
THE DIAGNOSIS AND TREATMENT OF FUNGAL INFECTIONS

Compiled and Edited by

HARRY M. ROBINSON, JR., M.D., FACP

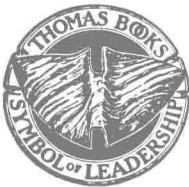
The Diagnosis and Treatment of Fungal Infections

Compiled and Edited by

HARRY M. ROBINSON, JR., M.D., FACP

*Professor and Head of Dermatology
University of Maryland
School of Medicine*

*Chief Dermatologist
University of Maryland Hospital and
South Baltimore General Hospital
Consultant in Dermatology for the
Veterans Administration Hospital, St. Agnes Hospital
Maryland General Hospital, Union Memorial Hospital
and the Greater Baltimore Medical Center*



CHARLES C THOMAS • PUBLISHER
Springfield • Illinois • U.S.A.

Published and Distributed Throughout the World by
CHARLES C THOMAS • PUBLISHER
BANNERSTONE HOUSE
301-327 East Lawrence Avenue, Springfield, Illinois, U.S.A.

This book is protected by copyright. No
part of it may be reproduced in any manner
without written permission from the publisher.

© 1974, by CHARLES C THOMAS • PUBLISHER

ISBN 0-398-02789-7

Library of Congress Catalog Card Number: 72-93227

*With THOMAS BOOKS careful attention is given to all details of
manufacturing and design. It is the Publisher's desire to present books
that are satisfactory as to their physical qualities and artistic possibilities
and appropriate for their particular use. THOMAS BOOKS will be true
to those laws of quality that assure a good name and good will.*

Printed in the United States of America

BB-14

**THE DIAGNOSIS AND
TREATMENT OF
FUNGAL INFECTIONS**

To Betsy, Bill, Ann and Max

CONTRIBUTORS

WILLIAM A. AKERS, COL., MC

*Chief, Dermatology Research
Division
Letterman Army Institute of
Research
San Francisco, California*

HARRY L. ARNOLD, JR., M.D.

*Clinical Professor of Dermatology
University of Hawaii School of
Medicine
Honolulu, Hawaii*

EUGENE S. BERESTON, M.D., D.Sc (MED.)

*Professor of Clinical Dermatology
University of Maryland School
of Medicine
Baltimore, Maryland*

JOSEPH W. BURNETT, M.D.

*Associate Professor of Medicine
in Dermatology
University of Maryland School of
Medicine
Baltimore, Maryland*

GARY J. CALTON, Ph.D.

*Assistant Professor of Medicine
in Dermatology
University of Maryland School of
Medicine
Baltimore, Maryland*

PHILIP CHARNEY, M.D.

*Assistant Director of Clinical
Research
Schering Corporation
Bloomfield, New Jersey*

MARVIN E. CHERNOSKY, M.D., F.A.C.P.

*Clinical Professor and Director
of the Program of Dermatology
University of Texas
Medical School
Houston, Texas*

NINA DABROWA, Ph.D.

*Assistant Research Mycologist II
University of California
Los Angeles, California*

THOMAS E. DRAKE, M.D.

*Assistant Research Dermatologist
and Clinical Instructor
Department of Dermatology
University of California School of
Medicine
San Francisco, California*

WILLIAM L. EPSTEIN, M.D.

*Professor and Acting Chairman of
Dermatology
University of California
San Francisco, California*

MARK ALLEN EVERETT, M.D. **FRANCES KEDDIE, M.D.**

*Professor and Head, Dept. of
Dermatology
University of Oklahoma
College of Medicine
Oklahoma City, Oklahoma*

*Research Dermatologist
Division of Dermatology,
Department of Medicine
University of California
Los Angeles, California*

T. LAWRENCE FLEISHER, M.D. **JOHN A. KENNEY, JR., M.D.**

*Associate Professor of Clinical
Dermatology
University of Puerto Rico School
of Medicine
Rio Piedras, Puerto Rico*

*Professor and Chairman of
Dermatology
Howard University College of
Medicine
1442 Iris Street, N.W.
Washington, D.C.*

ROBERT G. FREEMAN, M.D.

*Professor of Pathology and
Dermatology
University of Texas Southwestern
Medical School
Dallas, Texas*

DAVID W. KERSTING, M.D.

*Professor of Dermatology
Medical College of Wisconsin
Milwaukee, Wisconsin*

NORMAN GOLDFARB, M.D.

*Clinical Associate Professor of
Dermatology
New York University School of
Medicine
New York, New York*

JOSEPH W. LANDAU, M.D.

