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# Biomarkers in Disease: Methods, Discoveries and Applications

**Series Editor**

Victor R. Preedy

Department of Nutrition and Dietetics

Division of Diabetes and Nutritional Sciences

Faculty of Life Sciences and Medicine

King's College London

London, UK

In the past decade there has been a sea change in the way disease is diagnosed and investigated due to the advent of high-throughput technologies, such as microarrays, lab-on-a-chip, proteomics, genomics, lipomics, metabolomics etc. These advances have enabled the discovery of new and novel markers of disease relating to autoimmune disorders, cancers, endocrine diseases, genetic disorders, sensory damage, intestinal diseases etc. In many instances these developments have gone hand in hand with the discovery of biomarkers elucidated via traditional or conventional methods, such as histopathology or clinical biochemistry. Together with microprocessor-based data analysis, advanced statistics and bioinformatics these markers have been used to identify individuals with active disease or pathology as well as those who are refractory or have distinguishing pathologies. Unfortunately techniques and methods have not been readily transferable to other disease states and sometimes diagnosis still relies on single analytes rather than a cohort of markers. There is thus a demand for a comprehensive and focused evidenced-based text and scientific literature that addresses these issues. Hence the formulation of Biomarkers in Disease. The series covers a wide number of areas including for example, nutrition, cancer, endocrinology, cardiology, addictions, immunology, birth defects, genetics and so on. The chapters are written by national or international experts and specialists.

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4. Biomarkers in Kidney Disease
5. Biomarkers in Bone Disease
6. Biomarkers in Liver Disease

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Vinood B. Patel • Victor R. Preedy  
Editors

# Biomarkers in Bone Disease

With 186 Figures and 134 Tables

 Springer

*Editors*

Vinood B. Patel  
Department of Biomedical Sciences  
Faculty of Science and Technology  
University of Westminster  
London, UK

Victor R. Preedy  
Department of Nutrition and Dietetics  
Division of Diabetes and Nutritional  
Sciences  
Faculty of Life Sciences and Medicine  
King's College London  
London, UK

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# Preface

In the present volume, *Biomarkers in Bone Disease*, we have sections on

1. ***General Aspects and Introductory Material***
2. ***Body Fluids, Tissue, and Specific Biomarkers***
3. ***Genetic, Histological, Physical, and Imaging Methods***
4. ***Specific Diseases and Conditions***
5. ***Resources***

The editors recognize the difficulties in assigning particular chapters to particular sections, as some chapters can fit into more than one section. Nevertheless, the book has enormously wide coverage. Platforms and techniques include, for example, “omics,” Raman spectroscopy, ultrasound, immunological, biochemical, histochemical methods, and imaging. Conditions and biomedical areas encompass bariatric surgery, bisphosphonate failure, bone quality, diabetes, effect of phytoestrogens, effects of statins, ethnicity, exercise, fracture risk, gestational hypertension, glucocorticoid treatments, HIV, intrauterine growth restriction, lumbar spine analysis, osteoarthritis, osteogenesis imperfecta, osteopetrosis type II, osteoporosis, Paget’s disease, physiology, prematurity, remodeling, Rett syndrome, sclerosing disorders, sexual development, skeletal metastasis, spinal cord injury, and vascular remodeling. Analytes and measures include acid phosphatase, adiponectin, alkaline phosphatase, ameloblastin, calcium, carboxy-methyl lysine (CML), chitinases, creatine kinase, gene expression, geometry, integrin alpha2beta1, natural radionuclides, osteocalcin, parathyroid hormone, pentosidine, phosphorus, procollagen type 1 n-propeptide, PTX3, quality of life, radiomorphometric indices, relaxin, sclerostin, sirtuins, trabecular bone scores, ultrasound, uric acid, and vitamin D. There are also many other analytes and conditions described within this volume.

Finally, the last chapter is devoted to locating resource material for biomarker discovery and applications.

The chapters are written by national or international experts. This book is designed for clinical biochemists, orthopedic specialists, rheumatologists, those working within the wider field of skeletal disease, health scientists, epidemiologists,

doctors and nurses, from students to practioners at the higher level. It is also designed to be suitable for lecturers and teachers in health care and libraries as a reference guide.

