Preface

Human population is simultaneously and continuously exposed to a wide variety of chemical substances, biological agents, physical agents, and other stressors in daily life. The exposures can modify health consequences or potentiate the response expected from the exposure. Over the past decades, it has been a raised awareness of the environmental pollution to the health of human. Despite the effort of remediation and better control of the pollution, many of nature disasters, such as oil spill in the Gulf of Mexico, Fukushima nuclear plant disaster in Japan, and levee failure in New Orleans after Hurricane Katrina, or manmade products, such as bisphenol-A in food containers and a widely used plasticizer, di(2-ethylhexyl) phthalate (DEHP), presence of fungicides, vinclozolin and prochloraz, in foods, inappropriate disposal of electronic boards that contain heavy metals, and pharmaceutical use of finasteride, continuously pose threat to the human health.

Epidemiological and experimental studies have linked epigenetic modulations with exposure to environmental toxicants. Many environmental toxicants affect epigenetic pathways mainly through DNA methylation and complex histone modifications. Evidence linking environmental factors with DNA hyper- or hypomethylation provides the most compelling support for such an association. Further, life style and dietary factors may modulate the toxicity of environmental pollutants, through either synergistic or antagonistic effects. Environmental toxicants may also cause aberrant modifications in the metabolic activity of nutritional factors. However, the relationship between environmental toxicants and epigenetic modulations is complex and an exact causal relationship has yet to be identified. In addition, the complexity of the relationship is compounded by the interaction of multiple toxicants and nutritional factors. Nonetheless, nutritional factors and environmental toxicants may affect similar biological and epigenetic pathways and thus should be examined simultaneously.

This book provides a compilation of the recent development and knowledge in the exciting field of environmental epigenetics through interdisciplinary approach. The book begins with the question “What is epigenetics?” in Chap. 1 to explore the history and fundamental knowledge of epigenetic research and followed by Chap. 2 to provide an overview of epidemiology of environmental health. Chapters 3, 4, 5,

6, 7, 8, and 9 utilize uterine leiomyoma, endocrine disease, breast cancer, obesity, cancers, aging, and cardiovascular diseases, respectively, as an examples to explore the potentially intricate relationship between environmental disrupting chemicals and these diseases. Some have suggested that epigenetics is a natural exhibition of gene and environmental interactions. Therefore, Chap. 10 provides a slightly different angle to summarize the endeavor of gene-environmental interaction on human health to date. The technical applications of epigenetic biomarkers to investigate epigenetic alterations from environmental exposures are reviewed in Chap. 11. Genome rearrangement during development that is driven by epigenetic markings has been a relatively new concept in epigenetics research, which is explored in Chap. 12. Finally, Chap. 13 catalogs existing laboratory technologies used to index epigenetic modifications and offers a concluding note to explore the concept of "modifiable trilogy."

Because this book started out from the introductory knowledge of the science of epigenetics and the identification of issues in environmental epidemiology, this book is intended to serve both as a reference compendium on environmental epigenetics for scientists in academia, industry, and laboratories and a textbook for graduate level environmental health courses. We are indebted to scientists worldwide to their contributions that made the publication of this book possible. Most importantly, we would like to acknowledge the chapter authors for their efforts in creating this book. Even though they all have many demands on their time, they generously contributed toward this effort to highlight the link between environmental exposure and epigenetics and the consequence to human health and diseases.

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