

Second Edition

Practical Manual and Workbook of HISTOLOGY

As per the latest CBME Guidelines |
Competency Based Undergraduate
Curriculum for the Indian Medical Graduate

Salient features about the book

- Covers all the histological slides included in latest NMC recommended CBME curriculum for MBBS students, along with the competencies.
- Description of the slides has been included with relevant clinical anatomy related to each system.
- Key features of all the slides have been added in the book that would help the students to identify the slides in a better way.
- Simple and self-explanatory hand-drawn diagrams of all the slides have been provided.
- Additional circles have been included to make it an ideal workbook so that the students can practice drawing the diagrams and learn histology more effectively.

Veena V Kulkarni MBBS, MD

is Professor, Department of Anatomy, SDM College of Medical Sciences and Hospital, Shri Dharmasthala Manjunatheshwara University, Dharwad, Karnataka. She completed her graduation from JSS Medical College, Mysuru, and postgraduation from Jawaharlal Nehru Medical College, Belgaum, Karnataka. She has to her credit research papers published in indexed national and international journals. She has presented a scientific paper in international conference held at Malaysia. She has 16 years of teaching experience for both undergraduate and postgraduate students.

Rakesh Kumar BPT, MSc (Medical Anatomy)

is Tutor, Department of Anatomy, SDM College of Medical Sciences and Hospital, Shri Dharmasthala Manjunatheshwara University, Dharwad, Karnataka. He completed his graduation from Rajasthan University of Health and Sciences, Jaipur, and postgraduation from Kasturba Medical College, Manipal University, Manipal, Karnataka. He has been actively involved in teaching anatomy for undergraduate students.

Review Comments

In *Practical Manual and Workbook of Histology* students find the solutions to their questions, 'How to draw', 'What to draw', 'What to focus on', after studying histology slides under the microscope. The photomicrographs provided in the *Manual* give the actual features for reference.

I congratulate the authors for bringing out the second edition which is based on the latest CBME curriculum.

Arun V Kulkarni

Professor and Head, Department of Anatomy
SDM College of Medical Sciences and Hospital
Shri Dharmasthala Manjunatheshwara University, Dharwad, Karnataka

It is a very useful workbook for undergraduate medical and paramedical students. The book includes neatly hand drawn diagrams with labelling, the key features to identify the slides, enabling the students for easy learning and quick recapitulation during assessment. It covers all the slides with the competency numbers according to CBME curriculum and also more clinical correlation incorporated.

Shilpa M Bhimalli

Professor and Head, Department of Anatomy
Kaher's JN Medical College, Belagavi, Karnataka



CBS Publishers & Distributors Pvt Ltd

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



QR Code to
access online
CBS Catalogue

ISBN: 978-93-5466-358-1



Second
Edition

Practical Manual and Workbook of HISTOLOGY

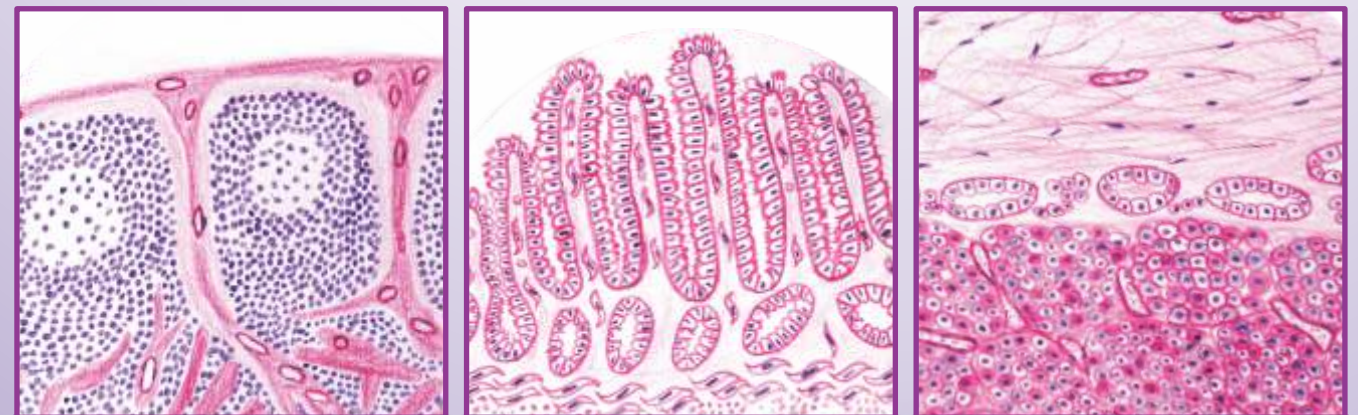
Kulkarni | Kumar



Second Edition

Practical Manual and Workbook of HISTOLOGY

As per the latest CBME Guidelines | Competency Based
Undergraduate Curriculum for the Indian Medical Graduate