The Editors

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## Series Preface

In the past decade, there has been major changes in the way diseases are diagnosed and investigated due to the advent of high-throughput technologies and advances in chemistry and physics. This has led to the development of microarrays, lab-on-a-chip, proteomics, genomics, lipomics, metabolomics, and other new platforms. These advances have enabled the discovery of new and novel markers of disease relating to autoimmune disorders, cancers, endocrine diseases, genetic disorders, sensory damage, intestinal diseases, and many other conditions too numerous to list here. In many instances, these developments have gone hand in hand with analysis of biomarkers elucidated via traditional methods, such as histopathology, immunoassays, and clinical biochemistry. Together with microprocessor-based data analysis, advanced statistics, and bioinformatics these markers have been used to identify individuals with active disease as well as those who are refractory or have distinguishing pathologies.

Unfortunately, techniques and methods have not been readily transferable to other disease states, and sometimes diagnosis still relies on a single analyte rather than a cohort of markers. Furthermore, the discovery of many new markers has not been put into clinical practice partly because of their cost and partly because some scientists are unaware of their existence or the evidence is at the preclinical stage. There is thus a demand for a comprehensive and focused evidenced-based text that addresses these issues. Hence, the book series **Biomarkers in Disease: Methods, Discoveries and Applications**. It imparts holistic information on the scientific basis of health and biomarkers and covers the latest knowledge, trends, and treatments. It links conventional approaches with new platforms. The ability to transcend the intellectual divide is aided by the fact that each chapter has:

- *Key Facts (areas of focus explained for the lay person)*
- *Definitions of Words and Terms*
- *Potential Applications to Prognosis, Other Diseases, or Conditions*
- *Summary Points*

The material in *Potential Applications to Prognosis, Other Diseases, or Conditions* pertains to speculative or proposed areas of research, cross-transference to

other diseases or stages of the disease, translational issues, and other areas of wide applicability.

The series is expected to prove useful for clinicians, scientists, epidemiologists, doctors and nurses, and also academicians and students at an advanced level.

The Editors



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## About the Editors



**Vinood B. Patel**

Department of Biomedical Science  
Faculty of Science and Technology  
University of Westminster  
London, UK

**Dr. Vinood B. Patel** is currently a Reader in Clinical Biochemistry at the University of Westminster and honorary fellow at King's College London. He presently directs studies on metabolic pathways involved in tissue

pathology particularly related to mitochondrial energy regulation and cell death. Research is being undertaken to study the role of nutrients, antioxidants, phytochemicals, iron, alcohol, and fatty acids in tissue pathology. Other areas of interest include identifying new biomarkers that can be used for diagnosis and prognosis of liver disease, understanding mitochondrial oxidative stress in Alzheimers disease, and gastrointestinal dysfunction in autism. Dr. Patel graduated from the University of Portsmouth with a degree in Pharmacology and completed his Ph.D. in Protein Metabolism from King's College London in 1997. His postdoctoral work was carried out at Wake Forest University Baptist Medical School studying structural-functional alterations to mitochondrial ribosomes, where he developed novel techniques to characterize their biophysical properties. Dr. Patel is a nationally and internationally recognized liver researcher and was involved in several NIH-funded biomedical grants related to alcoholic liver disease. Dr. Patel has edited biomedical books in the area of nutrition and health, autism, and biomarkers and has published over 150 articles, and in 2014 he was elected as a Fellow to The Royal Society of Chemistry.

**Victor R. Preedy** is a senior member of King's College London. He is also Director of the Genomics Centre and a member of the Faculty of Life Sciences and Medicine.

Professor Preedy graduated in 1974 with an Honours Degree in Biology and Physiology with Pharmacology. He gained his University of London Ph.D. in 1981. In 1992, he received his Membership of the Royal College of Pathologists, and in 1993 he gained his second doctoral degree for his outstanding contribution to protein metabolism in health and disease. Professor Preedy was elected as a Fellow to the Institute of Biology in 1995 and to the Royal College of Pathologists in 2000. Since then he has been elected as a Fellow to the Royal Society for the Promotion of Health (2004) and The Royal Institute of Public Health (2004). In 2009, Professor Preedy became a Fellow of the Royal Society for Public Health, and in 2012 a Fellow of the Royal Society of Chemistry. In his career, Professor Preedy has carried out research at the National Heart Hospital (part of Imperial College London), The School of Pharmacy (now part of University College London), and the MRC Centre at Northwick Park Hospital. He has collaborated with research groups in Finland, Japan, Australia, USA, and Germany. He is a leading expert on the science of health and has a long-standing interest in biomarkers for over 30 years especially related to tissue pathology. He has lectured nationally and internationally. To his credit, Professor Preedy has published over 600 articles, which include peer-reviewed manuscripts based on original research, abstracts and symposium presentations, reviews, and numerous books and volumes.

