

# METHODS IN MOLECULAR BIOLOGY

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# Oral Biology

## Molecular Techniques and Applications

### Second Edition

Edited by

**Gregory J. Seymour**

*Faculty of Dentistry, University of Otago, Dunedin, New Zealand*

**Mary P. Cullinan**

*Department of Oral Sciences, Faculty of Dentistry, University of Otago, Dunedin, New Zealand*

**Nicholas C.K. Heng**

*Faculty of Dentistry, Sir John Walsh Research Institute, University of Otago, Dunedin, New Zealand*

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*Editors*

Gregory J. Seymour  
Faculty of Dentistry  
University of Otago  
Dunedin, New Zealand

Mary P. Cullinan  
Department of Oral Sciences, Faculty of Dentistry  
University of Otago  
Dunedin, New Zealand

Nicholas C.K. Heng  
Faculty of Dentistry, Sir John Walsh Research  
Institute  
University of Otago  
Dunedin, New Zealand

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Cover illustration: Example of a bead experiment combined with in situ hybridization (ISH) analysis to study gene expression in embryonic tissue explants. The image shows the effects of BMP2 beads on *Id1* gene expression in explants of calvarial mesenchyme. Photograph provided by D. Rice and K. Närhi. The bead and ISH experiments are described in Chapter 20.

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## Preface

It is widely accepted that “evidence-based dentistry” is fundamental to clinical practice and that well-controlled randomized clinical trials followed by systematic reviews and meta-analyses provide much of this evidence base. However, it is still the basic biological and physical sciences that underpin advances in dentistry and form the basis for subsequent clinical trials. It is equally true that the treatment of any disease should be based on an understanding of the etiology and pathogenesis of that disease, and in this context, the future of dentistry lies very much in continued research in the basic biological sciences.

This second edition of *Oral Biology: Molecular Techniques and Applications* continues the approach taken in the first edition and has not attempted to cover all aspects of oral biology, but rather to present a selection of cellular and molecular techniques that can be adapted to cover a range of applications and diseases. The first part on saliva, for example, has been updated and expanded to include proteomic analyses by mass spectrometry and NMR-based metabolomics that can be used not only in the study of saliva but also in assessing other oral fluids such as gingival fluid. Clearly, saliva is unique to the oral cavity but so too is gingival fluid which, in essence, is the fluid medium of the gingiva and gingival sulcus, and thus is the fluid environment where interactions between the plaque biofilm and the host take place. Hence, techniques for its collection and analysis have now been included.

Although it is 6 years since publication of the first edition of this book, many of the techniques described are still in widespread use and so have been retained, albeit updated, in this second edition. In the part on molecular biosciences, for example, chapters on profiling of oral microbial communities, quantitative real-time PCR, and adhesion of yeast and bacteria to oral surfaces have all been retained but substantially updated.

Epigenetics is now a major theme in biology and is providing great insight into how we interact with our environment. As DNA methylation features heavily in epigenetic studies, new chapters on tools and strategies that facilitate the analysis of genome-wide or gene-specific DNA methylation patterns have been included.

As in the first edition, the last part of this second edition deals with a range of approaches that enable the behavior of cells and tissues in both health and disease to be analyzed at the molecular level. The future of dentistry and of the profession lies in research, and it is anticipated that this second edition of *Oral Biology: Molecular Techniques and Applications* will continue to be a useful resource for oral biologists at all levels, be they students, early career or experienced veterans, and that it provides a ready reference enabling new techniques and approaches to be used in answering a range of specific scientific questions that will underpin a deeper understanding and treatment of oral diseases.

