Aspergillus

Biology and Industrial Applications

J.W. Bennett
M.A. Klich

Aspergillus: Biology and Industrial Applications

Edited by

J.W. Bennett
Department of Cell and Molecular Biology
Tulane University
New Orleans, Louisiana

M.A. Klich
United States Department of Agriculture
Southern Regional Research Center
New Orleans, Louisiana

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CONTRIBUTORS

Randy M. Berka
Research & Development
Genencor International
South San Francisco, California

Jeannette M. Birmingham
Mycology and Botany Department
American Type Culture Collection
Rockville, Maryland

A. John Clutterbuck
Department of Genetics
University of Glasgow
Glasgow, Scotland

Medha Devchand
Allelix Biopharmaceuticals Inc.
Mississauga, Ontario, Canada

Dennis M. Dixon
Department of Health, State of New York
Albany, New York
Present address:
National Institutes of Health
National Institute of Allergy and Infectious Diseases
Bethesda, Maryland

Nigel Dunn-Coleman
Research & Development
Genencor International
South San Francisco, California

Katsuya Gomi
National Research Institute of Brewing
Tokyo, Japan

David I. Gwynne
Cambridge NeuroScience
Cambridge, Massachusetts

Shodo Hara
National Research Institute of Brewing
Tokyo, Japan

Shung-Chang Jong
Mycology and Botany Department
American Type Culture Collection
Rockville, Maryland

Katsuhiko Kitamoto
National Research Institute of Brewing
Tokyo, Japan

Maren A. Klich
USDA-ARS
Southern Regional Research Center
New Orleans, Louisiana

George Knaphus
Department of Botany
Iowa State University
Ames, Iowa

Jiři Kominek
Institute of Biochemical Technology and Microbiology
Technical University of Vienna
Vienna, Austria

Christian P. Kubicek
Institute of Biochemical Technology and Microbiology
Technical University of Vienna
Vienna, Austria

John E. Linz
Department of Food Science and Human Nutrition
Michigan State University
East Lansing, Michigan

Sylvia D. Martinelli
Pelham House
Brent Pelham
Buntingford, United Kingdom

Edward J. Mullaney
USDA-ARS
Southern Regional Research Center
New Orleans, Louisiana

Shantha Perera
Department of Applied Biology and Building
College of Technology
Brighton, United Kingdom

James J. Pestka
Department of Food Science and Human Nutrition
Michigan State University
East Lansing, Michigan

A.C. Pier
Department of Veterinary Sciences
University of Wyoming
Laramie, Wyoming

J.L. Richard
Mycotoxin Research Laboratory
USDA-ARS
Northern Regional Research Center
Peoria, Illinois

Max Roehr
Institute of Biochemical Technology and Microbiology
Technical University of Vienna
Vienna, Austria

Robert A. Samson
Centraalbureau Voor Schimmelcultures
Baarn, The Netherlands

Claudio Scazzocchio
Institut de Génétique et Microbiologie
Université Paris Sud, Centre d'Orsay
Orsay, France

Michael G. Schechtman
Biotechnology, Biologics, and Environmental Protection
USDA
Animal and Plant Health Inspection Service
Hyattsville, Maryland

Amina Sheikh (nee Zamir)
Genentec Inc.
South San Francisco, California

Lois H. Tiffany
Department of Botany
Iowa State University
Ames, Iowa

Thomas J. Walsh
Infectious Disease
National Cancer Institute
Bethesda, Maryland

Michael Ward
Research & Development
Genencor International
South San Francisco, California

Lawrence N. Yager
Department of Biology
Temple University
Philadelphia, Pennsylvania

PREFACE

Aspergillus is a genus of asexual (anamorphic) molds, some members of which have sexual (teleomorphic) stages classified among the Ascomycetes. The taxon was first described in 1729 by Micheli, a Florentine priest-mycologist. The conidiophore that characterizes the genus consists of a long hyphal cell culminating in a globe-like spore-bearing structure. Micheli was reminded of the aspergillum, a liturgical device used to sprinkle holy water, hence the name.

Aspergilli are now recognized as some of the most widely distributed and abundant of living things. In addition to the major role they play in the natural world, their metabolic versatility has both positive and negative economic consequences for human commerce. They are major agents of decomposition and decay. The enzymes that facilitate their biodegradative activities can also be harnessed in food fermentations and industrial processes. Some aspergilli cause serious diseases (mycoses) or produce toxic metabolites (mycotoxins). Others are grown in controlled fermentations in order to harvest various small molecules of industrial importance (e.g., citric acid and lovastatin). Examples of medically and industrially important species include: *A. flavus* (aflatoxin production); *A. fumigatus* (etiological agent in aspergillosis); *A. nidulans* (model system for genetic studies); *A. niger*

(citric acid production); and *A. oryzae* (saki and soy sauce production). *A. niger* and *A. oryzae* are both on the U.S. Food and Drug Administration "GRAS list" (generally regarded as safe).

As aspergilli are eukaryotic microbes capable of efficient secretion in liquid culture, modern biotechnologists have reevaluated the potential of these fungi as models for basic science as well as for cloning hosts in industrial fermentations. Advances in molecular biology have provided new approaches to old problems in plant and animal pathology; to selection of high-yielding industrial strains; to identification and control of decay organisms; and to basic studies in taxonomy, ecology, and physiology.

This book arose out of a chapter in an earlier book in the Butterworth–Heinemann Biotechnology Series entitled *Biology of Industrial Microorganisms*, edited by A.L. Demain and N. Solomon, which highlighted the diverse ways in which microorganisms have been used in biotechnology. We are grateful to Arny Demain for suggesting that the chapter on *Aspergillus* be expanded into an entire book. Additional thanks are due to Paul Bayman, Mia Molvray, and Toby Fiebelman for their stimulating discussions seasoned with generous doses of mycological humor. Gauri Radkur and Melissa Thorne gave superb help with revisions and manuscript preparations. Rose Glade provided months of cheerful and competent secretarial assistance. Just 5 days before we completed our editorial work, Ms. Glade was in a serious automobile accident so our pleasure in finishing the book is dampened because she is in the hospital and unable to celebrate with us.

John, Dan, and Mark Bennett provided filial encouragement, and Ed Mullaney could not have been more supportive during the double gestation. Last, but not least, we thank Gwen Mullaney for waiting.

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M.A. Klich

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