CYTOHISTOLOGY: ESSENTIALS AND BASIC CONCEPTS

CYTOHISTOLOGY OF SMALL TISSUE SAMPLES

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Every effort has been made in preparing this book to provide accurate and up-to-date information which is in accord with accepted standards and practice at the time of publication. Although case histories are drawn from actual cases, every effort has been made to disguise the identities of the individuals involved. Nevertheless, the authors, editors and publishers can make no warranties that the information contained herein is totally free from error, not least because clinical standards are constantly changing through research and regulation. The authors, editors and publishers therefore disclaim all liability for direct or consequential damages resulting from the use of material contained in this book. Readers are strongly advised to pay careful attention to information provided by the manufacturer of any drugs or equipment that they plan to use.

This book is dedicated to our numerous students, trainees, cytotechnologists, and colleagues who have taught us much of what we know.

PKG

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In celebration of the life and teachings of the late

John Kingsbury Frost MD

(1922–1990)

Dedicated teacher and a friend.

He leaves behind the Basic Concepts that shall enrich the lives of many students of cytopathology.

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ABBREVIATIONS

ASC-H	atypical squamous cells suspect high grade
ASPS	alveolar soft part sarcoma
BAL	bronchoalveolar
BES	balanced electrolyte solution
BSA	bovine serum albumin
BSS	balanced salt solution
CCP	ciliocytophthoria
CD	clusters of differentiation
CGH	comparative genomic hybridization
CIS	carcinoma in situ
CISH	chromogenic in situ hybridization
CMA	chromosomal microanalysis
DF	dermatofibroma
DTTF	diagnostic true tissue fragment
EBC	evidence-based criteria
EGFR	Epidermal Growth Factor Receptor
E-LMS	epithelioid leiomyosarcoma
EMA	epithelial membrane antigen
EMSS	epithelioid monophasic synovial sarcoma
ES	epithelioid sarcoma
EUS	endoscopic ultrasound
FISH	fluorescent in situ hybridization
FNA	fine needle aspirations
GCT	germ cell tumors
GFAP	glial fibrillary acidic proteins
GIST	gastrointestinal stromal tumor
HCG	human chorionic gonadotropin
HPC	hemangiopericytoma
HSP	heat shock proteins
IAP	inhibitor of apoptosis proteins
LBC	liquid-based cytology
LBP	liquid-based preparation
LCA	leucocyte Common Antigens
LOH	loss of heterozygosity
LSC	laser scanning cytometry
MFH	malignant fibrous histiocytoma
MH	mesothelial hyperplasia
MM	malignant mesothelioma
N:C	Nucleocytoplasmic Ratio
NFP	neurofilament proteins
NSGCT	non-seminomatous germ cell tumors
PCP	*Pneumocystis jiroveci* pneumonia
PEComa	perivascular epithelioid cell tumor
PEG	polyethylene glycol
PNET	peripheral neuroectodermal tumor
PP	post-partum
PTO	post-test odds
SBRCT	small blue round cell tumors
SFT	solitary fibrous tumor
SLCL	small cell lung cancer
TBS	The Bethesda System
TdT	terminal deoxynucleotidyl transferase
TMA	tissue microarray
TP	terminal plate

PREFACE

Learn from yesterday, live for today, hope for tomorrow. The important thing is to not stop questioning
Albert Einstein

This monograph is a compilation of the Concepts Basic to General Cytopathology written by the late John K. Frost MD, published in 1959 by Johns Hopkins University Press, Baltimore. It was produced for use by the various students of cytopathology. The last (fourth) edition was printed in 1972. The original book of "concepts" has been translated into Chinese and Persian languages and is considered a "Bible" for understanding the fundamentals of clinical cytopathology.

This book is a conceptual document and not a comprehensive account of cytohistology. It integrates the fundamental concepts of diagnostic cytohistology as developed over decades of observations and insights which have stood the test of time. They are regarded as the most valuable for *accurate interpretation and diagnosis of the cytologic specimens*. In the modern practice of medicine, microscopic interpretation and biologic behavior are often poorly connected. These factual conclusions, however slim, contribute to the crux of diagnosis and patient care, including grading and staging of most tumors. This monograph is intended to improve cytodiagnoses.

The book is organized into seven chapters. A brief history of cytohistology is presented followed by a detailed discussion of "normal" cells derived from the various body sites and preparations; malignant cell transformation, functional differentiation of various tissues, and diagnostic pitfalls are presented in that order. A chapter by Mr. Gary W. Gill on Fixation and Specimen Processing is included. A final chapter by Dr. Carlos Bedrossian is an overview that briefly discusses the ancillary techniques used for the refinement of cytologic interpretation. This chapter on the multidisciplinary approach to cytopathology is enriched by contributions from Dr. Fernando Schmitt, Dr. Ben Davidson, Dr. Claire Michael, Dr. Bjorn Risberg, and Dr. J. Reis Filho.

Although originally intended to be used with a set of representative glass slides corroborating the features described in the book, in the present monograph the original form has been suitably modified while retaining its integrity. A number of photomicrographs illustrating the salient features seen in the glass slides have been incorporated. The text has also been updated, reflecting some of our opinions and concepts as well as including the morphologic alterations seen by the recent introduction of various cytologic specimen collection and preparation techniques.

The cytologic descriptions in this manual are based upon the features as observed in the routine Papanicolaou polychromatic and Diff-Quik™ stains; however, when other stains have been used, this is mentioned. The line illustrations are conceptual and depict the critical/reproducible diagnostic cytomorphologic features that need to be scrutinized in the specimens. These were drawn and lettered by the late Dr. Frost; penned inscriptions and text have been carefully updated to facilitate interpretation without losing the original flair. Photomicrographs have been included to further enhance the learning experience and improve the teaching value. Most illustrations represent conventional smears and concentration techniques (Millipore®filters, Cytospins®, ThinPrep®, and SurePath™). The majority of these photomicrographs represent our (PG, ZB) collection; magnifications and resolutions observable by high dry microscope objectives and proper optical alignment are reproduced. Some of the key figures are from Dr. Frost's archival files kept at the Johns Hopkins Cytopathology Laboratory, Baltimore. A few illustrations are selected from the collections of Dr. Yener S. Erozan MD, Professor Emeritus, Johns Hopkins University, Baltimore, and former staff members including the late Drs. David H. Hollander MD and William Howdon MD. We thank Mr. Allen Green for his valuable secreterial

assistance. Special thanks to Mr. Christopher Miller of the Cambridge University Press for his help and willingness to work with us and keep us on track.

We believe this book will serve as a valuable primer to all students of cytopathology including cytotechnologists and pathologists in training; experienced persons may consult it when the cells do not speak loudly enough or in a muffled voice.

PKG
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