*Dunedin, New Zealand*  
*Dunedin, New Zealand*  
*Dunedin, New Zealand*

*Gregory J. Seymour*  
*Mary P. Cullinan*  
*Nicholas C.K. Heng*

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# Contents

<i>Preface</i> . . . . .	<i>v</i>
<i>Contributors</i> . . . . .	<i>xi</i>
PART I SALIVA AND OTHER ORAL FLUIDS	
1 Salivary Diagnostics Using Purified Nucleic Acids . . . . . <i>Paul D. Slowey</i>	3
2 RNA Sequencing Analysis of Salivary Extracellular RNA . . . . . <i>Blanca Majem, Feng Li, Jie Sun, and David T.W. Wong</i>	17
3 Qualitative and Quantitative Proteome Analysis of Oral Fluids in Health and Periodontal Disease by Mass Spectrometry . . . . . <i>Erdjan Salih</i>	37
4 Antioxidant Micronutrients and Oxidative Stress Biomarkers . . . . . <i>Iain L.C. Chapple, Helen R. Griffiths, Mike R. Milward, Martin R. Ling, and Melissa M. Grant</i>	61
5 NMR-Based Metabolomics of Oral Biofluids . . . . . <i>Horst Joachim Schirra and Pauline J. Ford</i>	79
6 Gene Therapy of Salivary Diseases . . . . . <i>Bruce J. Baum, Sandra Afione, John A. Chiorini, Ana P. Cotrim, Corinne M. Goldsmith, and Changyu Zheng</i>	107
PART II MOLECULAR BIOSCIENCES	
7 The Oral Microbiota in Health and Disease: An Overview of Molecular Findings . . . . . <i>José F. Siqueira Jr. and Isabela N. Rôças</i>	127
8 Microbial Community Profiling Using Terminal Restriction Fragment Length Polymorphism (T-RFLP) and Denaturing Gradient Gel Electrophoresis (DGGE) . . . . . <i>José F. Siqueira Jr., Mitsuo Sakamoto, and Alexandre S. Rosado</i>	139
9 Analysis of 16S rRNA Gene Amplicon Sequences Using the QIIME Software Package . . . . . <i>Blair Lawley and Gerald W. Tannock</i>	153
10 Adhesion of Yeast and Bacteria to Oral Surfaces . . . . . <i>Richard D. Cannon, Karl M. Lyons, Kenneth Chong, Kathryn Newsham-West, Kyoko Niimi, and Ann R. Holmes</i>	165
11 Quantitative Analysis of Periodontal Pathogens Using Real-Time Polymerase Chain Reaction (PCR) . . . . . <i>M<sup>a</sup> José Marin, Elena Figuera, David Herrera, and Mariano Sanz</i>	191

12	Methods to Study Antagonistic Activities Among Oral Bacteria . . . . .	203
	<i>Fengxia Qi and Jens Kreth</i>	
13	Natural Transformation of Oral Streptococci by Use of Synthetic Pheromones . . . . .	219
	<i>Gabriela Salvadori, Roger Junges, Rabia Khan, Heidi A. Åmdal, Donald A. Morrison, and Fernanda C. Petersen</i>	
14	Markerless Genome Editing in Competent Streptococci . . . . .	233
	<i>Roger Junges, Rabia Khan, Yanina Toypeko, Heidi A. Åmdal, Fernanda C. Petersen, and Donald A. Morrison</i>	
15	Tools and Strategies for Analysis of Genome-Wide and Gene-Specific DNA Methylation Patterns . . . . .	249
	<i>Aniruddha Chatterjee, Euan J. Rodger, Ian M. Morison, Michael R. Eccles, and Peter A. Stockwell</i>	
16	Generating Multiple Base-Resolution DNA Methylomes Using Reduced Representation Bisulfite Sequencing . . . . .	279
	<i>Aniruddha Chatterjee, Euan J. Rodger, Peter A. Stockwell, Gwenn Le Mée, and Ian M. Morison</i>	
17	A Protocol for the Determination of the Methylation Status of Gingival Tissue DNA at Specific CpG Islands . . . . .	299
	<i>Trudy J. Milne</i>	
18	Genome-Wide Analysis of Periodontal and Peri-Implant Cells and Tissues. . . .	307
	<i>Moritz Kebschull, Claudia Hülsmann, Per Hoffmann, and Panos N. Papapanou</i>	
19	Differential Expression and Functional Analysis of High-Throughput -Omics Data Using Open Source Tools . . . . .	327
	<i>Moritz Kebschull, Melanie Julia Fittler, Ryan T. Demmer, and Panos N. Papapanou</i>	
20	Exploring Genome-Wide Expression Profiles Using Machine Learning Techniques. . . . .	347
	<i>Moritz Kebschull and Panos N. Papapanou</i>	

