Genomics, Proteomics, and Metabolomics in Nutraceuticals and Functional Foods

Editors
Debasis Bagchi, Ph.D.
Pharmacological and Pharmaceutical Sciences Department
University of Houston, College of Pharmacy
Houston, Texas

Francis C. Lau, Ph.D.
Dept. of Research and Development
InterHealth Research Center
Benicia, California

Manashi Bagchi, Ph.D.
Dept. of Research and Development
InterHealth Research Center
Benicia, California
Contents

Editors and Contributors ix
Preface xiii

Section 1 Introduction
1. Recent advances in nutraceuticals and functional foods 3
   Francis C. Lau, Debasis Bagchi, Shirley Zafra-Stone, and Manashi Bagchi
2. Novel omics technologies in nutraceutical and functional food research 11
   Xuewu Zhang, Wei Wang, and Kaijun Xiao

Section 2 Genomics
3. Nutrigenomics and statistical power: The ethics of genetically informed nutritional advice 23
   Ruth Chadwick
4. NutrimiRomics: The promise of a new discipline in nutrigenomics 35
   Chandan K. Sen
5. Genomics in weight loss nutraceuticals 45
   Debasis Bagchi, Francis C. Lau, Hiroyoshi Moriyama, Manashi Bagchi, and Shirley Zafra-Stone
6. Application of genomics and bioinformatics analysis in exploratory study of functional food 61
   Kohsuke Hayamizu and Aiko Manji
7. Genomics as a tool to characterize anti-inflammatory nutraceuticals 73
   Sashwati Roy
8. Application of nutrigenomics in gastrointestinal health 83
   Lynnette R. Ferguson, Philip I. Baker, and Donald R. Love
9. Genomics analysis to demonstrate the safety and efficacy of dietary antioxidants 95
   Nilanjana Maulik
10. Genomics applied to nutrients and functional foods in Japan: State of the art 127
    Yuji Nakai, Akihito Yasuoka, Hisanori Kato, and Keiko Abe
Color plate appears between pages 154 and 155.

11. Genomic basis of anti-inflammatory properties of Boswellia extract 155
   Golakoti Trimurtulu, Chandan K. Sen, Alluri V. Krishnaraju, and Krishanu Sengupta

12. Nutrigenomic Perspectives on Cancer Chemoprevention with Anti-inflammatory and Antioxidant Phytochemicals: NF-κB and Nrf2 Signaling Pathways as Potential Targets 175
   Hye-Kyung Na and Young-Joon Surh

Section 3 Proteomics
13. Proteomics analysis of the functionality of Toona sinensis by 2D-gel electrophoresis 201
   Sue-Joan Chang and Chun-Yung Huang

14. Application of proteomics in nutrition research 213
   Baukje de Roos

15. Proteomics approach to assess the potency of dietary grape seed proanthocyanidins 225
   Hai-qing Gao

16. Proteomics and its application for elucidating insulin deregulation in diabetes 241
   Hyun-Jung Kim and Chan-Wha Kim

Section 4 Metabolomics
17. NMR-based-metabolomics strategy for the classification and quality control of nutraceuticals and functional foods 265
   Yulan Wang and Huiru Tang

18. Metabolomics: An emerging post-genomic tool for nutrition 271
   Phillip Whitfield and Jennifer Kirwan

19. Evaluation of the beneficial effects of phytonutrients by metabolomics 287
   Katia Nones and Silas G. Villas-Boas

Section 5 Nutrigenomics in Human Health
20. Omics for the development of novel phytomedicines 299
   Kandan Aravindaram, Harry Wilson, and Ning-Sun Yang

21. Contribution of omics revolution to cancer prevention research 315
   Nancy J. Emenaker and John A. Milner

Index 329