

CONTENTS

Contributors

ix

Preface

xvii

Section 1: Phages from Medical Perspective

1. Phage Therapy—History from Twort and d'Herelle Through Soviet Experience to Current Approaches

3

Nina Chanishvili

I. General Background 4

II. Mass Application of Phages 10

III. Current Status of Georgian Research and Their Impact on
Worldwide Phage Therapy Studies 31

References 35

2. Phage as a Modulator of Immune Responses: Practical Implications for Phage Therapy

41

Andrzej Górski, Ryszard Międzybrodzki, Jan Borysowski, Krystyna Dąbrowska, Piotr Wierzbicki, Monika Ohams, Grażyna Korczak-Kowska, Natasza Olszowska-Zaremba, Marzena Łusiak-Szelachowska, Marlena Kłak, Ewa Jończyk, Ewelina Kaniuga, Aneta Gołaś, Sylwia Purchla, Beata Weber-Dąbrowska, Sławomir Letkiewicz, Wojciech Fortuna, Krzysztof Szufnarowski, Zdzisław Pawełczyk, Paweł Rogóż, and Danuta Kłosowska

I. Background 43

II. Phage Immunogenicity 44

III. Immunomodulatory Activity of Phage Preparations 50

IV. Phage Virion Inactivation by Immune Cells 62

V. Concluding Remarks 63

Acknowledgments 66

References 66

3. Clinical Aspects of Phage Therapy	73
Ryszard Międzybrodzki, Jan Borysowski, Beata Weber-Dąbrowska, Wojciech Fortuna, Sławomir Letkiewicz, Krzysztof Szufnarowski, Zdzisław Pawełczyk, Paweł Rogóż, Marlena Kłak, Elżbieta Wojtasik, and Andrzej Górski	
I. Background	74
II. Ethical Aspects of Bacterial Drug Resistance and Phage Therapy	78
III. Therapeutic Bacteriophages from the Collection of the Institute of Immunology and Experimental Therapy in Wrocław	81
IV. Clinical Results of Phage Therapy Conducted in the Phage Therapy Unit in Wrocław	85
V. Discussion	113
VI. Conclusions	118
Acknowledgments	119
References	119
4. Bacteriophages in the Experimental Treatment of <i>Pseudomonas aeruginosa</i> Infections in Mice	123
Emilie Saussereau and Laurent Debarbieux	
I. General Background	124
II. <i>Pseudomonas aeruginosa</i> Bacteriophages	127
III. Experimental Phage Therapy of <i>Pseudomonas aeruginosa</i> Infections in Mice	129
IV. Perspectives	136
Acknowledgment	137
References	137
5. Genomics of Staphylococcal Twort-like Phages - Potential Therapeutics of the Post-Antibiotic Era	143
Małgorzata Łobocka, Monika S. Hejnowicz, Kamil Dąbrowski, Agnieszka Gozdek, Jarosław Kosakowski, Magdalena Witkowska, Magdalena I. Ulatowska, Beata Weber-Dąbrowska, Magdalena Kwiatk, Sylwia Parasion, Jan Gawor, Helena Kosowska, and Aleksandra Głowacka	
I. Introduction	145
II. Staphylococcal Bacteriophages: A Short Overview	145
III. Twort-Like Myoviruses of <i>Staphylococcus</i>	151
IV. Concluding Remarks	201
Acknowledgments	201
References	201

Section 2: Interactions and Applications of Phage Proteins and Protein Complexes

6. Bacteriophage Protein-Protein Interactions 219

Roman Häuser, Sonja Blasche, Terje Dokland, Elisabeth Haggård-Ljungquist, Albrecht von Brunn, Margarita Salas, Sherwood Casjens, Ian Molineux, and Peter Uetz

I. Introduction	221
II. Methods Used to Detect Protein-Protein Interactions	222
III. Protein-Protein Interactions of Bacteriophages	226
IV. Conclusions	275
Acknowledgments	277
References	277

7. Endolysins as Antimicrobials 299

Daniel C. Nelson, Mathias Schmelcher, Lorena Rodriguez-Rubio, Jochen Klumpp, David G. Pritchard, Shengli Dong, and David M. Donovan

I. Introduction	301
II. Peptidoglycan Structure	302
III. Endolysin Activities and Structure	303
IV. Gram-Positive Endolysins as Antimicrobials	335
V. Engineering Endolysins	345
VI. Gram-Negative Endolysins as Antimicrobials	350
VII. Concluding Remarks	352
Acknowledgments	353
References	353

8. Phage Recombinases and Their Applications 367

Kenan C. Murphy

I. Introduction	368
II. Phage Recombination Systems	370
III. Single-Stranded DNA-Annealing Proteins	380
IV. Recombineering	382
V. Genetic Manipulations	384
VI. Proposed Mechanisms of λ Red Recombineering	393
VII. Applications	399
VIII. Perspectives	403
References	404

9. “Push Through One-Way Valve” Mechanism of Viral DNA Packaging**415**

Hui Zhang, Chad Schwartz, Gian Marco De Donatis,
and Peixuan Guo

I. Introduction	417
II. Structure of Viral DNA Packaging Motors	418
III. Energy Source and Conversion Mechanism	436
IV. Mechanism for DNA Packaging Motor	440
V. Application of Viral Packaging Motors	448
VI. Prospective	454
Acknowledgments	456
References	456

Index

467

Color plate section at the end of the book