### PART III CELLS AND TISSUES

21	Embryonic Explant Culture: Studying Effects of Regulatory Molecules on Gene Expression in Craniofacial Tissues. . . . .	367
	<i>Katja Närhi</i>	
22	Oral Epithelial Cell Culture Model for Studying the Pathogenesis of Chronic Inflammatory Disease . . . . .	381
	<i>Mike R. Milward, Martin R. Ling, Melissa M. Grant, and Iain L.C. Chapple</i>	
23	Fabrication and Characterization of Decellularized Periodontal Ligament Cell Sheet Constructs . . . . .	403
	<i>Amro Farag, Cédryck Vaquette, Dietmar W. Hutmacher, P. Mark Bartold, and Saso Ivanovski</i>	

24	A Method to Isolate, Purify, and Characterize Human Periodontal Ligament Stem Cells . . . . .	413
	<i>Krzysztof Mrozik, Stan Gronthos, Songtao Shi, and P. Mark Bartold</i>	
25	Constructing Tissue Microarrays: Protocols and Methods Considering Potential Advantages and Disadvantages for Downstream Use . . . . .	429
	<i>Lynne Bingle, Felipe P. Fonseca, and Paula M. Farthing</i>	
26	Growing Adipose-Derived Stem Cells Under Serum-Free Conditions . . . . .	439
	<i>Diogo Godoy Zanicotti and Dawn E. Coates</i>	
27	Quantitative Real-Time Gene Profiling of Human Alveolar Osteoblasts . . . . .	447
	<i>Dawn E. Coates, Sobia Zafar, and Trudy J. Milne</i>	
28	Proteomic Analysis of Dental Tissue Microsamples . . . . .	461
	<i>Jonathan E. Mangum, Jew C. Kon, and Michael J. Hubbard</i>	
29	Characterization, Quantification, and Visualization of Neutrophil Extracellular Traps . . . . .	481
	<i>Phillipa C. White, Ilaria J. Chicca, Martin R. Ling, Helen J. Wright, Paul R. Cooper, Mike R. Milward, and Iain L.C. Chapple</i>	
	<i>Index</i> . . . . .	499

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## Contributors

- SANDRA AFIONE • *Molecular Physiology and Therapeutics Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health (NIH), Bethesda, MD, USA*
- HEIDI A. ÅMDAL • *Department of Oral Biology, Faculty of Dentistry, University of Oslo, Oslo, Norway*
- P. MARK BARTOLD • *Colgate Australian Clinical Dental Research Centre, Dental School, University of Adelaide, Adelaide, Australia*
- BRUCE J. BAUM • *Molecular Physiology and Therapeutics Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health (NIH), Bethesda, MD, USA; Molecular Physiology and Therapeutics Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health (NIH), Bethesda, MD, USA*
- LYNNE BINGLE • *Academic Unit of Oral and Maxillofacial Pathology, School of Clinical Dentistry, University of Sheffield, Sheffield, UK*
- RICHARD D. CANNON • *Department of Oral Sciences, University of Otago School of Dentistry, Dunedin, New Zealand; Faculty of Dentistry, Sir John Walsh Research Institute, University of Otago School of Dentistry, Dunedin, New Zealand*
- IAIN L.C. CHAPPLE • *School of Dentistry, Institute of Clinical Sciences, College of Medical and Dental Sciences, University of Birmingham, Birmingham, UK*
- ANIRUDDHA CHATTERJEE • *Department of Pathology, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand; Maurice Wilkins Centre for Molecular Biodiscovery, Auckland, New Zealand*
- ILARIA J. CHICCA • *Institute of Clinical Sciences, College of Medical and Dental Sciences, The School of Dentistry, University of Birmingham, Birmingham, UK*
- JOHN A. CHIORINI • *Molecular Physiology and Therapeutics Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health (NIH), Bethesda, MD, USA*
- KENNETH CHONG • *Department of Oral Sciences, University of Otago School of Dentistry, Dunedin, New Zealand*
- DAWN E. COATES • *Faculty of Dentistry, Sir John Walsh Research Institute, University of Otago, Dunedin, New Zealand*
- PAUL R. COOPER • *Institute of Clinical Sciences, College of Medical and Dental Sciences, The School of Dentistry, University of Birmingham, Birmingham, UK*
- ANA P. COTRIM • *Molecular Physiology and Therapeutics Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health (NIH), Bethesda, MD, USA*
- RYAN T. DEMMER • *Department of Epidemiology, Columbia University Mailman School of Public Health, New York, NY, USA*
- MICHAEL R. ECCLES • *Department of Pathology, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand; Maurice Wilkins Centre for Molecular Biodiscovery, Auckland, New Zealand*
- AMRO FARAG • *School of Dentistry and Oral Health, Regenerative Medicine Center, Menzies Health Institute Queensland, Gold Coast, QLD, Australia*