**Veena V Kulkarni
Rakesh Kumar**



CBSPD Dedicated to Education

CBS Publishers & Distributors Pvt Ltd

Practical Manual and Workbook of **HISTOLOGY**

Second Edition

Name: _____

Roll No. : _____ **University Registration No. :** _____

Date of Admission: _____

Permanent Address: _____

E-mail ID: _____ **Batch:** _____

Mobile No. : _____

Practical Manual and Workbook of **HISTOLOGY**

Second Edition

Veena V Kulkarni

MBBS, MD

Professor

Department of Anatomy

SDM College of Medical Sciences and Hospital
Shri Dharmasthala Manjunatheshwara University
Dharwad, Karnataka

Rakesh Kumar

BPT, MSc

Tutor

Department of Anatomy

SDM College of Medical Sciences and Hospital
Shri Dharmasthala Manjunatheshwara University
Dharwad, Karnataka



CBS Publishers & Distributors Pvt Ltd

New Delhi • Bengaluru • Chennai • Kochi • Kolkata • Lucknow • Mumbai
Hyderabad • Jharkhand • Nagpur • Patna • Pune • Uttarakhand

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.

Practical Manual and Workbook of HISTOLOGY

ISBN: 978-93-5466-358-1

Copyright © Authors and Publisher

Second Edition: 2022

First Edition: 2021

Reprint: 2021

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 authors 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: 011-23289259, 011-23266861, 011-23266867

Fax: 011-23243014

Website: www.cbspd.com

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

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

Ph: 011-4934 4934

Fax: 011-4934 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, India
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, India
Ph: +91-44-26680620, 26681266 Fax: +91-44-42032115 e-mail: chennai@cbspd.com
- **Kochi:** 42/1325, 1326, Power House Road, Opposite KSEB, Power House, Ernakulum-682 018, Kochi, Kerala, India
Ph: +91-484-4059061-67 Fax: +91-484-4059065 e-mail: kochi@cbspd.com
- **Kolkata:** 147, Hind Ceramics Compound, 1st Floor, Nilgunj Road, Belghoria, Kolkata-700 056, West Bengal, India
Ph: +033-25633055, 033-25633056 e-mail: kolkata@cbspd.com
- **Lucknow:** Basement, Khushnuma Complex, 7-Meerabai Marg (Behind Jawahar Bhawan), Lucknow-226 001, Uttar Pradesh, India
Ph: +0552-4000032 e-mail: tiwari.lucknow@cbspd.com
- **Mumbai:** PWD Shed, Gala No. 25/26, Ramchandra Bhatt Marg, Next to JJ Hospital Gate No. 2, Opp Union Bank of India, Noorbaug, Mumbai-400009, Maharashtra, India
Ph: +022-66661880/89 e-mail: mumbai@cbspd.com

Representatives

- | | | |
|--------------------------|--------------------------|----------------------------|
| • Hyderabad 0-9885175004 | • Jharkhand 0-9811541605 | • Nagpur 0-9421945513 |
| • Patna 0-9334159340 | • Pune 0-9623451994 | • Uttarakhand 0-9716462459 |

Printed at Sanjay Printers & Publishers Pvt. Ltd., Delhi, India

Foreword

It gives me pleasure to pen a few lines as the Foreword to *Practical Manual and Workbook of Histology*. It will certainly benefit the students.

Authors have made efforts to include diagrams of histological slides along with the schematic diagrams, which will help the students to understand and draw diagrams in an easier and simpler form.

This will create interest in the subject among students and enhance their knowledge that would build a strong foundation for their medical career in future.

My best wishes to the authors.



Dr Niranjana Kumar

Hon'ble Vice Chancellor
Shri Dharmasthala Manjunatheshwara University
Dharwad, Karnataka

Preface to the Second Edition

The *Practical Manual and Workbook of Histology* was conceptualized keeping in mind the difficulties encountered by the medical, dental and paramedical students while replicating the diagrams from various similar looking histology slides.

The schematic diagrams would differ to some extent from the natural appearance of the slides under the microscope. To resolve these challenges we have compiled the pictures of histological slides available in our department with hand-drawn schematic diagrams system wise. Along with the key features, description of the slides with applied histology and relevant competency numbers have been included in this updated edition.

It is our sincere effort to make this manual student-friendly so that they develop interest in understanding and drawing the histology diagrams in their practical histology record book.

We are welcome to valuable comments and suggestions which will help us to further improve our book in the future.

