

Illustrated Practical Microbiology

provides the undergraduate students a reliable, comprehensive, practical and informative approach to gaining high scores in the practical examinations.

- The book contains well displayed tables, detailed charts, summary text boxes and mnemonics to save students' time.
- Well labelled and captioned photographs serve as an effective tool to help retention by engaging the visual memory.
- The text is concise, easy to read and to the point.
- A separate section on frequently asked questions has been added to make understanding of the subject easy and interesting.
- Relevant addition has been made to highlight hospital infection control measures and biomedical waste management.

Amandeep Singh MBBS, MD

was Assistant Professor, Department of Microbiology, Grant Medical College and JJ Group of Hospitals, Mumbai; and earlier Assistant Professor, Department of Microbiology, Dr Shankarrao Chavan Government Medical College, Nanded, Maharashtra. He is currently Postdoctoral Fellowship Resident, Christian Medical College, Vellore, TN.



He completed his MBBS from SGRD Institute of Medical Sciences and Research, Amritsar, and MD (Microbiology) from Grant Government Medical College and Sir JJ Group of Hospitals, Mumbai. His area of interest includes infectious diseases, mycology and quality assurance. He has undergone specialized training in antifungals susceptibility testing (at PGIMER, Chandigarh), training in molecular techniques and laboratory quality management and internal audit.

Shuvankar Mukhopadhyay MBBS, MD

is currently Assistant Professor, Department of Microbiology, Hiteck Group of Medical Colleges, Odisha. Earlier, he was Assistant Professor, Department of Microbiology, Dr Shankarrao Chavan Government Medical College, Nanded, Maharashtra. He completed his MBBS from Calcutta National Medical College and MD (Microbiology) from TN Medical College & BYL Nair Hospital, Mumbai. His area of interest includes parasitology, molecular microbiology and immunology. He has undergone special training in molecular microbiology from Kasturba Hospital, Mumbai. He has to his credit five international and two national papers published in well reputed journals of microbiology.



CBS Publishers & Distributors Pvt Ltd

4819/XI, Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi 110 002, India
E-mail: delhi@cbspd.com, cbspubs@airtelmail.in Website: www.cbspd.com
New Delhi | Bengaluru | Chennai | Kochi | Kolkata | Mumbai
Hyderabad | Nagpur | Patna | Pune | Vijayawada

ISBN : 978-93-86217-92-9



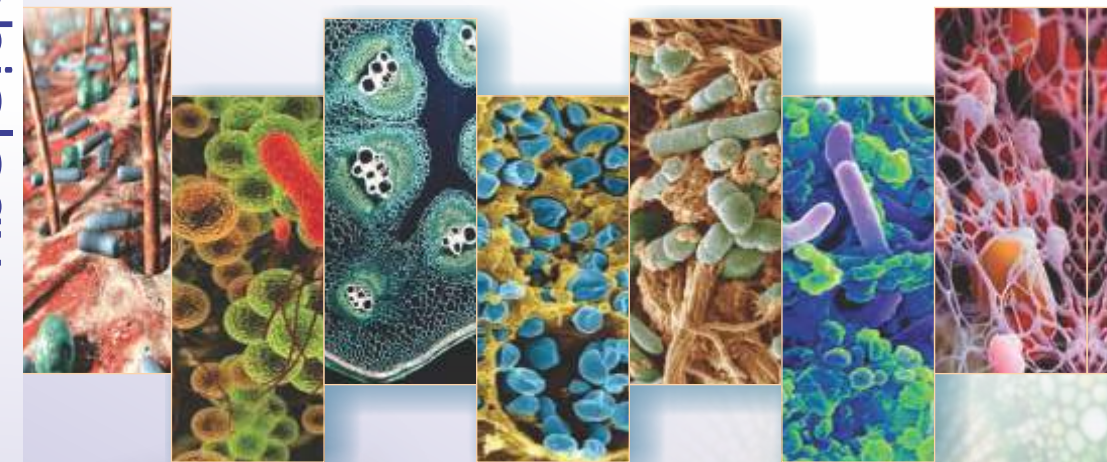
9 789386 217929

Illustrated Practical Microbiology

Singh | Mukhopadhyay




Illustrated Practical Microbiology



Amandeep Singh
Shuvankar Mukhopadhyay



CBS Publishers & Distributors Pvt Ltd

The background of the cover features a light blue and white color scheme. On the left, there is a vertical teal bar. The main area is a light blue gradient with a faint, semi-transparent image of a laboratory setting, including what appears to be a petri dish and some laboratory equipment. The title is centered in the upper half of the page.