- PAULA M. FARTHING • *Academic Unit of Oral and Maxillofacial Pathology, School of Clinical Dentistry, University of Sheffield, Sheffield, UK*
- ELENA FIGUERO • *Oral Research Laboratory, Faculty of Odontology, University Complutense, Madrid, Spain; Etiology and Therapy of Periodontal Diseases (ETEP) Research Group, University Complutense, Madrid, Spain; Department of Periodontology, Faculty of Dentistry, University Complutense of Madrid, Madrid, Spain*
- MELANIE JULIA FITTLER • *Department of Periodontology, Operative and Preventive Dentistry, University of Bonn, Bonn, Germany*
- FELIPE P. FONSECA • *Department of Oral Diagnosis, Faculty of Dentistry of Piracicaba, FOP, UNICAMP, Piracicaba, São Paulo, Brazil*
- PAULINE J. FORD • *School of Dentistry, Oral Health Centre, The University of Queensland, Herston, QLD, Australia*
- CORINNE M. GOLDSMITH • *Molecular Physiology and Therapeutics Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health (NIH), Bethesda, MD, USA*
- MELISSA M. GRANT • *School of Dentistry, Institute of Clinical Sciences, College of Medical and Dental Sciences, University of Birmingham, Birmingham, UK*
- HELEN R. GRIFFITHS • *School of Dentistry, Institute of Clinical Sciences, College of Medical and Dental Sciences, University of Birmingham, Birmingham, UK*
- STAN GRONTHOS • *Mesenchymal Stem Cell Group, Adelaide Medical School, Faculty of Health Sciences, University of Adelaide, Adelaide, SA, Australia*
- DAVID HERRERA • *Etiology and Therapy of Periodontal Diseases (ETEP) Research Group, University Complutense, Madrid, Spain; Department of Periodontology, Faculty of Dentistry, University Complutense of Madrid, Madrid, Spain*
- PER HOFFMANN • *Department of Genomics, Institute of Human Genetics, University of Bonn, Bonn, Germany; Human Genomics Research Group, Department of Biomedicine, University of Basel, Basel, Switzerland*
- ANN R. HOLMES • *Department of Oral Sciences, University of Otago School of Dentistry, Dunedin, New Zealand; Faculty of Dentistry, Sir John Walsh Research Institute, University of Otago School of Dentistry, Dunedin, New Zealand*
- MICHAEL J. HUBBARD • *Department of Pharmacology and Therapeutics, University of Melbourne, Melbourne, VIC, Australia; Department of Pediatrics, Royal Children's Hospital, University of Melbourne, Melbourne, VIC, Australia*
- CLAUDIA HÜLSMANN • *Department of Periodontology, Operative and Preventive Dentistry, Faculty of Medicine, University of Bonn, Bonn, Germany*
- DIETMAR W. HUTMACHER • *Queensland University of Technology, Brisbane, QLD, Australia*
- SASO IVANOVSKI • *School of Dentistry and Oral Health, Regenerative Medicine Center, Menzies Health Institute Queensland, Gold Coast, QLD, Australia; Menzies Health Institute Queensland, Griffith University, Gold Coast, QLD, Australia*
- ROGER JUNGES • *Department of Oral Biology, Faculty of Dentistry, University of Oslo, Oslo, Norway*
- MORITZ KEBSCHULL • *Department of Periodontology, Operative and Preventive Dentistry, Faculty of Medicine, University of Bonn, Bonn, Germany; Division of Periodontics, Section of Oral, Diagnostic and Rehabilitation Sciences, Columbia University College of Dental Medicine, New York, NY, USA*
- RABIA KHAN • *Department of Oral Biology, Faculty of Dentistry, University of Oslo, Oslo, Norway*