We would like to humbly acknowledge Dr. Subhash K Deshpande, Professor of Anatomy and Dr. Arun V. Kulkarni, Professor of Anatomy, SDM College of Medical Sciences and Hospital, Karnataka, for all their support and guidance.

We sincerely thank all our departmental colleagues and technicians for their kind co-operation.

Veena V Kulkarni
Rakesh Kumar

Preface to the First Edition

The *Practical Manual and Workbook of Histology* was conceptualized keeping in mind the difficulties encountered by the medical, dental and paramedical students while replicating the diagrams from various similar looking histology slides.

The schematic diagrams would differ to some extent from the natural appearance of the slides under the microscope. To resolve these challenges we have compiled the pictures of histological slides available in our department with handdrawn schematic diagrams system wise. Also a few key features necessary to identify the slides have been included.

It is our sincere effort to make this manual student-friendly so that they develop interest in understanding and drawing the histology diagrams in their practical histology record book.

We are welcome to valuable comments and suggestions which will help us to further improve our book in the future.

We would like to humbly acknowledge Dr Subhash K Deshpande, Head, Department of Anatomy, SDM College of Medical Sciences and Hospital, Karnataka, for all his support and guidance.

We sincerely thank all our departmental colleagues and technicians for their kind co-operation.

Veena V Kulkarni
Rakesh Kumar

Contents

| | |
|--|-------------|
| <i>Foreword by Dr Niranjana Kumar</i> | <i>v</i> |
| <i>Preface to the Second Edition</i> | <i>vii</i> |
| <i>Preface to the First Edition</i> | <i>viii</i> |
| <i>Index of Competencies</i> | <i>x</i> |
| 1. Microscope | 1 |
| Light Microscope | 1 |
| 2. Epithelial Tissue | 4 |
| Simple Epithelium | 5 |
| Apical Surface Modification of Columnar Epithelium | 6 |
| Stratified Squamous Non-keratinized Epithelium | 8 |
| Stratified Squamous Keratinized Epithelium | 10 |
| Transitional Epithelium | 12 |
| 3. Connective Tissue | 14 |
| Cells of Connective Tissue | 14 |
| Loose Areolar Tissue | 18 |
| Dense Regular Connective Tissue | 20 |
| Dense Irregular Connective Tissue | 22 |
| Adipose Tissue | 24 |
| 4. Cartilage | 26 |
| Hyaline Cartilage | 26 |
| Elastic Cartilage | 28 |
| White Fibrocartilage | 30 |
| 5. Bone | 32 |
| Compact Bone: Transverse Section (TS) | 32 |
| Compact Bone: Longitudinal Section (LS) | 34 |
| 6. Muscle Tissue | 36 |
| Skeletal Muscle: Transverse Section (TS) | 36 |
| Skeletal Muscle: Longitudinal Section (LS) | 38 |
| Cardiac Muscle | 40 |
| Smooth Muscle | 42 |
| 7. Nervous Tissue | 44 |
| Peripheral Nerve: Transverse Section (TS) | 44 |
| Peripheral Nerve: Longitudinal Section (LS) | 46 |
| Sensory (Spinal) Ganglion | 48 |
| Autonomic (Sympathetic) Ganglion | 50 |
| 8. Circulatory System | 52 |
| Large-sized Artery (Elastic Artery) | 52 |
| Medium-sized Artery (Muscular Artery) | 54 |
| Large-sized Vein | 56 |
| Medium-sized Vein | 58 |
| 9. Lymphoid System | 60 |
| Lymph Node | 60 |
| Spleen | 62 |
| Thymus | 64 |
| Palatine Tonsil | 66 |
| 10. Respiratory System | 68 |
| Epiglottis | 68 |
| Trachea | 70 |
| Lung | 72 |
| 11. Oral Cavity and Associated Structures | 74 |
| Lip | 74 |
| Tongue: Filiform and Fungiform Papillae | 76 |
| Tongue: Circumvallate Papilla | 78 |
| Serous Salivary Gland | 80 |
| Mucous Salivary Gland | 82 |
| Mixed Salivary Gland | 84 |
| 12. Digestive System | 86 |
| Oesophagus | 86 |
| Stomach: Fundus | 88 |
| Stomach: Pylorus | 90 |
| Duodenum | 92 |
| Jejunum | 94 |
| Ileum | 96 |
| Vermiform Appendix | 98 |
| Large Intestine/Colon | 100 |
| 13. Accessory Organs of Digestive System | 102 |
| Liver | 102 |
| Gall Bladder | 104 |
| Pancreas | 106 |
| 14. Urinary System | 108 |
| Kidney (Cortex) | 108 |
| Ureter | 110 |
| Urinary Bladder | 112 |
| 15. Male Reproductive System | 114 |
| Testis | 114 |
| Epididymis | 116 |
| Ductus (Vas) Deferens | 118 |
| Prostate | 120 |
| 16. Female Reproductive System | 122 |
| Ovary | 122 |
| Uterus: Proliferative Phase | 124 |
| Uterus: Secretory Phase | 126 |
| Uterine Tube/Fallopian Tube | 128 |
| Placenta | 130 |
| Umbilical Cord | 132 |
| 17. Endocrine System | 134 |
| Pituitary Gland | 134 |
| Thyroid and Parathyroid Gland | 136 |
| Adrenal/Suprarenal Gland | 138 |
| 18. Central Nervous System | 140 |
| Cerebrum | 140 |
| Cerebellum | 142 |
| Spinal Cord: Transverse Section (TS) | 144 |
| 19. Integumentary System | 146 |
| Thick Skin | 146 |
| Thin Skin | 148 |
| 20. Organ of Special Senses | 150 |
| Eyelid | 150 |
| Cornea | 152 |
| Retina | 154 |
| Optic Nerve: Transverse Section (TS) | 156 |