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## Editorial Advisor

### **Rajkumar Rajendram**

Consultant in Internal and Perioperative Medicine  
King Abdulaziz Medical City  
Ministry of National Guard Health Affairs  
Riyadh, Saudi Arabia



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## Contributors

**Élie Abed** Centre de recherche du Centre Hospitalier de l'Université de Montréal (CRCHUM), Montréal, QC, Canada

**Basim A. Almayahi** College of Science, Department of Environment, University of Kufa, Najaf, Iraq

**Alev Alp** Department of Physical Therapy and Rehabilitation (Atatürk Balneotherapy and Rehabilitation Center), Faculty of Medicine, Uludag University, Osmangazi, Bursa, Turkey

**Ashutosh Kumar Arya** Department of Endocrinology, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, India

**P. Balaji** Department of Oral Medicine and Radiology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India

**Fátima Baptista** Exercise and Health Laboratory, CIPER, Faculdade de Motricidade Humana, Universidade de Lisboa, Cruz Quebrada, Portugal

**Joshua Barzilay** Kaiser Permanente of Georgia, Duluth, GA, USA  
Division of Endocrinology, Emory University School of Medicine, Atlanta, GA, USA

**Arpita Basu** Department of Nutritional Sciences, Oklahoma State University, Stillwater, OK, USA

**Paramita Basu** Department of Biology, Texas Woman's University, Denton, TX, USA

**Milan Bayer** Department of Children and Adolescents Third Faculty of Medicine, Charles University, Prague 10, Czech Republic

**Bachir Benarba** Laboratory Research on Biological Systems and Geomatics, Faculty of Nature and Life, University of Mascara, Mascara, Algeria

**Ariane Berdal** Laboratory of Molecular Oral Pathophysiology, INSERM UMRS 1138, Team Berdal, Cordeliers Research Center, Paris, France

Pierre and Marie Curie University (Paris 6), Paris, France

Paris Descartes University (Paris 5), Paris, France

Paris Diderot University (Paris 7), Paris, France

UFR d'Odontologie, Paris Diderot University (Paris 7), Paris, France

Reference Center for Buccal and Facial Malformations CRMR MAFACE, Hopital Rotshild-APHP, Paris, France

**Alexander E. Berezin** Department of Internal Medicine, State Medical University of Zaporozhye, Zaporozhye, Ukraine

**Giulia Bernardini** Dipartimento di Biotecnologie, Chimica e Farmacia, Università di Siena, Siena, Italy

**Maria F. G. Biagioni** Internal Medicine Department, Botucatu Medical School, Unesp, Botucatu, São Paulo, Brazil

**Neil Binkley** Department of Medicine, Divisions of Geriatrics and Endocrinology, University of Wisconsin, Madison, WI, USA

**Annette I. Birkhold** Continuum Biomechanics and Mechanobiology Research Group, Institute of Applied Mechanics, University of Stuttgart, Stuttgart, Germany

**Francisco J. Blanco** Grupo de Proteómica, ProteoRed-PRB2/ISCIII, Servicio de Reumatología. Instituto de Investigación Biomédica (INIBIC). Complejo Hospitalario Universitario A Coruña (CHUAC). Sergas. Universidad de A Coruña (UDC), A Coruña, Spain

Rheumatology Divison, INIBIC-Hospital Universitario A Coruña, A Coruña, Spain

**Mark Bloch** Holdsworth House Medical Practice, Darlinghurst, NSW, Australia  
Kirby Institute, University of New South Wales, Sydney, Australia

**Catherine Bosser** Ingénierie et Vieillessement des Tissus Vivants, Centrale Innovation, Centre Scientifique Auguste Moiroux, Ecully Cedex, France