*Associate Professor of Medicine
and Dermatology
University of California
Center for the Health Sciences
Los Angeles, California*

**ANTONIO GONZÁLEZ-OCCHOA,
M.D.**

*Head, Department of Tropical
Dermatology
Public Health Institute of Tropical
Diseases
Carpio 470 ESQ.
Plan de San Luis
Mexico*

ULLIN W. LEAVELL, JR., M.D.

*Professor of Medicine
University of Kentucky College
of Medicine
Lexington, Kentucky*

NORMAN E. LEVAN, M.D.

*Chairman of Dermatology
University of Southern California
Los Angeles, California*

KENT F. JACOBS, M.D.

*Research Associate Division of
Dermatology
University of Colorado
Denver, Colorado*

PETER J. LYNCH, M.D.

*Associate Professor of
Dermatology
University of Michigan Medical
Center
Ann Arbor, Michigan*

HOWARD MAIBACH, M.D.

*Associate Professor of
Dermatology
University of California
San Francisco, California*

JOHN WILLARD RIPPON, Ph.D.

*Associate Professor of Medicine
The Pritzker School of Medicine
University of Chicago
Chicago, Illinois*

**SHIRLEY McMILLEN,
Mycologist**

*Cook County Hospital
Chicago, Illinois*

HARRY M. ROBINSON, JR., M.D.

*Professor and Head of
Dermatology
University of Maryland School of
Medicine
Baltimore, Maryland*

LEOPOLDO F. MONTES, M.D.

*Professor of Dermatology
Associate Professor
of Microbiology
University of Alabama
Medical Center
Birmingham, Alabama*

**RAYMOND C. V. ROBINSON,
M.D.**

*Assistant Professor of
Dermatology
Johns Hopkins University
School of Medicine
Baltimore, Maryland*

VICTOR D. NEWCOMER, M.D.

*Clinical Professor of Medicine,
Dermatology
University of California
Los Angeles, California*

ANTARPADIHA-GONÇALVES, M.D.

*Professor of Dermatology
of the Escola de Medicina e
Cirurgia (Guanabara State-Brazil)
and
Professor of Dermatology of the
Faculdade de Medicina de
Petrópolis
(Rio de Janeiro State-Brazil)*

**STANLEY A. ROSENTHAL,
Ph.D.**

*Associate Professor of
Experimental Dermatology
Department of Dermatology
New York University Medical
Center
New York, New York*

JOHN P. TINDALL, M.D.

*Associate Professor of
Dermatology
Duke University Medical Center
Durham, North Carolina*

JOAN RASKIN, M.D.

*Associate Professor of
Dermatology
University of Maryland,
School of Medicine
Baltimore, Maryland*

M. EUGENE TUDINO, M.D.

*Assistant Professor of
Dermatology
University of Maryland School of
Medicine
Baltimore, Maryland*

HENRY JAMES WERNER, Ph.D. J. WALTER WILSON, M.D.

*Professor of Zoology
Louisiana State University
Baton Rouge, La.*

*Chief, Dermatology,
Veterans Administration Hospital
Long Beach, California*

STEWART E. WIEGAND,
M.S., M.D.

*Clinical Instructor of Medicine
(Dermatology)
Emory University School of
Medicine
Atlanta, Georgia*

EDWIN T. WRIGHT, M.D.

*Chief, Dermatology Section and
Assoc. Professor of Medicine
Veterans Administration Hospital
School of Medicine
University of California
Los Angeles, California*

WALTER H. WILBORN, Ph.D.

*Associate Professor of Anatomy
and Dermatology
University of Alabama Medical
Center
Birmingham, Alabama*

PREFACE

THIS VOLUME contains presentations by the many investigators who contributed to the success of the symposia on the "Diagnosis and Treatment of Fungal Infections" at the annual meetings of the American Academy of Dermatology in recent years. In addition, there are manuscripts by other authors who by their research have contributed to our knowledge of mycotic infections. In preparing this book, an attempt has been made to bridge the gap between the basic scientist and the clinician, to expand present knowledge and to present results of recent research.

The Academy symposium served for many years as an educational experience for trainees in dermatology and a refresher course for practitioners. Participants were carefully selected for their expertise; therefore, the manuscripts included in this volume reflect current opinion as stated by well-qualified scientists.

The past fifteen years have witnessed significant advances in the diagnosis and treatment of mycotic infections. Modern medical science is deeply indebted to those investigators whose ingenuity was responsible for the basic and clinical research necessary for the continued production of new and more effective diagnostic and therapeutic methods.

