PRACTICAL PRINCIPLES OF CYTOPATHOLOGY
REVISED EDITION
To Alexander, David, and Jacqueline
Love, Dad
PRACTICAL PRINCIPLES OF CYTOPATHOLOGY
REVISED EDITION

Richard M. DeMay, MD
Professor of Pathology
Director of Cytopathology
University of Chicago

American Society for
Clinical Pathology
Press
Chicago, IL
Publishing Team
Jeffrey Carlson (design)
Erik Tanck (production)
Joshua Weikersheimer (publishing direction)

Author’s Acknowledgments
Thanks to the outstanding staff of the section of cytopathology: Ann Marie Maslan, Patsy Lin, Sean Macleish, Namrita Rodriguez, Rebecca Danahey, Raephaele Masrinille, Jeffrey Mueller, and Ward Reeves. Thanks also to Tom Stricker for helpful suggestions on revisions. And of course, Joan Hives and Joshua Weikersheimer—they’re still the best!

Notice
Trade names for equipment and supplies described herein are included as suggestions only. In no way does their inclusion constitute an endorsement or preference by the American Society for Clinical Pathology. The ASCP did not test the equipment, supplies, or procedures and therefore urges all readers to read and follow all manufacturers’ instructions and package insert warnings concerning the proper and safe use of products.

Copyright © 2007 by the American Society for Clinical Pathology.
All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher.

Printed in Singapore.
# Table of Contents

## Preface xi

### ONE

#### The Pap Test 1

1.1 Squamous Epithelium 1
1.2 Benign Proliferative Reactions 3
1.3 Dysplasia and Carcinoma In Situ 4
1.4 Microinvasive Carcinoma 8
1.5 Squamous Cell Carcinoma 9
1.6 Cervical Cancer: Further Considerations 11
1.7 Atypical Squamous Cells 13
1.8 Benign Cellular Changes 14
1.9 Glandular Epithelium 18
1.10 Rare Tumors 22
1.11 Pregnancy-Associated Changes 23
1.12 Miscellaneous Findings 23
1.13 Summary and Conclusions 24

### TWO

#### The Respiratory Tract 27

2.1 Diagnostic Respiratory Cytology 27
2.2 The Cells 28
2.3 Benign Proliferation 32
2.4 Therapeutic Agents 34
2.5 Granulomatous Inflammation 35
2.6 Specific Infections 36
2.7 Pulmonary Embolism/Infarct 37
2.8 Miscellaneous Benign Diseases 37
2.9 Malignant Diseases 38

### THREE

#### Fluids 49

##### BODY CAVITY FLUIDS 49

3.1 Pleural Effusions 49
3.2 Ascites 49
3.3 Pericardial Effusions 50
3.4 Special Types of Effusions 50
3.5 The Cells 51
3.6 Specific Benign Effusions 54
3.7 Malignant Effusions 55
3.8 Mesothelioma 62

**BODY CAVITY WASHINGS 64**
3.9 Mesothelial Cells 64
3.10 Gynecologic Cytology in Peritoneal Washes 64

**SYNOVIAL FLUID 66**
3.11 The Cells 66
3.12 Diseases of Synovium and Joints 67

**NIPPLE DISCHARGE 69**
3.13 The Cells 69
3.14 Cytology of Abnormal Nipple Discharge 70
3.15 Breast Cancer 71

---

**The Gastrointestinal Tract 73**

**ORAL CAVITY 73**
4.1 The Cells 73
4.2 Benign Diseases 74
4.3 Malignant Diseases 75

**ESOPHAGUS 76**
4.4 The Cells 76
4.5 Benign Diseases 76
4.6 Malignant Diseases 79

**STOMACH 81**
4.7 The Cells 81
4.8 Benign Diseases 82
4.9 Malignant Diseases 84

**SMALL INTESTINE 87**
4.10 The Cells 87
4.11 Infections 88
4.12 Malignant Diseases 88

**COLON AND RECTUM 89**
4.13 The Cells 89
4.14 Benign Diseases 90
4.15 Malignant Diseases 91

**EXTRAHEPATIC BILARY TRACT 92**
4.16 The Cells 92
4.17 Benign Tumors 93
4.18 Malignant Tumors 93
FIVE

Urine 95
5.1 Urinary Tract Cytology 95
5.2 The Cells 96
5.3 Basic Specimens 99
5.4 Benign Diseases of the Urinary Tract 99
5.5 Renal Transplant 102
5.6 Cellular Reaction to Therapeutic Agents 103
5.7 Urinary Tract Cancer 104

