
Molecular Applications in Cytology

Fernando C. Schmitt
Editor

Molecular Applications in Cytology

 Springer

Editor

Fernando C. Schmitt
Medical Faculty of Porto University
Porto
Portugal

Instituto de Investigação e Inovação em Saúde
Universidade do Porto
Porto
Portugal

IPATIMUP, Institute of Molecular Pathology and Immunology of Porto University
Porto
Portugal

ISBN 978-3-319-74940-2 ISBN 978-3-319-74942-6 (eBook)
<https://doi.org/10.1007/978-3-319-74942-6>

Library of Congress Control Number: 2018948164

© Springer International Publishing AG, part of Springer Nature 2018

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by the registered company Springer International Publishing AG part of Springer Nature.

The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

To do more with less... this is the great challenge for the pathology in the next decades. Recently many patients are managed based on diagnosis performed in small biopsies or cytology. Molecular techniques in the routine pathology are changing paradigms as did the introduction of immunohistochemistry some decades ago and are preferentially used on histological material. The goal of this book is to demonstrate that most of these techniques can be easily applied to the cytological material. In fact, cytological samples present numerous advantages over histological material. These include the ability to check the quality of the tissue immediately after harvesting, better preservation of RNA/DNA and the possibility of conducting extensively genomic studies on small amounts of cytological material obtained by fine-needle aspiration or from effusions, urine, among others. In turn, this minimizes the need for more invasive procedures and allows for more frequent re-sampling enabling monitoring of the disease along the time.

Molecular techniques in cytological samples have a wide array of applications. Depending on the method, they can be applied for diagnosis, subtype classification, and prognostic and predictive purposes. In this book we cover from the main aspects of pre-analytical phase, the applications in different organs and systems, through to the clinical integration of the results. Of course in this field of medicine knowledge advances so rapidly that a book cannot include all the more recent discoveries. However, the readers of this book can acquire very solid information in the different fields of molecular cytology that allow them to follow any new finding in the field. This book was written to the cytopathologists that even not practicing inside a molecular lab can acquire enough knowledge in the field that allow them to discuss the results and applications of different molecular techniques.

Now it is time to thank all those who have directly or indirectly collaborated for this book. For you the reader, it is time to relax, open the book and enjoy!

Porto, Portugal

Fernando C. Schmitt

Contents

1	Why Cytology for Molecular Testing? Pros and Cons	1
	Lukas Bubendorf	
2	How to Prepare Cytological Samples for Molecular Testing	11
	Claudio Bellevicine, Umberto Malapelle, Elena Vigliar, Pasquale Pisapia, Carlo Ruosi, and Giancarlo Troncone	
3	Molecular Tests Use in Cytological Material (Analytical Phase)	29
	Zsofia Balogh and Philippe Vielh	
4	Molecular Cytology Applications on Head and Neck	57
	Marc P. Pusztazeri, Joaquín J. García, and William C. Faquin	
5	Molecular Cytology Applications on the Lung.	79
	Alessia Di Lorito, Daniel Stieber, and Fernando C. Schmitt	
6	Molecular Cytology of Serous Effusions.	103
	Ben Davidson	
7	Molecular Cytology Applications on Urine	117
	Spasenija Savic	
8	Molecular Cytology Applications on Gynecological Cytology	127
	Francesca Carozzi, Giovanni Negri, and Cristina Sani	
9	Molecular Applications in Hematolymphoid Cytology	151
	Joerg Schwock, Graeme R. Quest, and William R. Geddie	
10	Molecular Cytology Application on Thyroid	179
	Esther Diana Rossi and Massimo Bongiovanni	
11	Molecular Cytology Applications on Pancreas and Biliary Tract . . .	205
	Rene Gerhard, Roseann I. Wu, and Norge Vergara	
12	Molecular Cytology Applications in Soft Tissue	223
	Kossivi E. Dantey and Sara E. Monaco	

13 Molecular Cytology Applications in Metastases 247
Francisco Beca and Fernando C. Schmitt

**14 Clinical Integration of Molecular Results on
Cytology (Post-analytical Phase) 261**
Perry Maxwell, Fernando C. Schmitt, and Manuel Salto-Tellez