**Despina D. Briana** Department of Neonatology, Athens University Medical School, Athens, Greece

**Wadena D. Burnett** Division of Biomedical Engineering, University of Saskatchewan, Saskatoon, SK, Canada

**Petra Bůžková** Department of Biostatistics, University of Washington, Seattle, WA, USA

**Joana Caetano-Lopes** Rheumatology Research Unit, Instituto de Medicina Molecular, Faculdade de Medicina da Universidade de Lisboa, Lisbon, Portugal

**Elisa Cairoli** Unit of Endocrinology and Metabolic Diseases, Fondazione IRCCS Ca' Granda – Ospedale Maggiore Policlinico, Milan, Italy

Department of Clinical Sciences and Community Health, University of Milan, Milan, Italy

**Enrico Carmina** Department of Health Sciences and Mother and Child Care, University of Palermo, Palermo, Italy

**Mauro Celli** Department of Pediatrics “Sapienza”, University of Rome, Rome, Italy

**Poornima Chandra** Department of Oral Medicine and Radiology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India

**Eun-Ju Chang** Department of Biomedical Sciences, University of Ulsan College of Medicine, Asan Medical Center, Seoul, Republic of Korea

**Iacopo Chiodini** Unit of Endocrinology and Metabolic Diseases, Fondazione IRCCS Ca' Granda – Ospedale Maggiore Policlinico, Milan, Italy

**Bongkun Choi** Department of Biomedical Sciences, University of Ulsan College of Medicine, Asan Medical Center, Seoul, Republic of Korea

**Luis Corral-Gudino** Internal Medicine Department, Hospital el Bierzo, Ponferrada, León, Spain

**Amélie E. Coudert** Molecular Oral Pathophysiology, INSERM UMRS 1138, Centre de Recherche des Cordeliers, UFR d'Odontologie, Université Paris Diderot, Paris, France

**Patrizia D'Eufemia** Department of Pediatrics “Sapienza”, University of Rome, Rome, Italy

**Marco Daverio** Neonatal Intensive Care, Department of Woman and Child's Health, Azienda Ospedaliera University of Padova, Padova, Italy

**Marie-Christine de Vernejoul** BIOSCAR, INSERM UMRS 1132, Hôpital Lariboisière, Université Paris Diderot, Secteur Violet, Porte 4, Bâtiment Viggo Petersen, Paris, France

**Giuseppe Derosa** Department of Internal Medicine and Therapeutics, University of Pavia, Fondazione IRCCS Policlinico S. Matteo, Pavia, Italy

Center for Prevention, Surveillance, Diagnosis and Treatment of Rare Diseases, Fondazione IRCCS Policlinico San Matteo, Pavia, Italy

Center for the Study of Endocrine-Metabolic Pathophysiology and Clinical Research, University of Pavia, Pavia, Italy

Laboratory of Molecular Medicine, University of Pavia, Pavia, Italy

**Jean-Pierre Devogelaer** Pôle de Pathologie Rhumatismale, Université Catholique de Louvain, Brussels, Belgium

**Michelino Di Rosa** Department of Biomedical and Biotechnological Science, University of Catania, Catania, Italy

**Sebastian Dinu** St. Vincent Hospital Vienna, Medical Department II, Academic Teaching Hospital, Medical University of Vienna, Vienna, Austria

**Carolina Duarte** RAK College of Dental Sciences, RAK Medical and Health Sciences University, Ras Al Khaimah, United Arab Emirates

**Anne Durnez** Pôle de Pathologie Rhumatismale, Université Catholique de Louvain, Brussels, Belgium

AZ Jan Portaels, Vilvoorde, Belgium

**M. P. Engbersen** Division of Rheumatology, Duke Molecular Physiology Institute, Duke University School of Medicine, Durham, NC, USA

**Margherita Fantinato** Neonatal Intensive Care, Department of Woman and Child's Health, Azienda Ospedaliera University of Padova, Padova, Italy

**Magdalena Fernández García** Bone Metabolism Unit, Department of Internal Medicine, Hospital Marqués de Valdecilla, University of Cantabria, Santander, Spain

**Patricia Fernández-Puente** Grupo de Proteómica, ProteoRed-PRB2/ISCIII, Servicio de Reumatología. Instituto de Investigación Biomédica (INIBIC). Complejo Hospitalario Universitario A Coruña (CHUAC). Sergas. Universidad de A Coruña (UDC), A Coruña, Spain

