Table of Contents

CONTRIBUTORS TO VOLUME 336 ........................................ xi
PREFACE ................................................................. xix
VOLUME IN SERIES ...................................................... xxi

Section I. Developmental Processes in Biofilms

1. Whole Genome DNA Microarray Expression Analysis of Biofilm Development by *Vibrio cholerae O1 El Tor*  
   GARY K. SCHOOLNIK, MARTIN I. VOSKUIL, DIRK SCHNAPPINGER, FITNAT H. YILDIZ, KARIN MEIBOM, NADIA A. DOLGANOV, MICHAEL A. WILSON, AND KIMBERLY H. CHONG  3

2. Biofilm Formation as a Developmental Process  
   PAUL N. DANese, LESLIE A. PRATT, AND ROBERTO KOLTER  19

Section II. Signaling and Gene Expression in Biofilm

3. Surface Sensing, Swarmer Cell Differentiation, and Biofilm Development  
   MOHAMMAD ALAVI AND ROBERT BELAS  29

4. Acylated Homoserine Lactone Detection in *Pseudomonas aeruginosa* Biofilms by Radiolabel Assay  
   AMY L. SCHAEFER, E. P. GREENBERG, AND MATTHEW R. PARSEK  41

5. Genetic and Phenotypic Analysis of Multicellular Behavior in *Salmonella typhimurium*  
   UTE RÖMLING  48

6. Gene Transfer in Bacterial Biofilms  
   ADAM P. ROBERTS, PETER MULLANY, AND MICHAEL WILSON  60

7. Conversion to Mucoidy in *Pseudomonas aeruginosa* Infecting Cystic Fibrosis Patients  
   JENS F. POSCHET, J. CLIFF BOUCHER, AARON M. FIROVED, AND VAJO DERETIC  65
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Authors</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Subtractive Hybridization-Based Identification of Genes Uniquely Expressed or Hyperexpressed during Biofilm Growth</td>
<td>Michael D. Parks, Moritz Altebaumer, Howard Ceri, and Douglas G. Storey</td>
<td>76</td>
</tr>
<tr>
<td>9</td>
<td>Biofilm-Induced Gene Expression and Gene Transfer</td>
<td>Richard J. Lamont and James D. Bryers</td>
<td>84</td>
</tr>
<tr>
<td>10</td>
<td>Directed Movement and Surface-Borne Motility of Myxococcus and Pseudomonas</td>
<td>Daniel B. Kearns and Lawrence J. Shimkets</td>
<td>94</td>
</tr>
<tr>
<td>11</td>
<td>A General Method to Identify Bacterial Genes Regulated by Cell-to-Cell Signaling</td>
<td>Xuedong Ding, Rita R. Baca-DeLancey, Soofia Siddiqui, and Philip N. Rather</td>
<td>102</td>
</tr>
<tr>
<td>12</td>
<td>Genetic and Chemical Tools for Investigating Signaling Processes in Biofilms</td>
<td>Timothy Charlton, Michael Giovskov, Rocky deNys, Jens Bo Andersen, Morten Hentzer, Scott Rice, and Staffan Kjelleberg</td>
<td>108</td>
</tr>
<tr>
<td>13</td>
<td>In Situ Quantification of Gene Transfer in Biofilms</td>
<td>Stefan Wuertz, Larissa Hendrickx, Martin Kuehn, Karsten Rodenacker, and Martina Hausner</td>
<td>129</td>
</tr>
<tr>
<td>14</td>
<td>Transcriptional Analysis of Genes Involved in Pseudomonas aeruginosa Biofilms</td>
<td>Timna J. O. Wyckoff and Daniel J. Wozniak</td>
<td>144</td>
</tr>
<tr>
<td>15</td>
<td>First Stages of Biofilm Formation: Characterization and Quantification of Bacterial Functions Involved in Colonization Process</td>
<td>Thanh-Thuy Le Thi, Claire Prigent-Combaret, Corinne Dorel, and Philippe Lejeune</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>Section III. Growth of Bacteriophage in Bacteria in Biofilms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Phenotype Characterization of Genetically Defined Microorganisms and Growth of Bacteriophage in Biofilms</td>
<td>Robert J. C. McLean, Brian D. Corbin, Grant J. Balzer, and Gary M. Aron</td>
<td>163</td>
</tr>
<tr>
<td></td>
<td>Section IV. Biofilms of Staphylococci</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Methods for Studying Biofilms Produced by Staphylococcus epidermidis</td>
<td>Margaret A. Deighton, Jillian Capstick, Ewa Domalewski, and Trung Van Nguyen</td>
<td>177</td>
</tr>
</tbody>
</table>
18. Methods to Detect and Analyze Phenotypic Variation in Biofilm-Forming Staphylococci