- JEW C. KON • *Department of Pharmacology and Therapeutics, University of Melbourne, Melbourne, VIC, Australia; Department of Pediatrics, Royal Children's Hospital, University of Melbourne, Melbourne, VIC, Australia*
- JENS KRETH • *Oregon Health and Science University, Portland, OR, USA*
- BLAIR LAWLEY • *Department of Microbiology and Immunology, University of Otago, Dunedin, New Zealand*
- FENG LI • *Division of Oral Biology and Oral Medicine, School of Dentistry, University of California Los Angeles (UCLA), Los Angeles, CA, USA*
- MARTIN R. LING • *School of Dentistry, Institute of Clinical Sciences, College of Medical and Dental Sciences, University of Birmingham, Birmingham, UK*
- KARL M. LYONS • *Faculty of Dentistry, Sir John Walsh Research Institute, University of Otago School of Dentistry, Dunedin, New Zealand; Department of Oral Rehabilitation, University of Otago School of Dentistry, Dunedin, New Zealand*
- BLANCA MAJEM • *Biomedical Research Unit in Gynecology, Vall Hebron Research Institute (VHIR) and University Hospital, University Autònoma de Barcelona (UAB), Barcelona, Spain*
- JONATHAN E. MANGUM • *Department of Pharmacology and Therapeutics, University of Melbourne, Melbourne, VIC, Australia*
- M<sup>a</sup> JOSÉ MARIN • *Oral Research Laboratory, Faculty of Odontology, University Complutense, Madrid, Spain*
- GWENN LE MÉE • *Department of Pathology, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand*
- TRUDY J. MILNE • *Faculty of Dentistry, Sir John Walsh Research Institute, University of Otago, Dunedin, New Zealand*
- MIKE R. MILWARD • *School of Dentistry, Institute of Clinical Sciences, College of Medical and Dental Sciences, University of Birmingham, Birmingham, UK*
- IAN M. MORISON • *Department of Pathology, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand*
- DONALD A. MORRISON • *Department of Biological Sciences, College of Liberal Arts and Sciences, University of Illinois at Chicago, Chicago, IL, USA*
- KRZYSZTOF MROZIK • *Colgate Australian Dental Research Centre, Dental School, University of Adelaide, Adelaide, SA, Australia*
- KATJA NÄRHI • *Institute for Molecular Medicine Finland, University of Helsinki, Helsinki, Finland*
- KATHRYN NEWSHAM-WEST • *Faculty of Dentistry, Sir John Walsh Research Institute, University of Otago School of Dentistry, Dunedin, New Zealand; Department of Oral Rehabilitation, University of Otago School of Dentistry, Dunedin, New Zealand*
- KYOKO NIIMI • *Department of Oral Sciences, University of Otago School of Dentistry, Dunedin, New Zealand*
- PANOS N. PAPAPANOU • *Division of Periodontics, Section of Oral, Diagnostic and Rehabilitation Sciences, Columbia University College of Dental Medicine, New York, NY, USA*
- FERNANDA C. PETERSEN • *Department of Oral Biology, Faculty of Dentistry, University of Oslo, Oslo, Norway*
- FENGXIA QI • *University of Oklahoma Health Sciences Center BRC364, Oklahoma City, OK, USA*
- ISABELA N. RÓÇAS • *Department of Endodontics and Molecular Microbiology, Estácio de Sá University, Rio de Janeiro, RJ, Brazil*

