

The background of the cover is a dark, textured blue. It features several stylized, glowing 3D models of cells. Some are purple with bright blue or red centers, while others are more complex, showing a red outer shell with a blue core. These models are scattered across the cover, with a large cluster of purple cells in the center and smaller ones in the corners.

DELIVERY STRATEGIES AND ENGINEERING
TECHNOLOGIES IN CANCER IMMUNOTHERAPY

VOLUME 1

CANCER IMMUNOLOGY AND IMMUNOTHERAPY

EDITED BY
MANSOOR M. AMIJI
LARA SCHEHERAZADE MILANE



Contents

<i>Contributors</i>	<i>xiii</i>
<i>Preface</i>	<i>xvii</i>
<i>Acknowledgments</i>	<i>xix</i>
1. The hallmarks of cancer and immunology	1
Lara Scheherazade Milane	
1. Introduction	1
2. Activating invasion and metastasis	2
3. Resistance to cell death	5
4. Evading growth suppression and sustaining proliferative signaling	6
5. Genome instability and mutation and replicative immortality	9
6. Angiogenesis	10
7. Avoiding immune destruction and tumor-promoting inflammation	11
8. Deregulated energetics	14
9. Plasticity, tumor heterogeneity, quiescence, and stemness	14
10. Conclusion	15
References	15
2. Innate and adaptive immunity in cancer	19
Aatman S. Doshi and Kirtika H. Asrani	
1. Introduction	20
2. Innate immunity	21
3. Effector mechanisms and immunotherapies modulating innate immunity pathway	28
4. Adaptive immunity	33
5. Recognition of antigens	37
6. Costimulatory signals	37
7. Adaptive immune activation	38
8. Adaptive immune regulation	38
9. Humoral mediated immunity	39
10. Immune suppression and cancer progression	41
11. Treatments modulating the adaptive immune system	42
12. Conclusion	48
References	49

3. Inflammation and cancer	63
Gerardo G. Mackenzie	
1. Introduction	63
2. Similarities and differences between inflammatory responses in "Physiological" conditions and "Inflammation in Cancer"	65
3. Sources of inflammation during tumorigenesis	66
4. Role of inflammation in tumor initiation	70
5. Role of inflammation in tumor progression	72
6. Role of inflammation in tumor metastasis	73
7. Inflammation elicited due to cancer therapy	75
8. Conclusions	76
Acknowledgments	77
References	77
 4. Novel immunotherapeutic approaches to cancer: Voltage-gated sodium channel expression in immune cells and tumors	 83
Mustafa B.A. Djamgoz and Laetitia Firmenich	
1. Introduction	84
2. VGSC expression and function in cells of the immune system	89
3. Potential of VGSC (nNav1.5) expression in immunotherapy	93
4. Conclusions and future perspectives	100
Acknowledgments	101
References	101
 5. Immunoediting and cancer priming	 111
Taichiro Goto	
1. Introduction	112
2. Cancer-immunity cycle	112
3. Tumors escape immunosurveillance through immunoediting	117
4. Human leukocyte antigen (HLA) loss and immune escape in lung cancer evolution	119
5. Heterogenous immunoediting in lung cancer	120
6. Neoantigen derived from mutation	122
7. Treg and tumor immunity	125
8. Tumor-associated macrophages (TAMs) and tumor immunity	127
9. Conclusions	129
References	130

6. Metabolic reprogramming and immunity in cancer	137
Yu Chen and Yongsheng Li	
1. Introduction	140
2. Cancer immunity and immunotherapy	143
3. Metabolic reprogramming and immunometabolism	150
4. Conclusion and perspectives	173
References	175
7. Epigenetic programming of the immune responses in cancer	197
Abbey A. Saadey, Amir Yousif, and Hazem E. Ghoneim	
1. Introduction	197
2. Epigenetic mechanisms	201
3. Overview of cancer-immunity cycle	208
4. Epigenetic regulation of immune cells in the tumor microenvironment	211
5. Epigenetic barriers to cancer immunotherapy	223
6. Epigenetic reprogramming of immune cells in the tumor microenvironment	225
References	226
8. Cellular therapeutics in immuno-oncology	237
Gulzar Ahmad and Mansoor M. Amiji	
1. Introduction	237
2. Chimeric antigen receptor (CAR)	238
3. CAR-T cells	239
4. CAR-NK cells	251
5. CAR-M cells	260
6. Conclusions	262
References	263
9. T-cell engaging bispecific antibody therapy	267
Patty A. Culp, Jeremiah D. Degenhardt, Danielle E. Dettling, and Chad May	
1. Inherently active T-cell engagers	268
2. The challenges of targeting solid tumor indications	280
3. Next-generation TCEs	284
4. Potential mechanisms of resistance to TCEs	288
5. The limitations of preclinical <i>in vivo</i> efficacy models	289
6. TCEs targeting solid tumors in the clinic	298
References	310

