

Fungal Biology

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Fungal biology has an integral role to play in the development of the biotechnology and biomedical sectors. It has become a subject of increasing importance as new fungi and their associated biomolecules are identified. The interaction between fungi and their environment is central to many natural processes that occur in the biosphere. The hosts and habitats of these eukaryotic microorganisms are very diverse; fungi are present in every ecosystem on Earth. The fungal kingdom is equally diverse, consisting of seven different known phyla. Yet detailed knowledge is limited to relatively few species. The relationship between fungi and humans has been characterized by the juxtaposed viewpoints of fungi as infectious agents of much dread and their exploitation as highly versatile systems for a range of economically important biotechnological applications. Understanding the biology of different fungi in diverse ecosystems as well as their interactions with living and non-living is essential to underpin effective and innovative technological developments. This series will provide a detailed compendium of methods and information used to investigate different aspects of mycology, including fungal biology and biochemistry, genetics, phylogenetics, genomics, proteomics, molecular enzymology, and biotechnological applications in a manner that reflects the many recent developments of relevance to researchers and scientists investigating the Kingdom Fungi. Rapid screening techniques based on screening specific regions in the DNA of fungi have been used in species comparison and identification, and are now being extended across fungal phyla. The majorities of fungi are multicellular eukaryotic systems and therefore may be excellent model systems by which to answer fundamental biological questions. A greater understanding of the cell biology of these versatile eukaryotes will underpin efforts to engineer certain fungal species to provide novel cell factories for production of proteins for pharmaceutical applications. Renewed interest in all aspects of the biology and biotechnology of fungi may also enable the development of “one pot” microbial cell factories to meet consumer energy needs in the 21st century. To realize this potential and to truly understand the diversity and biology of these eukaryotes, continued development of scientific tools and techniques is essential. As a professional reference, this series will be very helpful to all people who work with fungi and should be useful both to academic institutions and research teams, as well as to teachers, and graduate and postgraduate students with its information on the continuous developments in fungal biology with the publication of each volume.

More information about this series at <http://www.springer.com/series/11224>

Arti Gupta • Nagendra Pratap Singh
Editors

Recent Developments in Fungal Diseases of Laboratory Animals

 Springer

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Preface

Fungal growths may significantly impact human and animal well-being. Numerous natural pathogens of laboratory animals may alter host physiology, rendering the host unsuitable for many experimental uses. While the number and prevalence of several pathogens have declined considerably, many still appear in laboratory animals and represent unwanted variables in research. Investigators using laboratory animals in biomedical experimentation should be aware of the profound effects that these agents can have on research. What does the future hold regarding the natural pathogens of laboratory animals? The choice of which animal model to use must be considered carefully, addressing issues on the type of human disease to mimic, the parameters to follow, and collection of the appropriate data to answer the questions being asked. Overall, animal models of fungal infection will continue to deepen our understanding of how these infections occur, progress, and can be controlled and eliminated. This book provides a valuable source of information for biological and biomedical scientists, and clinical and academic researchers working the area of fungal infections or diseases of laboratory animal species including mice and rats. To overcome this problem of fungal infections, we are trying to fill this knowledge gap by introducing some antifungal medicines that work by either killing the fungal cells, for example, by affecting a substance in the cell walls, causing the contents of the fungal cells to leak out and the cells to die, or preventing the fungal cells from growing and reproducing. We will attempt our level best to incorporate what we consider the most vital infectious agents found in lab animals as of now. Also, endeavors have been made to incorporate however much data as could reasonably be expected from natural outbreaks of disease. However, a lot of data will likewise be incorporated from experimental/lab-based *in vitro* studies and trials that may be based on conditions like the course and dosage to those of natural infections.

This book covers fungal infection as a keystone reference, reflecting state-of-the-art research and current emerging issues in fungal biology and biotechnology in the animal system. It reviews the methods and experimental work used to investigate different aspects of fungal infection and provides examples of the diverse applications of fungal infection. This book has been edited by an experienced team, with contributions from international specialists. It should be an invaluable resource

for industry-based researchers, academic institutions, and professionals working in the area of fungal biology and associated infection and prevention for their applications. It should be immensely useful to those in the field of biological sciences, especially microbiologists, microbial biotechnologists, biochemists, researchers, and scientists of fungal biotechnology. We have been honored that the leading scientists who have extensive, in-depth experience and expertise in fungal systems and microbial biotechnology took the time and effort to develop these outstanding chapters. Each chapter was written by an internationally recognized researcher or scientist with up-to-date and detailed knowledge of white biotechnology and the innumerable industrial applications of fungi.

This volume comprises ten chapters. In Chap. 1, emphasis is given on emerging infectious diseases in a variety of animals and their control measures are discussed. Additionally, the factors affecting the spread of fungal pathogens are also described by Shukla. Chapter 2 presented by Suman et al. covers the importance of honey bee, their role in the ecosystem and the impact of microsporidian disease, one of the most significant and less studied diseases, on the honey bee population worldwide. In Chap. 3, Avnish et al. suggested that limitations of the currently available rapid tests for point-of-care diagnosis of fungal diseases can be surpassed by fusing molecular biology techniques and immunodiagnostic procedures, along with other conventional devices and techniques. Chapter 4 by Tell et al. highlights the broad health and economic impacts of aspergillosis on veterinary medicine across so many animal species, making additional studies crucial. In Chap. 5, Hilal describes fungal diseases of animals, detailing symptoms and their cure by natural products. Chapter 6 by Kamal et al. represents an overview of the different categories of fungal infections that can be encountered in animals and also assesses the effect of climate change on mycotic diseases. Chapter 7 by Saurabh and Suchit deals with the epidemiology, pathophysiology, and symptoms of chronic obstructive pulmonary disease, together with invasive pulmonary aspergillosis. In Chap. 8, Shiv et al. place emphasis on the incidence of drug resistance and the importance of adjusting antifungal therapy and finding a newer drug to treat sporotrichosis. Plant-derived drugs may be an alternative approach for curing sporotrichosis and combating antifungal drug resistance. Ravindra and Ruhel focus, in Chap. 9, on invasive fungal infections in humans, diagnostic methods, and their treatment, including future implications of these infections, where more research in this field is required to facilitate the development of better diagnostic tests, therapies, and preventive vaccines. In Chap. 10, Yadav and Malvi give an overview of diseases in animals caused by fungi forming biofilms, which is a huge challenge in veterinary medicine.

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Poster Presenter awarded by the International Consortium of Contemporary Biologists (ICCB) and Madhavi Shyam Educational Trust, Ranchi, Fellowship Award awarded by the International Consortium of Contemporary Biologists (FICCB) and Madhavi Shyam Educational Trust (FMSET), and Dr. V.P. Agarwal Gold Medal awarded by D.A.V. (P.G.) College, Muzaffarnagar. Dr. Arti has lifetime memberships with the Indian Science Congress Association, Biotech Research Society of India, Zoological Society of India, and International Consortium of Contemporary Biologists.



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