Index of Competencies

| | | | |
|--|-----------|---|-----------|
| 1. AN 25.1 | 1 | 12. AN 67.2 | 66 |
| Identify, draw and label a slide of trachea and lung | 1 | Classify Muscle and describe the structure and functional correlation of the same | 70 |
| 2. AN 43.2 | 3 | 13. AN 67.3 | 1 |
| Identify, describe and draw the microanatomy of: | 3 | Describe the ultrastructure of Muscular tissue | 1 |
| Pituitary gland, thyroid and parathyroid gland, Tongue, Salivary glands, Tonsil, Epiglottis, Cornea, Retina | | 14. AN 68.1 | 1 |
| 3. AN 43.3 | 12 | Describe and Identify multipolar and unipolar Neuron, Ganglia, Peripheral nerve | 1 |
| Identify, describe and draw the microanatomy of: | | 15. AN 68.2 | 1 |
| Eyelid, lip, optic nerve | 12 | Describe the structure-function correlation of Neuron | 1 |
| 4. AN 52.1 | 24 | 16. AN 68.3 | 1 |
| Describe and identify the microanatomical features of Gastrointestinal system: | 28 | Describe the ultrastructure of Nervous tissue | 1 |
| Oesophagus, Fundus of stomach, Pylorus of stomach, Duodenum, Jejunum, Ileum, Large intestine, Appendix, Liver, Gallbladder, Pancreas, Suprarenal gland | | 17. AN 69.1 | 1 |
| 5. AN 52.2 | 30 | Identify elastic and muscular Blood vessels, Capillaries under the Microscope | 1 |
| Describe and identify the microanatomical features of: | 32 | 18. AN 69.2 | 1 |
| Urinary system: Kidney, Ureter and Urinary bladder | | Describe the various types and structure-function correlation of Blood vessel | 1 |
| Male Reproductive System: Testis, Epididymis, Vas deferens, Prostate | | 19. AN 69.3 | 1 |
| Female reproductive system: Ovary, Uterus, Uterine tube, Placenta and Umbilical cord | | Describe the ultrastructure of Blood vessels | 1 |
| 6. AN 64.1 | 34 | 20. AN 70.1 | 1 |
| Describe and identify the microanatomical features of Spinal cord, Cerebellum and Cerebrum | 40 | Identify Exocrine Gland under the microscope and distinguish between serous, mucous and mixed acini | 1 |
| 7. AN 65.1 | 42 | 21. AN 70.2 | 3 |
| Identify Epithelium under the microscope and describe the various types that correlate to its function | 48 | Identify the Lymphoid tissue under the microscope and describe microanatomy of Lymph node, Spleen, Thymus, Tonsil and correlate the structure with function | 30 |
| 8. AN 65.2 | 50 | 22. AN 71.1 | 12 |
| Describe the ultrastructure of Epithelium | 56 | Identify Bone under the microscope: classify various types and describe the function correlation of the same | 12 |
| 9. AN 66.1 | 58 | 23. AN 71.2 | 24 |
| Describe and identify various types of Connective tissue with functional correlation | 64 | Identify Cartilage under the microscope and describe various types and structure-function correlation of the same | 30 |
| 10. AN 66.2 | 66 | 24. AN 72.1 | 30 |
| Describe the ultrastructure of Connective tissue | 70 | Identify the skin and its appendages under the microscope and correlate the structure with function | 30 |
| 11. AN 67.1 | 66 | | |
| Describe and identify various types of Muscle under the microscope | 70 | | |