Illustrated Practical
Microbiology



Illustrated Practical Microbiology

Amandeep Singh MBBS, MD

Postdoctoral Fellowship Resident
Christian Medical College, Vellore, TN

Ex-Assistant Professor

Department of Microbiology

Grant Government Medical College and JJ Group of Hospitals
Mumbai, Maharashtra

Shuvankar Mukhopadhyay MBBS, MD

Assistant Professor in Microbiology

Hitech Group of Medical Colleges, Odisha

Ex-Assistant Professor

Department of Microbiology

Dr Shankarrao Chavan Government Medical College
Nanded, Maharashtra



CBS Publishers & Distributors Pvt Ltd

New Delhi • Bengaluru • Chennai • Kochi • Kolkata • Mumbai

Hyderabad • Nagpur • Patna • Pune • Vijayawada

Disclaimer

Science and technology are constantly changing fields. New research and experience broaden the scope of information and knowledge. The authors have tried their best in giving information available to them while preparing the material for this book. Although all efforts have been made to ensure optimum accuracy of the material, yet it is quite possible some errors might have been left uncorrected. The publisher, the printer and the authors will not be held responsible for any inadvertent errors, omissions or inaccuracies.



ISBN: 978-93-86217-92-9

Copyright © Author and Publisher

First Edition: 2017

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system without permission, in writing, from the author and the publisher.

Published by Satish Kumar Jain and produced by Varun Jain for

CBS Publishers & Distributors Pvt Ltd

4819/XI Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi 110 002, India.

Ph: 23289259, 23266861, 23266867 Website: www.cbspd.com

Fax: 011-23243014

e-mail: delhi@cbspd.com; cbspubs@airtelmail.in.

Corporate Office: 204 FIE, Industrial Area, Patparganj, Delhi 110 092

Ph: 4934 4934

Fax: 4934 4935

e-mail: publishing@cbspd.com; publicity@cbspd.com

Branches

- **Bengaluru:** Seema House 2975, 17th Cross, K.R. Road, Banasankari 2nd Stage, Bengaluru 560 070, Karnataka
Ph: +91-80-26771678/79 Fax: +91-80-26771680 e-mail: bangalore@cbspd.com
- **Chennai:** 7, Subbaraya Street, Shenoy Nagar, Chennai 600 030, Tamil Nadu
Ph: +91-44-26680620, 26681266 Fax: +91-44-42032115 e-mail: chennai@cbspd.com
- **Kochi:** Ashana House, No. 39/1904, AM Thomas Road, Valanjambalam, Ernakulam 682 018, Kochi, Kerala
Ph: +91-484-4059061-65 Fax: +91-484-4059065 e-mail: kochi@cbspd.com
- **Kolkata:** 6/B, Ground Floor, Rameswar Shaw Road, Kolkata-700 014, West Bengal
Ph: +91-33-22891126, 22891127, 22891128 e-mail: kolkata@cbspd.com
- **Mumbai:** 83-C, Dr E Moses Road, Worli, Mumbai-400018, Maharashtra
Ph: +91-22-24902340/41 Fax: +91-22-24902342 e-mail: mumbai@cbspd.com

Representatives

- **Hyderabad** 0-9885175004 • **Nagpur** 0-9021734563 • **Patna** 0-9334159340
- **Pune** 0-9623451994 • **Vijayawada** 0-9000660880

Printed at



to

*our Teachers, Parents and Students
with Special Thanks to Dr Chhaya Chande*

"Never regard study as a duty, but as the enviable opportunity to learn."

Albert Einstein



Foreword

I take great pleasure in writing this foreword for "*Illustrated Practical Microbiology*".

I know the authors from the last 4 years. Both are ambitious, highly motivated students and always eager to learn new things. I have observed in them a constant desire to learn more and strive for perfection. They have an experience in teaching microbiology to undergraduates and other paraclinical branches. Authors are also well versed with conducting undergraduate examinations for MBBS students.

The book includes many coloured photographs, microscopic slides, media and biochemical reactions, etc.

The book will be of definite benefit to students of MBBS, other paraclinical branches as well as postgraduates preparing for the university examinations.

I am delighted to encourage and assist them in pursuit of their goal. I wish the authors a grand success.