Cerebrospinal Fluid 115
6.1 CSF Physiology 115
6.2 CSF Cytology 115
6.3 Reactive Conditions: Hemorrhage, Inflammation, Infection 119
6.4 Central Nervous System Tumors 121
6.5 Primary Tumors of the Central Nervous System 121
6.6 Metastatic Malignancy 127

Fine Needle Aspiration Biopsy 131
7.1 Advantages 131
7.2 Complications 132
7.3 Contraindications 134
7.4 Performing, Interpreting, and Reporting the Biopsy 134

EIGHT

The Gut Course 139
8.1 Tumor Classification 139
8.2 The Building Blocks of Cytodiagnosis 140
8.3 Squamous Cells 141
8.4 Glandular Cells 142
8.5 Leukocytes 147
8.6 Giant Cells 152
8.7 Small Cells 153
8.8 Spindle Cells 155
8.9 Clear Cells 155
8.10 Granular Cells 156
8.11 Neuroendocrine Cells 157
8.12 Melanoma 159
8.13 Background/Extracellular Material 161
13.6 Hodgkin Lymphoma 249
13.7 Plasma Cell Myeloma 251
13.8 Leukemic Lymphadenopathy 252
13.9 Extramedullary Hematopoiesis (Myeloid Metaplasia) 254

Breast 257
14.1 The Triple Test 257
14.2 The Cells 258
14.3 Nonneoplastic Diseases and Conditions of the Breast 259
14.4 Benign Breast Neoplasms 264
14.5 Malignant Breast Neoplasms 267
14.6 Male Breast 278

Thorax 281

LUNG 281
15.1 Transbronchial (Wang) Needle Biopsy 281
15.2 The Cells 282
15.3 Benign Diseases of the Lung 282
15.4 Lung Cancer 285

PLEURA 297
15.5 Malignant Mesothelioma 297

MEDIASTINUM 298
15.6 Thymoma 298
15.7 Thymic Carcinoid 300
15.8 Germ Cell Tumors 301
15.9 Malignant Lymphoma 301
15.10 Neurogenic Tumors 302
15.11 Mesenchymal Tumors 305
15.12 Metastases 305

Liver 307
16.1 The Cells 307
16.2 Inclusions and Pigments 308
16.3 Diffuse Liver Diseases 309
16.4 Nodular Liver Diseases 310
Preface

vade mecum n: 1: a portable, practical reference 2: go with me

Evade, invade, pervade—ever on the go with a prefix to steer us. This book is for those with limited time and immediate information needs. Going against the trend for ever larger information sources in print, this book follows instead the trend from desktop to palmtop.

A vade mecum is supposed to be concise and at hand: in Practical Principles of Cytopathology readers can expect handy information. The surgical pathologist needing quick cytomorphologic consult will find it here—and in a form easily carried to a colleague’s office. The resident with only a few months’ time to master the essentials can fall asleep (when exhaustion strikes) without fear of injury when this book falls!

The Art & Science of Cytopathology is encyclopedic: it comprises synoptic atlases, thousands of references, etc. Practical Principles of Cytopathology dispenses with atlases and references, offering instead what the diagnostician needs at hand, without urging more going to yet another set of pages. Nonetheless, because cytopathology is a visual art and science, we’ve built in over 1200 images, each of them at hand within a page of the information you are seeking.

Rabbi Hillel was once challenged to teach the whole Torah while his challenger stood on one foot. He replied, “That which is hurtful to you do not do to others. That is the whole of the Torah, now go study.” We’ve striven to make Practical Principles of Cytopathology a wealth of information for the hand (we can’t stop to stand on one foot), but when further study is needed, The Art & Science of Cytopathology stands ready.

Mac DeMay
Author

Joshua Weikersheimer
ASCP Press