Wilma Ziebuhr, Isabel Loessner, Vanessa Krimmer, and Jörg Hacker

19. In Vivo Models to Evaluate Adhesion and Biofilm Formation by Staphylococcus epidermidis

Mark E. Rupp and Paul D. Fey

20. Genetic and Biochemical Analysis of Staphylococcus epidermidis Biofilm Accumulation

Dietrich Mack, Katriin Bartsch, Claudia Fischer, Holger Rohde, Clemens de Grahl, Sabine Dobinsky, Matthias A. Horstkotte, Kathrin Kiel, and Johannes K.-M. Knobloch

21. In Vitro Methods to Study Staphylococcal Biofilm Formation

Sarah E. Cramton, Christiane Gerke, and Friedrich Götz

22. Efficient RNA Isolation Method for Analysis of Transcription in Sessile Staphylococcus epidermidis Biofilm Cultures

Sabine Dobinsky and Dietrich Mack

Section V. Metabolic Potential of Biofilms

23. Assessment of Metabolic Potential of Biofilm-Associated Bacteria

Werner Manz, Michael Wagner, and Sibylle Kalmbach

Section VI. Extracellular Polymers

24. Characterization of Extracellular Chitinolytic Activity in Biofilms

Ace M. Baty III, Zhenjun Diwu, Glen Dunham, Callie C. Eastburn, Gill G. Geesey, Amanda E. Goodman, Peter A. Suci, and Somsri Techkarnjanaruk

25. Isolation and Biochemical Characterization of Extracellular Polymeric Substances from Pseudomonas aeruginosa

Jost Wingender, Martin Strathmann, Alexander Rode, Andrew Leis, and Hans-Curt Flemming
Section VII. Microbiological Aspects of Microbial Biofilm

26. Approach to Analyze Interactions of Microorganisms, Hydrophobic Substrates, and Soil Colloids Leading to Formation of Composite Biofilms, and to Study Initial Events in Microbiogeological Processes  
HEINRICH LÜNSDORF, CARSTEN STRÖMPL, A. MARK OSBORN, ANTONIO BENNASAR, EDWARD R. B. MOORE, WOLF-RAINER ABRAHAM, AND KENNETH N. TIMMIS 317

27. Extracellular Polymers of Microbial Communities Colonizing Ancient Limestone Monuments  
BENJAMÍN OTTO ORTEGA-MORALES, ALEJANDRO LÓPEZ-CORTÉS, GUILLERMO HERNÁNDEZ-DUQUE, PHILIPPE CRASSOUS, AND JEAN GUEZENNEC 331

28. Studying Phototrophic and Heterotrophic Microbial Communities on Stone Monuments  
CLAIRA URZI AND PATRIZIA ALBERTANO 340

29. Identification of Archaea in Objects of Art by Denaturing Gradient Gel Electrophoresis Analysis and Shotgun Cloning  
GUADALUPE PIÑAR, CLAUDIA GURTNER, WERNER LÜBITZ, AND SABINE RÖLLEKE 356

Section VIII. Probiotics

30. Lactobacilli as Vehicles for Targeting Antigens to Mucosal Tissues by Surface Exposition of Foreign Antigens  
PETER H. POUWELS, ALDWIN VRIESEMA, BEATRIZ MARTINEZ, FRANS J. TIELEN, JOE F. M. L. SEEGERS, ROB J. LEER, JAN JORE, AND EGBERT SMIT 369

31. A Dot-Blot Assay for Adhesive Components Relative to Probiotics  
MAURILIA ROJAS AND PATRICIA L. CONWAY 389

32. Understanding Urogenital Biofilms and Potential Impact of Probiotics  
GREGOR REID, CHRISTINE HEINEMANN, JEFFREY HOWARD, GILLIAN GARDINER, AND BING S. GAN 403
33. Surface Characterization and Adhesive Properties of Bifidobacteria  RODRIGO BIBILONI, PABLO F. PEREZ, GRACIELA L. GARROTE, E. ANIBAL DISALVO, AND GRACIELA L. DE ANTONI  411

AUTHOR INDEX .............. 429

SUBJECT INDEX ............. 457