Abhay Chowdhary

MD, DHA, DM Virology, FIMSA, FRSTMH

Professor and Head

Department of Microbiology

Grant Govt. Medical College and Sir JJ Group of Hospitals

Mumbai



Preface

In our book titled *“Illustrated Practical Microbiology”*, the primary goal is to provide the undergraduate students with a reliable, comprehensive, practical and informative approach towards their practical examination. The authors describe the basic issues in practical microbiology, general principles for safety and diagnostic approaches including antimicrobial susceptibility testing and identification.

To facilitate understanding of the subject matter, we continue to employ the tables, detailed charts, summary text boxes and mnemonics. The labelled and captioned photographs have been selected to aid retention by engaging the visual memory in a manner complementary to mnemonics. The book is concise, easy to read, to the point text and a separate section on frequently asked questions has been added which has made the understanding of the subject easy and interesting. Also there is a relevant addition in the view of growing importance to hospital infection control measures and biomedical waste management.

This edition may replace the other books as a textbook of practical microbiology for MBBS, lab technology students and will also help the postgraduate students and thus may be recommended for the same. This edition integrates the theoretical principles and experimental techniques common to all the undergraduate courses.

We invite the students and faculty to share their thoughts and ideas to help us continually to improve through our blog and collaborative editorial platform. We will gladly make corrections if they are brought to our attention.

Amandeep Singh

Shuvankar Mukhopadhyay

Figures Courtesy

Department of Microbiology
Grant Govt. Medical College and JJ Group of Hospitals
Mumbai

Department of Microbiology
TN Medical College and BYL Nair Hospital
Mumbai

Gupta Polyclinic and Diagnostic Centre
Rourkela, Odisha

Acknowledgements

All praise and glory to Almighty who gave us courage and patience to carry out this work. We would like to express our gratitude to all those who gave us the possibility to complete this book.

First of all, we would like to express our thanks to Dr Chhaya Chande (Associate Professor, GGMC, Mumbai) for her suggestions and provision of the materials evaluated in this book, whose expertise, understanding and patience, added considerably to our experience. We appreciate her vast knowledge and skill, and her assistance in writing this book.

We are very grateful to Dr SG Joshi (Professor, GGMC, Mumbai) and Dr Sarala Menon (Associate Professor, GGMC, Mumbai), without whose motivation and encouragement we would not have considered this book to be complete.

Dr Abhay Chowdhary (Professor and Head, Department of Microbiology, GGMC, Mumbai) is the one teacher who truly made a difference in our lives. It was under his tutelage that we developed a focus and became interested in writing this book. It was through his persistence, understanding and kindness that we completed this book. We doubt that we will ever be able to convey our appreciation fully, but we owe him our eternal gratitude.

Dr Jayanti Shastri (Professor and Head, Department of Microbiology, Nair Medical College, Mumbai) whose untiring efforts and drive to reach perfection have always been a source of inspiration. Her word of care and hand of support has been the pillar of strength while writing this book.

We would also like to thank our friends in the department for valuable, exchanges of knowledge while writing this book, which helped enrich the experience.

We would also like to thank our family with Special thanks to Dr Tapan Mukhopadhyay and Dr Ramala Mukhopadhyay, parents of second author and Mr Harvinder Singh and Ms Surinder Kaur, parents of first author for their support. Without their love, patience, understanding and encouragement we would not have been able to complete this book.

Department of Microbiology, Grant Govt Medical College and JJ Group of Hospitals, Mumbai; we will like to acknowledge following for providing us some of the illustrations:

Department of Microbiology, TNMC and BYL Nair Hospital, Mumbai.
Gupta Polyclinic and Diagnostic Centre, Rourkela, Odisha.

Last but not the least we would like to express our gratitude to CBS Publishers and their team for their substantial contributions associated with the completion of this book.

We hope this book serves to repay their contributions in some small part.

Amandeep Singh
Shuvankar Mukhopadhyay



Contents

<i>Foreword by Abhay Chowdhary</i>	<i>vii</i>
<i>Preface</i>	<i>ix</i>
<hr/>	
1. Microscopy	1
2. Staining Methods	14
3. Slides	22
4. Spots in Parasitology	67
5. Instruments	71
6. Culture Media	83
7. Individual Media	87
8. Tests for Bacterial Identification	104
9. Serology—Spots	122
10. Vaccines—Spots	135
11. Antimicrobial Susceptibility Testing (AST)	138
12. Virology—Spots	143
13. Stool Examination	147
14. Hospital Waste Management	160
15. Animals	162
16. Symbols of Importance	170
<i>Index</i>	<i>173</i>