The annual meeting of the American Academy of Dermatology has provided the stage setting for the initial presentations of many innovations in the field of mycology. Who could forget the dramatic introduction of griseofulvin by Harvey Blank in 1959 or the novel exhibit on fungus cultures by J. Walter Wilson? Tolnaftate, another specific antifungal drug, made its debut at an American Academy meeting. Harrell, Zaias, Ochoa, Wilson, Arnold, Marples, Everett, Weary, Roth, and many others unselfishly gave their time and effort to prepare and present outstanding papers for this annual symposium.

In this volume there are articles on various subjects concerning both superficial and deep mycotic infections. This book is not a comprehensive review of the field of mycology and is not intended as a text for students. It is a compilation

of articles representing current thought on various topics in the research, diagnosis and treatment of fungal infections.

As organizer and moderator of the American Academy of Dermatology Symposium on the Diagnosis and Treatment of Fungal Infections, I enjoyed the cooperation of my old friends who not only presented papers, but also helped me find young talented people who were also willing to contribute to our knowledge.

As editor of this publication, I wish to extend my sincere thanks to all who contributed manuscripts.

Harry M. Robinson, Jr.

ACKNOWLEDGMENTS

PREPARATION of a volume such as this is a labor of love; therefore, I am deeply indebted to those of my confreres who contributed to this volume.

Special thanks are due to Mrs. Judith Lubao, our secretary, who spent many hours on the necessary voluminous correspondence, retyping of some manuscripts and the other countless tasks necessary to bring this book to completion.

H.M.R., Jr.

CONTENTS

| | <i>Page</i> |
|------------------------------|-------------|
| <i>Contributors</i> | vii |
| <i>Preface</i> | xi |
| <i>Acknowledgments</i> | xiii |

PART I CLINICAL STUDIES

Chapter

| | |
|--|-----|
| 1. CUTANEOUS CANDIDIASIS <i>Thomas E. Drake and Howard I. Maibach</i> | 5 |
| 2. TRICHOPHYTON RUBRUM <i>Nina Dabrowa</i> | 29 |
| 3. TINEA IMBRICATA <i>Harry L. Arnold, Jr.</i> | 41 |
| 4. DERMATOPHYTIC FUNGUS INFECTIONS INVOLVING THE FACE (TINEA FACIALE) <i>John P. Tindall and Melvin L. Elson</i> | 43 |
| 5. SKIN INFECTIONS BY THE DERMATOPHYTIC FUNGI, INCLUDING ALTERNARIOSIS <i>John P. Tindall and Bernard F. Fetter</i> | 51 |
| 6. CUTANEOUS NORTH AMERICAN BLASTOMYCOSIS: A REVIEW OF FORTY-EIGHT PATIENTS <i>John P. Tindall and Melvin L. Elson</i> | 73 |
| 7. NORTH AMERICAN BLASTOMYCOSIS <i>Ullin W. Leavell, Jr.</i> | 89 |
| 8. OCCUPATIONAL FUNGUS INFECTIONS <i>Eugene S. Bereston</i> | 99 |
| 9. THE ROLE OF OPPORTUNISTIC PATHOGENS IN THE PRODUCTION OF DISEASE <i>T. Lawrence Fleisher</i> | 113 |

| | | |
|-----|--|-------------|
| xvi | <i>Diagnosis and Treatment of Fungal Infections</i> | |
| | <i>Chapter</i> | <i>Page</i> |
| 10. | SYSTEMIC SPOROTRICHOSIS <i>Peter J. Lynch</i> | 129 |
| 11. | MUCOCUTANEOUS HISTOPLASMOSIS <i>M. Eugene Tudino</i> | 145 |
| 12. | TINEA CAPITIS <i>Raymond C. V. Robinson</i> | 153 |
| 13. | DIFFERENTIAL DIAGNOSIS OF PIGMENTED DOTS IN THE SCALP <i>Marvin E. Chernosky</i> | 157 |
| 14. | TINEA NIGRA PALMARIS <i>John A. Kenney, Jr.</i> | 165 |
| 15. | TINEA VERSICOLOR, 1846-1900—A HISTORICAL SURVEY BASED ON SELECTIONS FROM WRITINGS OF THE NINETEENTH CENTURY <i>Frances Keddie</i> | 169 |
| 16. | FUNGUS AND YEAST INFECTIONS OF THE NAILS <i>Joseph W. Burnett and Gary J. Calton</i> | 185 |
| 17. | ACTINOMYCOSIS <i>Antonio Gonzalez Ochoa</i> | 191 |
| 18. | PARACOCIDIOIDOMYCOSIS (LUTZ'S MYCOSIS) <i>Antar Padilha-Gonçalves</i> | 207 |
| 19. | COCCIDIOIDOMYCOSIS <i>Norman E. Levan</i> | 241 |

