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## Preface

Breast cancer is the leading cause of cancer specific deaths in women worldwide. Screening and early diagnosis provides better patient management, improves treatment efficacy, and reduce mortality. With the advent of next-generation “omics” technologies; several early markers, novel targets, and personalized targeted therapeutics are now available that are either under development or in use. However, the new cases are increasing rapidly and control of the incidences and the mortality rate is not coming down significantly due to several factors associated with the disease. Therefore, identification of the disease biology at a deeper level and search for the gold standard molecular markers for screening, early diagnosis, prognosis, and novel therapeutics irrespective to the type of breast cancer will continue till we identify them. In this “omics” era, a large amount of data have been generated and analyzed in various aspects of breast cancer to achieve these ultimate goals. However, the outcomes of these data in an organized form is not readily available so far, so that, the summery and the advancements in these fields can be glanced in a single resource.

This book entitled *Omics Approaches in Breast Cancer: Towards Next-Generation Diagnosis, Prognosis and Therapy* is introduced to fill these gaps by providing all basic and latest developments in various “omics”-based breast cancer research outcomes and applications in a single volume. The book also contains basic topics such as types of breast cancers, conventional treatment strategies, currently used diagnostic tools, etc. so that readers can get the entire spectrum of breast cancer.

The book is a successful effort of more than 65 experts (scientists, clinicians, pharmacists, etc.) from nearly 20 countries who are either working on various “omics” aspects of breast cancer biology or developing breast cancer biomarkers and therapeutics or treating breast cancer for last several decades. Therefore, the book reflects richest and up-to-date contents, personal and real-life experiences, and most importantly, provides the future directions of breast cancer research.

*Omics Approaches in Breast Cancer: Towards Next-Generation Diagnosis, Prognosis and Therapy* contains 27 chapters covering most of the aspects of female breast cancer “omics” and is divided into 2 parts. While Part I contains applied technologies and outcomes of various “omics” approaches in breast cancer, Part II provides real-life applications of “omics”-based research outcomes in breast cancer diagnosis, prognosis and therapy along with basic clinical and therapeutical aspects of the disease. A special chapter is also

included on male breast cancer to describe up-to-date “omics”-based outcomes on this rare type of breast cancer.

Part I starts with an introductory chapter (Chap. 1) by Dr. Cusati and colleagues to provide an overview of “Omics technologies applied in breast cancer research”. In Chap. 2, the “Omics of hereditary breast cancer” has been described by Dr. Catherine’s group. Dr. Uctepe et al. provide the insights on how the oncogenes and tumor suppressor genes can act as biomarkers in breast cancer in the Chap. 3. Chapter 4 by Dr. Kumar and Dr. Mandal gives a detail account on various aspects of “Breast cancer genomics”. In the next chapter (Chap. 5), Dr. Yaykasli and colleagues have provided the epigenomics approaches in breast cancer. How the nutrients and genes interplay in breast cancer have been covered by Dr. Dwivedi and colleagues in Chap. 6. In Chap. 7, the implications of long non-coding RNAs in breast cancer pathogenesis, diagnosis and therapy have been discussed by Dr. Juracek and colleagues. The subsequent chapter (Chap. 8) by Dr. Shafi’s team gives a detail account on how microRNA can be utilized as clinical biomarkers for diagnosis and treatment strategies in breast cancer. In Chap. 9, Prof. Minafra has demonstrated a detail account on “Breast cancer proteomics”. The next chapter (Chap. 10) by Dr. Calomarde et al. covers the “Metabolomics in breast cancer”. The “Lipidomics in breast cancer” written by Dr. Kamili and Dr. Byrne is included in Chap. 11. “Breast cancer stem cells and cellomics” by Dr. Demir and colleagues in Chap. 12 has provided the emerging field of potential stem cell therapeutic aspects in breast cancer. In this book, breast cancer generally means female breast cancer. However, there are cases where males are also diagnosed with breast cancer. The book has included a chapter (Chap. 13) on “Omics of male breast cancer” by Dr. Nur Unal et al. to give up-to-date “omics”-based strategies, outcomes, and other aspects of this very rare type of breast cancer. In Chap. 14, omics approaches in chemoresistant and metastatic breast cancer have been discussed by Dr. Aguilera. In the next two chapters (Chaps. 15 and 16), animal and *in silico* breast cancer disease models and their various aspects have been described by Dr. El-Abd and Dr. Munshi’s groups, respectively. The last chapter (Chap. 17, by Dr. Hernández-Lemus) under Part-I provides systems biology and integrative omics approaches in breast cancer to give the latest developments in this area.

Part II of this book provides information on how the “omics”-based research outcomes are used in real-life diagnosis, prognosis and therapy of breast cancer. The section starts with a chapter (Chap. 18) by Dr. Robinson and Dr. Ali that provides the basic clinical or gynaecological aspects and considerations for women suffering from breast cancer. The next chapter (Chap. 19) developed by Dr. Mar Gil and colleagues gives the detail account of currently available imaging technologies and their applications in early diagnosis and prognosis of breast cancer. In Chap. 20, Dr. Verma and I have demonstrated various molecular biomarkers that are either under development or in practice for risk assessment, screening, detection, diagnosis, and prognosis of breast cancer. Next three chapters deal with very important aspects in breast cancer diagnosis and prognosis through minimal- or non-invasive strategy. Dr. Van Pham in Chap. 21 has provided how the circulating tumor cells can be used for diagnosis and prognosis of breast cancer. In the

same direction, Dr. Dwivedi and colleagues in Chap. 22 have described the molecular diagnosis of metastasizing breast cancer using liquid biopsy, and in Chap. 23, Dr. Barash and Dr. Haick have demonstrated the emerging potential of exhaled volatile biomarkers in breast cancer. Chapters 24, 25, and 26 cover therapeutic aspects of breast cancer. Dr. Ch Yiannakopoulou in Chap. 24 has given a detail account of classical therapy and drug targets along with targeted therapy in breast cancer. In the next chapter (Chap. 25), Dr. Ch Yiannakopoulou and me have discussed the pharmacogenomics or personalized medicine and their therapeutic implications in breast cancer. The current status and future prospects of gene therapy in breast cancer has been discussed in Chap. 26 by Dr. Büyükköroğlu and her colleagues. The last chapter (Chap. 27) is on clinical trial, and in this chapter Dr. George and Dr. Selvarajan have described the essentiality of optimum end points in breast cancer clinical trials to select the right drug having the best efficacy and minimal toxicity.

I believe that this book and its up-to-date contents and broad coverage will be worthwhile to cutting-edge breast cancer research, diagnosis, and clinician communities. I highly appreciate your comments and suggestions to improve the next edition of the book.

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<http://www.springer.com/978-81-322-0842-6>

Omic Approaches in Breast Cancer  
Towards Next-Generation Diagnosis, Prognosis and  
Therapy

Barh, D. (Ed.)

2014, XXVIII, 545 p. 60 illus., 35 illus. in color.,

Hardcover

ISBN: 978-81-322-0842-6