10. Role of microbiome in cancer immunotherapy	321
Edda Russo, Federico Boem, and Amedeo Amedei	
1. Introduction	321
2. Main immunotherapy approaches: From the past to nowadays	323
3. A new emerging actor in cancer immunotherapy response: The human microbiome	327
4. Crosstalk between the microbiome and immunity in cancer	329
5. The "microbiome-immunity axis" influences the effectiveness of cancer immunotherapy	333
6. Microbiota shaping: From molecular immunotherapy to "eco-immunotherapy"	338
7. How the holobiont perspective can reshape our approach to cancer immunotherapy	341
8. Conclusions	343
Acknowledgment	344
References	345
11. STING pathway and modulation for cancer immunotherapy	353
Ting Su, Nadia Tasnim Ahmed, Shurong Zhou, Xiang Liu, and Guizhi Zhu	
1. Introduction	353
2. cGAS–STING signaling pathway in cancer	354
3. Targeting the STING pathway for cancer immunotherapy	359
4. Drug delivery systems for STING agonists	361
5. Summary and outlook	366
References	366
12. Oncolytic viruses in immunotherapy	375
Ilse Hernandez-Aguirre and Kevin A. Cassady	
1. Introduction—Oncolytic viroimmunotherapy	376
2. A brief history of oncolytic viruses	376
3. Overview of oncolytic virotherapy	379
4. Oncolytic virus safety and efficacy	381
5. Viral gene expression, replication and oncolysis	383
6. Immune-mediated antitumor activity	388
7. Oncolytic viruses as gene expression platforms	393
8. Oncolytic virus platforms and clinical trials	394
9. Conclusion	420
References	421

13. Comparison of therapeutic strategies for immuno-oncology	439
Hae Lin Jang and Shiladitya Sengupta	
1. Introduction	439
2. The immunological response	440
3. The intrinsic immune response within a cancer cell	440
4. The innate immune response	449
5. The adaptive immune response	453
6. B-cell immunotherapy	457
7. Summary	457
References	457
14. Intrinsic and acquired cancer immunotherapy resistance	463
Reem Saleh, Varun Sasidharan Nair, Salman M. Toor, and Eyad Elkord	
1. Introduction	463
2. Tumor microenvironment	464
3. Cancer immunotherapies	468
4. Mechanisms of resistance against cancer immunotherapies	472
5. Therapeutic approaches to overcome resistance	481
6. Conclusions, challenges, and future perspectives	485
References	486
15. Preclinical and clinical toxicity of immuno-oncology therapies and mitigation strategies	499
Lauren M. Gauthier	
1. Introduction	499
2. Overview of immunotoxicity with immuno-oncology therapies	500
3. Current practices and challenges in preclinical translation of IrAEs with immuno-oncology therapy	505
4. Regulatory guidance for safe clinical dosing with immuno-oncology therapies	508
5. Preclinical mitigation strategies for translatable prediction of IrAEs	509
6. Alternative approach to defining safe clinical starting doses with immuno-oncology therapy	510
7. Conclusion	511
References	511
<i>Index</i>	515

DELIVERY STRATEGIES AND ENGINEERING TECHNOLOGIES IN CANCER IMMUNOTHERAPY
VOLUME 1

CANCER IMMUNOLOGY AND IMMUNOTHERAPY

EDITED BY

MANSOOR M. AMIJI AND LARA SCHEHERAZADE MILANE

The series *Delivery Strategies and Engineering Technologies in Cancer Immunotherapy* examines the challenges and opportunities in the growing field of immuno-oncology (IO). IO has shown tremendous clinical potential for certain types of cancers, but broad application, especially for highly lethal cancers has yet to be validated. The three-volume series focuses on understanding the fundamentals of cancer immunotherapeutic strategies and evaluation of various approaches for targeted drug/nucleic acid delivery and engineering technologies. Each chapter is authored by world renowned experts in the field yielding a critical resource in the advancement of IO.

Key Features of the series

- Comprehensive treaty covering all aspects of immuno-oncology (IO)
- Novel strategies for systemic and local delivery of IO therapeutics and vaccines
- Forecasting on the future of nanotechnology and drug delivery for IO
- Use of engineering technologies in IO
- Challenges and opportunities for clinical translation

Volume 1 of the series focuses on Cancer Immunology and Immunotherapy with a specific focus on understanding the fundamentals of immunological approaches for both hematological and solid tumors. Specific chapters of **Volume 1** address the challenges and opportunities in this exciting area of research and future clinical translation. **Volume 1** covers the comprehensive concepts of IO from immunoediting to cancer vaccines.

About the editors

Dr. Mansoor M. Amiji is the University Distinguished Professor, Professor of Pharmaceutical Sciences, and Professor of Chemical Engineering at Northeastern University in Boston, MA. His primary areas of research interest are in the development of targeted therapeutic solutions for chronic diseases such as cancer, neurodegenerative diseases, and inflammatory diseases. Dr. Amiji has edited 10 books including *Applied Physical Pharmacy* (now in 3rd edition), *Nanotechnology for Cancer Therapy* (Taylor & Francis, 2007), *Handbook of Materials for Nanomedicine* (Pan Stanford Publishing, 2010), and *Diagnostic and Therapeutic Applications of Exosomes in Cancer* (Elsevier, 2018) along with over 70 published book chapters, and over 360 peer-reviewed articles.



Dr. Lara Scheherazade Milane is the Bouvé College of Health Sciences Distinguished Educator (2021) and Assistant Teaching Professor in the Department of Pharmaceutical Sciences, Northeastern University, Boston, MA. Her research interests include mitochondrial nanomedicine and developing nanotechnology based solutions to manipulate cell communication. Dr. Milane is particularly interested in applications for treating multidrug resistant cancer and neurodegenerative diseases. Dr. Milane is also an advocate for women in science, and has 21 peer-reviewed articles, 3 white papers, and 5 book chapters.



ID 23 1000 9493
ISBN 9780128233979



ACADEMIC PRESS

An imprint of Elsevier
elsevier.com/books-and-journals