PART II

PATHOLOGY OF SUPERFICIAL AND DEEP MYCOTIC INFECTIONS

| | | |
|-----|---|-----|
| 20. | HISTOPATHOLOGY OF SUPERFICIAL FUNGUS INFECTIONS <i>Robert G. Freeman, Lawrence M. Joseph, Sally Jackson and Roberta Halloran</i> | 261 |
| 21. | THE PATHOLOGY OF THE DEEP FUNGUS INFECTIONS <i>David W. Kersting</i> | 277 |

PART III

THERAPY

| <i>Chapter</i> | <i>Page</i> |
|--|-------------|
| 22. DRUG THERAPY OF MYCOTIC INFECTIONS <i>Harry M. Robinson, Jr.</i> | 293 |
| 23. TOLNAFTATE <i>Philip Charney</i> | 301 |
| 24. GRISEOFULVIN-ABSORPTION, METABOLISM AND EXCRETION <i>Vinod P. Shah, William L. Epstein and Sidney Riegelman</i> | 315 |

PART IV

MICROBIOLOGY AND IMMUNOLOGY

| | |
|---|-----|
| 25. COCCIDIOIDOMYCOSIS: MYCOLOGY-PATHOLOGY-IMMUNOLOGY <i>Edwin T. Wright</i> | 341 |
| 26. CHRONIC MUCOCUTANEOUS CANDIDIASIS; ASSOCIATED LABORATORY ABNORMALITIES <i>Joseph W. Landau</i> | 355 |
| 27. RELEVANCE OF SEXUAL FORMS OF PATHOGENIC FUNGI TO DERMATOLOGY <i>John Willard Rippon</i> | 373 |
| 28. THE FINE STRUCTURE OF DERMATOPHYTES <i>Henry James Werner</i> | 381 |

PART V

LABORATORY DIAGNOSTIC STUDIES

| | |
|---|-----|
| 29. KOH AND CULTURE IN TINEA PEDIS <i>Mark Allen Everett</i> | 391 |
| 30. MYCOLOGIC EXAMINATION OF NAILS <i>Norman Goldfarb</i> | 395 |
| 31. THE SEROLOGY OF SPOROTRICHOSIS <i>Shirley McMillen</i> | 401 |

| | | |
|-------|--|-------------|
| xviii | <i>Diagnosis and Treatment of Fungal Infections</i> | |
| | <i>Chapter</i> | <i>Page</i> |
| 32. | RECOGNITION OF DERMATOPHYTES WITH pH INDICATION AGAR <i>Stewart E. Wiegand</i> | 411 |
| 33. | COCCIDIOIDIN <i>Victor D. Newcomer</i> | 435 |
| 34. | SKIN TESTING IN SYSTEMIC MYCOSES <i>J. Walter Wilson</i> | 459 |

PART VI

EXPERIMENTAL STUDIES

| | | |
|-----|--|-----|
| 35. | FLUORESCENCE MICROSCOPY IN THE STUDY OF MYCOSES <i>Joan Raskin</i> | 473 |
| 36. | DIAGNOSTIC TECHNIQUES OF THE FUTURE <i>Kent F. Jacobs</i> | 499 |
| 37. | THE EPIDEMIOLOGY OF TINEA PEDIS <i>Stanley A. Rosenthal</i> | 515 |
| 38. | ULTRASTRUCTURE OF FUNGAL-HOST RELATIONSHIP IN KIDNEYS OF EXPERIMENTAL CANDIDIASIS <i>Walter H. Wilborn and Leopoldo Montes</i> | 527 |
| 39. | PROPHYLACTIC GRISEOFULVIN AGAINST TRICHOPHYTON MEN- TAGROPHYTES INFECTION <i>William A. Akers</i> | 533 |
| 40. | A PRELIMINARY REPORT ON A POTENTIALLY NEW ANTI- FUNGAL COMPOUND <i>Gary J. Calton and Joseph W. Burnett</i> | 553 |
| | <i>Index</i> | 555 |

THE DIAGNOSIS AND TREATMENT OF FUNGAL INFECTIONS