**Paulo Fernandes** LAETA, IDMEC, Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal

**Roberto Finocchiaro** Department of Pediatrics "Sapienza", University of Rome, Rome, Italy

**João Eurico Fonseca** Rheumatology Research Unit, Instituto de Medicina Molecular, Faculdade de Medicina da Universidade de Lisboa, Lisbon, Portugal

Rheumatology Department, Lisbon Academic Medical Center, Lisbon, Portugal

**Erin Gaffney-Stomberg** Military Performance and Nutrition Divisions, United States Army Research Institute of Environmental Medicine, Natick, MA, USA

**Paola Gaio** Neonatal Intensive Care, Department of Woman and Child's Health, Azienda Ospedaliera University of Padova, Padova, Italy

**Federico Galvagni** Dipartimento di Biotecnologie, Chimica e Farmacia, Università di Siena, Siena, Italy

**Poornima Govindraju** Department of Oral Medicine and Radiology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India

**Damien Gruson** Pôle de Recherche en Endocrinologie, Diabète et Nutrition et Département des Laboratoires Cliniques, Institut de Recherche Expérimentale et Clinique, Cliniques Universitaires Saint-Luc, Université catholique de Louvain, Bruxelles, Belgium

**Giovanni Guaraldi** Department of Medical and Surgical Sciences for Children and Adults, University of Modena and Reggio Emilia, Modena, Italy

**Christopher L. Hall** Department of Chemical Engineering, University of Massachusetts at Amherst, Amherst, MA, USA

**José L. Hernández** Bone Metabolism Unit, Department of Internal Medicine, Hospital Marqués de Valdecilla, University of Cantabria, Santander, Spain

**Thierry Hoc** Ingénierie et Vieillesse des Tissus Vivants, Centrale Innovation, Centre Scientifique Auguste Moiroux, Ecully Cedex, France

**Z. Huang** Division of Rheumatology, Duke Molecular Physiology Institute, Duke University School of Medicine, Durham, NC, USA

**Laurianne Imbert** UMR CNRS 5513, Laboratoire de Tribologie et Dynamique des Systèmes, Ecole Centrale de Lyon, Ecully Cedex, France

**Juliane Isaac** Laboratory of Molecular Oral Pathophysiology, INSERM UMRS 1138, Team Berdal, Cordeliers Research Center, Paris, France

Pierre and Marie Curie University (Paris 6), Paris, France

Paris Descartes University (Paris 5), Paris, France

Paris Diderot University (Paris 7), Paris, France

UFR d'Odontologie, Paris Diderot University (Paris 7), Paris, France

Laboratory of Morphogenesis Molecular Genetics, Department of Developmental and Stem Cell Biology, CNRS URA 2578, Institut Pasteur, Paris, France

**Takeshi Ishihara** Shionogi Pharmaceutical Research Center, Shionogi & Co. Ltd., Toyonaka, Osaka, Japan

**Shinya Ishii** Department of Geriatric Medicine, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan

**Norimasa Iwasaki** Department of Orthopedic Surgery, Hokkaido University School of Medicine, Kita-ku, Sapporo, Japan

**Jaime Jacques** Laboratory of Molecular Oral Pathophysiology, INSERM UMRS 1138, Team Berdal, Cordeliers Research Center, Paris, France

Periodontology Unit, Department of Stomatology-Faculty of Health Science, University of Talca, Talca, Chile

**Kathleen F. Janz** Department of Health and Human Physiology; Department of Epidemiology, University of Iowa, Iowa City, IA, USA

**Jens-Erik Beck Jensen** Department of Endocrinology, Copenhagen University Hospital, Hvidovre Hospital, Hvidovre, Denmark

**James D. Johnston** Department of Mechanical Engineering, University of Saskatchewan, Saskatoon, SK, Canada

Division of Biomedical Engineering, University of Saskatchewan, Saskatoon, SK, Canada

**Evan T. Keller** Department of Urology, University of Michigan, Ann Arbor, MI, USA

**Yukiho Kobayashi** Department of Maxillofacial Orthognathics, Division of Maxillofacial and Neck Reconstruction, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, Tokyo, Japan

**Roland Kocijan** St. Vincent Hospital Vienna, Medical Department II, Academic Teaching Hospital, Medical University of Vienna, Vienna, Austria

