organisms causing systemic mycoses. Ordinarily, the state health department acts as a reference laboratory; in some localities the city department of health or other local laboratories supply the service.

Cultures to be sent to reference laboratories should be pure, young, and actively growing on agar slants. Petri dishes should not be used. For details on the labeling, mailing and delivering of specimens, one should consult their reference laboratory for specific requirements or refer to Huffaker, 1973.

SAFETY PRECAUTIONS

Since many fungi produce spores which are very light and easily become airborne, precautions are essential to prevent contamination of the laboratory and infection of the personnel.

A suitable biological safety cabinet should be used.

Tubed slants of media should be used for primary isolation. Petri plates should *never* be used if *Coccidioides* is suspected or if a culture is to be mailed.

Care must be taken not to spatter infectious material by careless flaming of wire needles or loops. Many workers prefer to use Bacticinerators* to avoid this hazard.

The work area should be cleaned with disinfectant daily.

Hands should be thoroughly washed with a disinfectant soap after handling mycology cultures.

All contaminated materials should be autoclaved before discarding.

* *Available from Scientific Products, McGraw Park, Ill.*

CONTENTS

PART ONE

1 / GUIDES

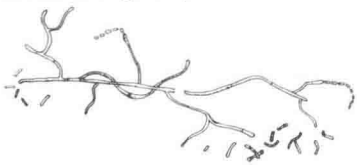
FUNGUS-LIKE BACTERIA

Very thin (1 μm or less in diameter) branching filaments*

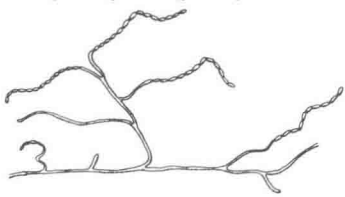
Actinomycetes

AEROBIC:

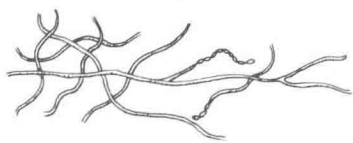
Nocardia (p. 31)



Streptomyces (p. 32)



Actinomadura (p. 32)



ANAEROBIC OR MICROAEROPHILIC:

Actinomyces (p. 29)

** Growth characteristics and biochemical tests must be utilized for identifications; these are summarized in tables on pages 30 and 33.*

MONOMORPHIC YEASTS AND YEAST-LIKE FUNGI

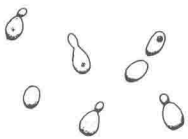
All rapid growers except *Ustilago*
All white, cream, or tan except *Rhodotorula*

MICROSCOPIC MORPHOLOGY ON CORNMEAL-TWEEN 80 AGAR*

Yeast-like cells only; usually no hyphae or pseudohyphae

Saccharomyces (p. 41)

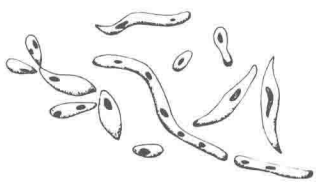
Torulopsis (p. 44)



Rhodotorula (p. 45)
(pink or coral pigment)

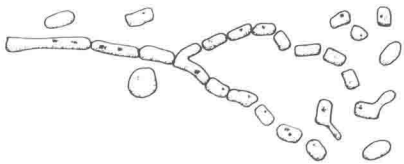
Cryptococcus (p. 46)

Ustilago (p. 47)

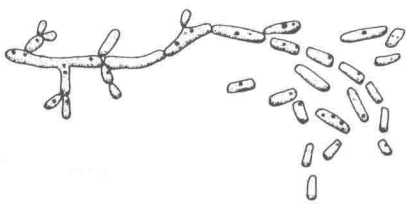


Hyphae and arthrospores

Geotrichum (p. 42)



Trichosporon (p. 43)



** Morphology alone cannot be relied upon for identification. Follow procedure on page 120 and tables on pages 48–50 for complete identifications.*