

Biomarkers in Disease:
Methods, Discoveries and Applications
Series Editor: Victor R. Preedy

Victor R. Preedy
Vinood B. Patel *Editors*

Biomarkers in Cancer



Springer Reference

Victor R. Preedy • Vinood B. Patel
Editors

Biomarkers in Cancer

With 176 Figures and 88 Tables



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Biomarkers in Disease: Methods, Discoveries and Applications

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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. Furthermore, the discovery of many new markers have 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 still at the preclinical stage. In some cases the work needs further scientific scrutiny. 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: Methods, Discoveries and Applications*. 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.

Series Titles

1. General Methods in Biomarker Research and Their Applications
2. Biomarkers in Cancer
3. Biomarkers in Cardiovascular Disease
4. Biomarkers in Kidney Disease
5. Biomarkers in Bone Disease
6. Biomarkers in Liver Disease

More information about this series at <http://www.springer.com/series/13842>

Preface

In the present volume, *Biomarkers in Cancer*, we have over 40 chapters covering a wide range of conditions, body locations, and cancer types. Their allocations to a traditional grouping presents some difficulty as this may mean having only one chapter in a particular section. Instead, we have adopted a pragmatic approach for ease of navigation and so have the following sections:

- General Aspects: Techniques and Overviews
- Bladder, Kidney, Liver, and Lung
- Brain
- Breast and Prostate
- Cervix and Uterus
- Colorectum
- Head and Neck
- Leukemia and Hodgkin Lymphoma
- Further Knowledge

While the Editors recognize the difficulties in assigning particular chapters to particular sections, the book has enormously wide coverage and includes the following areas, analytes, and platforms: omics, circulating tumor cells, oncoproteomics, cardiotoxicity, DNA methylation, kallikreins, MAP17, CA 19-9, PTTG (Securin), small nuclear RNA, centrosome amplification, cytological specimens, microarrays, cell death markers, epigenetics, molecular markers, maspin, LGR5, 2D-DIGE-MS, imaging, TPS, CD133, mitosis targets, HER2, immunohistochemistry, visceral adipocytes, expression profiling, telomerase, carcinoembryonic antigen family cell adhesion molecules, human papillomavirus (HPV), the NeoMark European project, matrix metalloproteinases, tissue microarrays, FGFR4, whole blood transcriptome, nuclear BMI-1, immunophenotyping, and CD163 and TARC. Tissues and conditions include cancers in general, cancers of the bladder, renal cell, liver, lung, brain, breast, prostate, cervix, endometrium, colorectum, head and neck cancers including the oral cavity, salivary gland, oropharynx, nasopharynx, larynx, leukemia, and Hodgkin lymphoma. Finally, the last chapter is devoted to locating resource material for biomarker

discovery and applications. The chapters are written by national or international experts and specialists.

This book is specifically designed for clinical biochemists, oncologists, scientists, epidemiologists, doctors, and nurses, from students to practitioners at the higher level. It is also designed to be suitable for lecturers and teachers in health care and libraries as a reference guide.

April 2015
London

Victor R. Preedy
Vinood B. Patel

Series Preface

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 and advances in chemistry and physics, leading to the development of 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, and many other conditions too numerous to list here. In many instances, these developments have gone hand in hand with the discovery of biomarkers elucidated via traditional or conventional methods, such as histopathology, immunoassays, or 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 still at the preclinical stage. There is thus a demand for a comprehensive and focused evidence-based text and scientific literature 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.

April 2015
London

Victor R. Preedy

About the Editors

Victor R. Preedy is a senior member of King's College London (Professor of Nutritional Biochemistry) and King's College Hospital (Professor of Clinical Biochemistry, Honorary). He is attached to both the Diabetes and Nutritional Sciences Division and the Department of Nutrition and Dietetics. He is also founding and current Director of the Genomics Centre and a member of the School of Medicine. Professor Preedy graduated in 1974 with an Honors 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 contribution to the science of protein metabolism in health and disease. Professor Preedy was elected as a Fellow of 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 and Hygiene (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 worked at the National Heart Hospital (part of Imperial 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 biomedical sciences and has a long-standing interest in analytical methods and their applications to the study of health and disease. He has lectured nationally and internationally. To his credit, Professor Preedy has published over 500 articles, which includes peer-reviewed manuscripts based on original research, reviews, abstracts, and numerous books and volumes.



Vinood B. Patel is currently a Senior Lecturer 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 liver disease, 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 the pathophysiology of liver disease. Other areas of interest are identifying new biomarkers that can be used for

diagnosis and prognosis of liver disease, understanding mitochondrial oxidative stress in Alzheimer's 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. He has edited biomedical books in the area of nutrition and health prevention, autism, and biomarkers and has published over 150 articles. In 2014, he was elected as a Fellow to The Royal Society of Chemistry.

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