**Saija A. Kontulainen** Division of Biomedical Engineering, University of Saskatchewan, Saskatoon, SK, Canada

College of Kinesiology, University of Saskatchewan, Saskatoon, SK, Canada

**V. B. Kraus** Division of Rheumatology, Duke Molecular Physiology Institute, Duke University School of Medicine, Durham, NC, USA

**Daniel Lajeunesse** Département de médecine, Centre de recherche du Centre Hospitalier de l'Université de Montréal (CRCHUM), Université de Montréal, Montréal, QC, Canada

**William D. Leslie** Department of Medicine, University of Manitoba, Winnipeg, MB, Canada

**Thoralf Randolph Liebs** Department of Paediatric Orthopaedics and Paediatric Traumatology, Inselspital, University of Bern, University Clinic for Paediatric Surgery, Bern, Switzerland

**Guilhem Lignon** Laboratory of Molecular Oral Pathophysiology, INSERM UMRS 1138, Team Berdal, Cordeliers Research Center, Paris, France

Pierre and Marie Curie University (Paris 6), Paris, France

Paris Descartes University (Paris 5), Paris, France

Paris Diderot University (Paris 7), Paris, France

**Anna Lubkowska** Department of Functional Diagnostics and Physical Medicine, Faculty of Health Sciences, Pomeranian Medical University in Szczecin, Szczecin, Poland

**Raquel Lucas** EPIUnit - Institute of Public Health of the University of Porto, Porto, Portugal

Department of Clinical Epidemiology, Predictive Medicine and Public Health, University of Porto Medical School, Porto, Portugal

**Simon Lykkeboe** Department of Clinical Biochemistry, Aalborg University Hospital, Aalborg, Denmark

**Michael R. MacArthur** Military Performance and Nutrition Divisions, United States Army Research Institute of Environmental Medicine, Natick, MA, USA

**Pamela Maffioli** Department of Internal Medicine and Therapeutics, University of Pavia, Fondazione IRCCS Policlinico S. Matteo, Pavia, Italy

PhD School in Experimental Medicine, University of Pavia, Pavia, Italy

Center for Prevention, Surveillance, Diagnosis and Treatment of Rare Diseases, Fondazione IRCCS Policlinico San Matteo, Pavia, Italy

**T. S. Mahesh Kumar** Department of Oral Medicine and Radiology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India

**Camelia Maier** Department of Biology, Texas Woman's University, Denton, TX, USA

**Lucia Malaguarnera** Department of Biomedical and Biotechnological Science, University of Catania, Catania, Italy

**Ariadne Malamitsi-Puchner** Department of Neonatology, Athens University Medical School, Athens, Greece

**Daniel H. Manicourt** Pôle de Pathologie Rhumatismale, Université Catholique de Louvain, Brussels, Belgium

**Ana Martins** EPIUnit - Institute of Public Health of the University of Porto, Porto, Portugal

Department of Clinical Epidemiology, Predictive Medicine and Public Health, University of Porto Medical School, Porto, Portugal

**Glucia M. F. S. Mazeto** Internal Medicine Department, Botucatu Medical School, Unesp, Botucatu, São Paulo, Brazil

**James P. McClung** Military Performance and Nutrition Divisions, United States Army Research Institute of Environmental Medicine, Natick, MA, USA

**Adriana L. Mendes** Internal Medicine Department, Botucatu Medical School, Unesp, Botucatu, São Paulo, Brazil

**Jan Mieszkowski** Institute of Physical Culture, Faculty of Physical Education, Health and Tourism, Kazimierz Wielki University in Bydgoszcz, Bydgoszcz, Poland

**Teresa Monjardino** EPIUnit - Institute of Public Health of the University of Porto, Porto, Portugal

**Keiji Moriyama** Department of Maxillofacial Orthognathics, Division of Maxillofacial and Neck Reconstruction, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, Tokyo, Japan

**Kenneth J. Mukamal** Department of General Medicine, Beth Israel Deaconess Medical Center, Boston, MA, USA

**Christian Muschitz** St. Vincent Hospital Vienna, Medical Department II, Academic Teaching Hospital, Medical University of Vienna, Vienna, Austria

**Shin-Ichiro Nishimura** Field of Drug Discovery Research, Faculty of Advanced Life Science, Hokkaido University, Sapporo, Japan

**Agathe Ogier** UMR CNRS 5513, Laboratoire de Tribologie et Dynamique des Systèmes, Ecole Centrale de Lyon, Ecully Cedex, France

**Maurizio Orlandini** Dipartimento di Biotecnologie, Chimica e Farmacia, Università di Siena, Siena, Italy

**Sergio A. R. Paiva** Internal Medicine Department, Botucatu Medical School, Unesp, Botucatu, São Paulo, Brazil

**Vladimir Palicka** University Hospital Hradec Králové, Hradec Králové, Czech Republic

**Socrates E. Papapoulos** Department of Endocrinology and Metabolic Diseases, Center for Bone Quality, Leiden University Medical Center, Leiden, The Netherlands

**Bushra Parveen** Faculty of Pharmacy, Jamia Hamdard, New Delhi, India

**Vinood B. Patel** Department of Biomedical Science, Faculty of Science and Technology, University of Westminster, London, UK

**Victor R. Preedy** Diabetes and Nutritional Sciences Research Division, Faculty of Life Science and Medicine, King's College London, London, UK

**Janet M. Pritchard** Kinesiology and Interdisciplinary Science, McMaster University, Hamilton, ON, Canada

**Aleksandra Radecka** Department of Functional Diagnostics and Physical Medicine, Faculty of Health Sciences, Pomeranian Medical University in Szczecin, Szczecin, Poland

**Rajkumar Rajendram** Diabetes and Nutritional Sciences Research Division, Faculty of Life Science and Medicine, King's College London, London, UK

Department of Internal Medicine, King Abdulaziz Medical City, National Guard Hospital Affairs, Riyadh, Saudi Arabia

**Pascal Reboul** Biopôle de l'Université de Lorraine – Campus biologie-santé, UMR7365 CNRS Université de Lorraine, IMoPA, Vandœuvre-lès-Nancy cedex, France

**Gitte Roende** Department of Pediatrics, Zealand University Hospital, Roskilde Hospital, Roskilde, Denmark



**Cristina Ruiz-Romero** Grupo de Proteómica, ProteoRed-PRB2/ISCIII, Servicio de Reumatología. Instituto de Investigación Biomédica (INIBIC). Complejo Hospitalario Universitario A Coruña (CHUAC). Sergas. Universidad de A Coruña (UDC), A Coruña, Spain

Proteomics Unit, INIBIC-Hospital Universitario A Coruña, A Coruña, Spain

**Naresh Sachdeva** Department of Endocrinology, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, India

**Annalisa Santucci** Dipartimento di Biotecnologie, Chimica e Farmacia, Università di Siena, Siena, Italy

**Roop Singh** Department of Orthopaedics, Pandit B. D. Sharma PGIMS, Rohtak, Haryana, India

**M. B. Sowbhagya** Department of Oral Medicine and Radiology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India

**Jakob Starup-Linde** Department of Endocrinology and Internal Medicine, Aarhus University Hospital, Aarhus C, Denmark

**Eveline Staub** Division of Neonatology, University of Basel Children's Hospital UKBB, Basel, Switzerland

**Antoon H. van Lierop** Department of Internal Medicine, Amsterdam Medical Center, Amsterdam-Zuidoost, The Netherlands

**Giovanna Verlato** Neonatal Intensive Care, Department of Woman and Child's Health, Azienda Ospedaliera University of Padova, Padova, Italy

**Peter Vestergaard** Department of Endocrinology, Aalborg University Hospital, Aalborg, Denmark

**Divya Vohora** Faculty of Pharmacy, Jamia Hamdard, New Delhi, India

**Sidse Westberg-Rasmussen** Department of Endocrinology and Internal Medicine, Aarhus University Hospital, Aarhus C, Denmark

**Thomas L. Willett** Biomedical Engineering Program, Department of Systems Design Engineering, University of Waterloo, Waterloo, ON, Canada

**Bettina M. Willie** Department of Pediatric Surgery, McGill University, Research Centre, Shriners Hospital for Children-Canada, Montreal, QC, Canada

**Yulong Yang** Internal Medicine Resident, Mount Sinai Beth Israel, New York, NY, USA

**Anna Zambrano** Department of Pediatrics "Sapienza", University of Rome, Rome, Italy

**Vera Zymbal** Exercise and Health Laboratory, CIPER, Faculdade de Motricidade Humana, Universidade de Lisboa, Cruz Quebrada, Portugal