- EUAN J. RODGER • *Department of Pathology, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand*
- ALEXANDRE S. ROSADO • *Institute of Microbiology Prof. Paulo de Góes, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil*
- MITSUO SAKAMOTO • *Microbe Division/Japan Collection of Microorganisms, RIKEN BioResource Center, Wako, Saitama, Japan*
- ERDJAN SALIH • *Department of Periodontology, Henry M. Goldman School of Dental Medicine, Boston University, Boston, MA, USA*
- GABRIELA SALVADORI • *Department of Oral Biology, Faculty of Dentistry, University of Oslo, Oslo, Norway*
- MARIANO SANZ • *Etiology and Therapy of Periodontal Diseases (ETEP) Research Group, University Complutense, Madrid, Spain; Department of Periodontology, Faculty of Dentistry, University Complutense of Madrid, Madrid, Spain*
- HORST JOACHIM SCHIRRA • *Centre for Advanced Imaging, The University of Queensland, Brisbane, QLD, Australia*
- SONGTAO SHI • *Department of Anatomy and Cell Biology School of Dental Medicine, University of Pennsylvania, Philadelphia, PA, USA*
- JOSÉ F. SIQUEIRA JR. • *Department of Endodontics and Molecular Microbiology, Estácio de Sá University, Rio de Janeiro, RJ, Brazil; Faculty of Dentistry, Estácio de Sá University, Rio de Janeiro, Brazil*
- PAUL D. SLOWEY • *Oasis Diagnostics® Corporation, Vancouver, WA, USA*
- PETER A. STOCKWELL • *Department of Biochemistry, University of Otago, Dunedin, New Zealand*
- JIE SUN • *Medical School of Shenzhen University, Shenzhen, Guangdong, China*
- GERALD W. TANNOCK • *Department of Microbiology and Immunology, University of Otago, Dunedin, New Zealand*
- YANINA TOVPEKO • *Department of Biological Sciences, College of Liberal Arts and Sciences, University of Illinois at Chicago, Chicago, IL, USA*
- CÉDRYCK VAQUETTE • *Queensland University of Technology, Brisbane, QLD, Australia*
- PHILLIPA C. WHITE • *Institute of Clinical Sciences, College of Medical and Dental Sciences, The School of Dentistry, University of Birmingham, Birmingham, UK*
- DAVID T.W. WONG • *Division of Oral Biology and Oral Medicine, School of Dentistry, University of California Los Angeles (UCLA), Los Angeles, CA, USA; Johnson Comprehensive Cancer Center, University of California Los Angeles (UCLA), Los Angeles, CA, USA; Molecular Biology Institute, University of California Los Angeles (UCLA), Los Angeles, CA, USA; Head & Neck Surgery/Otolaryngology, Henry Samuel School of Engineering and Applied Science, University of California Los Angeles (UCLA), Los Angeles, CA, USA*
- HELEN J. WRIGHT • *Institute of Clinical Sciences, College of Medical and Dental Sciences, The School of Dentistry, University of Birmingham, Birmingham, UK*
- SOBIA ZAFAR • *Faculty of Dentistry, Sir John Walsh Research Institute, University of Otago, Dunedin, New Zealand*
- DIOGO GODOY ZANICOTTI • *Faculty of Dentistry, Sir John Walsh Research Institute, University of Otago, Dunedin, New Zealand*
- CHANGYU ZHENG • *Molecular Physiology and Therapeutics Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health (NIH), Bethesda, MD, USA*