

# Human Papillomavirus (HPV)-Associated Oropharyngeal Cancer

Daniel L. Miller · M. Sharon Stack  
Editors

# Human Papillomavirus (HPV)-Associated Oropharyngeal Cancer



Springer

*Editors*

Daniel L. Miller  
School of Medicine  
University of Missouri  
Columbia, MO  
USA

M. Sharon Stack  
Department of Chemistry  
and Biochemistry, Harper Cancer  
Research Institute  
University of Notre Dame  
South Bend, IN  
USA

ISBN 978-3-319-21099-5

ISBN 978-3-319-21100-8 (eBook)

DOI 10.1007/978-3-319-21100-8

Library of Congress Control Number: 2015943436

Springer Cham Heidelberg New York Dordrecht London

© Springer International Publishing Switzerland 2015

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.

Printed on acid-free paper

Springer International Publishing AG Switzerland is part of Springer Science+Business Media  
([www.springer.com](http://www.springer.com))

# Contents

<b>1</b>	<b>Epidemiology of HPV-Associated Oropharyngeal Squamous Cell Carcinoma</b> . . . . .	<b>1</b>
	Susanne M. Gollin	
<b>2</b>	<b>Behavioral Correlates of HPV-Associated Oropharyngeal Squamous Cell Carcinomas</b> . . . . .	<b>25</b>
	Teresa A. Anderson and Aaron C. Ermel	
<b>3</b>	<b>Racial Disparities in Oropharyngeal Cancer</b> . . . . .	<b>43</b>
	Lucia Pirisi, Swati Tomar and Sandra H. Glover	
<b>4</b>	<b>HPV Virology: Cellular Targets of HPV Oncogenes and Transformation</b> . . . . .	<b>69</b>
	Eric A. Smith, Marie C. Matrka and Susanne I. Wells	
<b>5</b>	<b>Papillomavirus Replication</b> . . . . .	<b>103</b>
	Sara P. Culleton, Elliot J. Androphy and Sriramana Kanginakudru	
<b>6</b>	<b>MicroRNA Profiles of HPV-Associated Oropharyngeal Squamous Cell Carcinoma (OPSCC)</b> . . . . .	<b>133</b>
	Daniel Lee Miller and M. Sharon Stack	
<b>7</b>	<b>Targeting the PI3 K-mTOR Signaling Circuitry in HPV-Associated Oral Malignancies: Novel Precision Molecular Therapies</b> . . . . .	<b>153</b>
	Colleen L. Doçi and J. Silvio Gutkind	
<b>8</b>	<b>Mutational Profile of HPV-Positive HNSCC</b> . . . . .	<b>171</b>
	Hua Li and Jennifer R. Grandis	

<b>9</b>	<b>Clinical Presentation of HPV-Driven Oropharyngeal Carcinoma . . .</b>	<b>195</b>
	Michael Moore and Marion Couch	
<b>10</b>	<b>Differences and Similarities Between HPV-Associated OPSCC and Cervical Cancer . . . . .</b>	<b>213</b>
	Panagiota Economopoulou and Amanda Psyrris	
<b>11</b>	<b>Surgical Perspective in the Management of Oropharyngeal Cancer . . . . .</b>	<b>231</b>
	Neil Gildener-Leapman and Seungwon Kim	
<b>12</b>	<b>HPV and Radiation Sensitivity . . . . .</b>	<b>243</b>
	Anna-Maria De Costa, Thorsten Rieckmann and Randall J. Kimple	
<b>13</b>	<b>The Role of Immune Modulation in the Carcinogenesis and Treatment of HPV-Associated Oropharyngeal Cancer . . . . .</b>	<b>291</b>
	Nicole C. Schmitt, Robert L. Ferris and Seungwon Kim	
	<b>Index . . . . .</b>	<b>307</b>

# Contributors

**Teresa A. Anderson** Department of Internal Medicine, Division of Infectious Diseases, Indiana University School of Medicine, Indianapolis, IN, USA

**Elliot J. Androphy** Department of Dermatology and Department of Microbiology and Immunology, Indiana University School of Medicine, Indianapolis, IN, USA

**Marion Couch** Department of Otolaryngology—Head and Neck Surgery, Indiana University School of Medicine, Indianapolis, IN, USA

**Sara P. Culetton** Department of Microbiology and Immunology, Indiana University School of Medicine, Indianapolis, IN, USA

**Anna-Maria De Costa** Department of Human Oncology, Carbone Comprehensive Cancer Center, School of Medicine and Public Health, University of Wisconsin, Madison, WI, USA

**Colleen L. Doçi** Oral and Pharyngeal Cancer Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, MD, USA

**Panagiota Economopoulou** 2nd Department of Internal Medicine, Attikon Hospital, National Kapodistrian University of Athens, Athens, Greece

**Aaron C. Ermel** Department of Internal Medicine, Division of Infectious Diseases, Indiana University School of Medicine, Indianapolis, IN, USA

**Robert L. Ferris** Department of Otolaryngology, Eye & Ear Institute, University of Pittsburgh, Pittsburgh, PA, USA

**Neil Gildener-Leapman** Department of Otolaryngology, New York Eye and Ear Infirmary of Mount Sinai, New York City, NY, USA

**Sandra H. Glover** Department of Health Services, Policies and Management, Arnold School of Public Health, University of South Carolina, Columbia, SC, USA

**Susanne M. Gollin** Graduate School of Public Health and the University of Pittsburgh Cancer Institute, University of Pittsburgh, Pittsburgh, PA, USA

**Jennifer R. Grandis** Departments of Otolaryngology Head and Neck Surgery, Clinical and Translational Science Institute, University of California, San Francisco, San Francisco, CA, USA

**J. Silvio Gutkind** Oral and Pharyngeal Cancer Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, MD, USA

**Sriramana Kanginakudru** Department of Dermatology, Indiana University School of Medicine, Indianapolis, IN, USA

**Seungwon Kim** Department of Otolaryngology, Eye & Ear Institute, University of Pittsburgh, Pittsburgh, PA, USA

**Randall J. Kimple** Department of Human Oncology, Carbone Comprehensive Cancer Center, School of Medicine and Public Health, University of Wisconsin, Madison, WI, USA

**Hua Li** Department of Otolaryngology Head and Neck Surgery, University of California, San Francisco, San Francisco, CA, USA

**Marie C. Matrka** Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

**Daniel Lee Miller** Department of Pathology and Anatomical Sciences, University of Missouri School of Medicine, Columbia, MO, USA

**Michael Moore** Department of Otolaryngology—Head & Neck Surgery, Indiana University School of Medicine, Indianapolis, IN, USA

**Lucia Pirisi** Department of Pathology, Microbiology and Immunology, School of Medicine, University of South Carolina, Columbia, SC, USA

**Amanda Psyrrri** 2nd Department of Internal Medicine, Attikon Hospital, National Kapodistrian University of Athens, Athens, Greece

**Thorsten Rieckmann** Department of Otolaryngology, Laboratory for Radiobiology and Experimental Radiation Oncology, University Medical Center Hamburg Eppendorf, Hamburg, Germany

**Nicole C. Schmitt** Department of Otolaryngology, Eye & Ear Institute, University of Pittsburgh, Pittsburgh, PA, USA

**M. Sharon Stack** Department of Chemistry and Biochemistry, Harper Cancer Research Institute, University of Notre Dame, South Bend, IN, USA

**Eric A. Smith** Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

**Swati Tomar** Department of Pathology, Microbiology and Immunology, School of Medicine, University of South Carolina, Columbia, SC, USA

**Susanne I. Wells** Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA