

# Contents

List of Contributors.....	xvii
Preface.....	xxi
Acknowledgments.....	xxiii

## **SECTION 1 OVERVIEW OF FRUITS, VEGETABLES, AND HERBS IN HEALTH**

### **CHAPTER 1 Socioeconomic inequalities in fruit and vegetable intakes .....**3

Lukar Thornton, Dana Lee Olstad, Karen Lamb and Kylie Ball	
Introduction .....	4
Overview of Evidence on Socioeconomic Inequalities in Fruit and	
Vegetable Consumption.....	4
Children .....	5
Adolescents.....	6
Adults.....	7
Older adults.....	7
Summary.....	8
Mechanisms Underlying Socioeconomic Inequalities in Fruit and	
Vegetable Consumption.....	8
Children .....	9
Adolescents.....	10
Adults.....	11
Older adults.....	13
Summary.....	14
Future Research Directions .....	14
Measures of socioeconomic position .....	14
Measures of fruit and vegetable intake .....	15
Understudied Populations .....	15
Improvements to study design and statistical analysis .....	16
Implications for Practice .....	16
Conclusion.....	17
References .....	17

### **CHAPTER 2 Industrial freezing, cooking, and storage differently affect antioxidant nutrients in vegetables.....**23

Alessandra Frati, Elena Antonini and Paolino Ninfali	
Introduction .....	23
The Industrial Processing of Frozen Vegetables.....	25
Phenol Oxidizing Enzymes and Blanching .....	27

Optimization of the Total Phenols Extraction and Analysis.....	28
Comparison Among Vegetables: Spinach, Broccoli, and Green Beans .....	29
Experimental Data Obtained in Our Laboratory .....	31
Conclusions .....	34
References .....	36
<b>CHAPTER 3 Pharmacological properties of some medicinal plants, its components and using fields.....</b>	<b>41</b>
Hajjaj Ghizlane and Bahlouri Aziz	
Introduction .....	41
Some of the Plants That Have Contributed to the Discovery of Drugs for Use in Modern Medicine .....	42
<i>Matricaria chamomilla L.</i> .....	42
<i>Ormenis mixta L.</i> .....	45
<i>Pistacia atlantica Desf.</i> .....	47
<i>Papaver rhoeas L.</i> .....	50
References .....	53
<b>CHAPTER 4 Nutritional indicators and health aspects of fruit and vegetable consumption in aged adults .....</b>	<b>57</b>
Ibrahim Elmadfa and Alexa L. Meyer	
Introduction .....	57
The Aging Body .....	58
Fruits and Vegetables and Their Special Role in the Nutrition of the Elderly .....	59
Fruits and vegetables as nutrient-rich, low-energy foods .....	61
Antioxidants and bioactive plant components .....	62
Dietary fiber .....	64
Intake of Fruits and Vegetables in Elderly Across Europe .....	66
Factors Influencing Fruit and Vegetable Consumption in Elderly .....	69
Conclusion.....	70
References .....	71
<b>CHAPTER 5 Diabetes, diabetic complications, and flavonoids .....</b>	<b>77</b>
Yogesh A. Kulkarni, Mayuresh S. Garud, Manisha J. Oza, Kalyani H. Barve and Anil B. Gaikwad	
Introduction .....	77
Flavonoids .....	80
Flavonol .....	81
Flavonones .....	85
Flavones .....	86
Isoflavones .....	88
Chalcones.....	88

Biflavonoids.....	91
Amentoflavone .....	91
Kolaviron .....	92
Anthocyanins.....	92
Summary .....	93
References .....	93
<b>CHAPTER 6 Curcumin: the epigenetic therapy .....</b>	<b>105</b>
Anuradha Pandey, Yogesh A. Kulkarni and Anil B. Gaikwad	
Introduction .....	105
Turmeric: The Golden Spice .....	106
Molecular Targets of Curcumin.....	107
Curcumin and Epigenetics.....	109
What is epigenetics? .....	109
Modulation of Epigenetics With Curcumin.....	111
Curcumin and Histone Acetylation .....	112
Future Directions.....	116
References .....	116
<b>CHAPTER 7 Nutraceuticals as therapeutic agents for inflammation.....</b>	<b>121</b>
Kalyani H. Barve, Yogesh A. Kulkarni and Anil B. Gaikwad	
Introduction .....	122
Inhibition of the activation of NF- $\kappa$ B .....	123
Blocking the overexpression of proinflammatory cytokines .....	123
Downregulation of the overexpression of CAMs and inhibiting enzyme activity (phospholipase A2, COX-2, 5-LOX, iNOS, and myeloperoxidase).....	124
Inhibit ROS-generating enzyme activity/increasing ability to scavenge ROS .....	124
Flavonoids .....	125
Soy isoflavones .....	126
Catechins.....	127
Pycnogenol .....	133
Anthocyanins.....	134
Resveratrol .....	135
Lipoic acid .....	137
Linolenic acid .....	138
Thymoquinone .....	139
Lupeol .....	139
Astaxanthin .....	140
Phosphopeptides .....	141
References .....	141

<b>CHAPTER 8 Vegetarian diets and disease outcomes.....</b>	<b>149</b>
Ming-Chin Yeh and Marian Glick-Bauer	
Introduction .....	149
Vegetarian Diets and Health Outcomes.....	151
Cardiovascular disease/hypertension .....	151
Metabolic syndrome and diabetes .....	153
Cancer .....	155
Kidney disease .....	156
Weight loss.....	157
Vegetarian Diets, Inflammation, and the Gut Microbiota Connection .....	157
Metabolic disease and obesity .....	158
Cardiovascular disease.....	159
Autoimmune disease.....	159
Conclusion.....	161
References .....	161
<b>CHAPTER 9 Diet and nutrition role in prostate health.....</b>	<b>165</b>
Akram Elembaby and Ronald Ross Watson	
Introduction .....	165
Nonmodifiable Risk Factors .....	167
Modifiable Risk Factors .....	167
Diet .....	167
Macronutrients .....	167
Micronutrients.....	168
Alcohol .....	168
Herbs and supplements .....	168
Nonmodifiable Risk Factors .....	170
Aging .....	170
Endocrine .....	170
Race and Ethnicity .....	170
Genetic Predisposition .....	171
Modifiable Risk Factors .....	171
Diet and Obesity .....	171
References .....	173

## SECTION 2 FRUIT AND HEALTH AND DISEASES

<b>CHAPTER 10 Advances in the study of the health benefits and mechanisms of action of the pulp and seed of the Amazonian palm fruit, <i>Euterpe oleracea</i> Mart., known as “Açaí” .....</b>	<b>179</b>
Alexander G. Schauss	
Introduction.....	180
Botany of Fruit.....	180

Açaí Seed .....	180
Açaí Pulp of the Fruit.....	187
Cardiovascular and Lipid Profile Studies.....	190
Epigenetic Effects of Açaí Pulp on Life Span Extension.....	196
Açaí Pulp, Transcription and Modulation of Immune Function .....	199
Central Nervous System (CNS) and Brain Function .....	203
Antiproliferative Effects.....	208
Hepatic, Renal Function, and Liver Studies .....	210
References.....	213
<b>CHAPTER 11 Grape bioactives for human health.....</b>	<b>221</b>
Marcello Iriti and Elena Maria Varoni	
Introduction.....	221
Grape Phytochemistry.....	222
Bioactivities of Grape Chemicals .....	224
The Cardioprotective Potential of Grape Products and Polyphenols.....	230
Grape seed extracts.....	230
Resveratrol.....	231
Grape juice .....	233
Oral Bioavailability of Grape Polyphenols.....	233
Conclusion .....	235
Conflict of Interest .....	236
References.....	236
<b>CHAPTER 12 Kiwifruit and health.....</b>	<b>239</b>
Denise C. Hunter, Margot A. Skinner and A. Ross Ferguson	
Introduction.....	239
Health Benefits from <i>Actinidia</i> Species .....	241
Cell protection and antimutagenic activity.....	241
Gut health .....	245
Immune function and protection from infectious disease .....	248
Cardiovascular disease .....	253
Other health benefits from kiwifruit.....	255
Kiwifruit allergies and other detrimental health effects .....	257
Conclusion .....	259
References.....	260
<b>CHAPTER 13 Cocoa—past medicinal uses, current scientific evidence, and advertised health benefits .....</b>	<b>271</b>
Dan Ju and Gertraud Maskarinec	
Introduction.....	271
Historic Uses of Cocoa Products .....	274

Current Scientific Evidence .....	276
Cardiovascular disease .....	276
Antioxidant/antiinflammatory effects.....	278
Cancer.....	279
Neurocognitive function .....	279
Intestinal health .....	280
Advertised Health Benefits .....	280
Conclusions.....	284
References.....	286
<b>CHAPTER 14 Pomegranate juice and extract .....</b>	<b>293</b>
Gene Bruno	
Introduction.....	293
Plant Parts and Chemistry .....	294
Pharmacology/Mechanism of Action.....	294
Human Clinical Research .....	296
Cardiovascular health .....	296
Prostate cancer.....	301
Musculoskeletal/joint health.....	303
Exercise .....	303
Dental health.....	304
UV-induced skin pigmentation.....	306
Discussion .....	306
References.....	308
<b>CHAPTER 15 Berries and blood pressure.....</b>	<b>313</b>
Greg Arnold	
Introduction.....	313
High Blood Pressure: A Hidden Epidemic .....	314
The Onset of High Blood Pressure .....	314
Berries for High Blood Pressure .....	314
Blueberries: Best for Blood Pressure.....	315
Grapes.....	318
Strawberries.....	321
Cranberries .....	321
Black currants.....	322
Beyond Hypertension: Berries for Orthostatic Hypotension .....	323
Crataegus berries with D-camphor.....	323
Conclusions.....	324
References.....	325

## **SECTION 3 VEGETABLES IN HEALTH AND DISEASES**

### **CHAPTER 16 *Poi* history, uses, and role in health.....331**

Amy C. Brown, Salam A. Ibrahim and Danfeng Song	
Introduction.....	331
Historical Review of Taro.....	331
<i>Poi</i> Preparation .....	332
Medical Use Review .....	333
Digestive disorders .....	334
Infant allergies .....	337
Failure-to-thrive.....	337
Probiotic effects.....	338
Cancer inhibiting properties .....	338
Future research .....	340
Summary Points .....	340
References.....	341

### **CHAPTER 17 Bioactive potential of two wild edible mushrooms of the**

### **Western Ghats of India.....343**

N.C. Karun, K.R. Sridhar, V.R. Niveditha and S.D. Ghate	
Introduction.....	344
Mushrooms and Processing .....	344
Bioactive Principles .....	346
Total phenolics .....	346
Tannins .....	346
Flavonoids .....	346
Vitamin C .....	347
L-DOPA .....	347
Trypsin inhibition.....	348
Hemagglutination.....	348
Antioxidant Assay .....	349
Total antioxidant activity .....	349
Ferrous ion chelating capacity.....	349
DPPH free radical-scavenging activity.....	350
Reducing power.....	350
Data analysis.....	350
Observations and Discussion .....	351
Conclusion .....	358
Abbreviations .....	358
Acknowledgments.....	359
References.....	359

**SECTION 4 HERBS IN HEALTH AND DISEASES**

<b>CHAPTER 18 Nutrient profile, bioactive components, and functional properties of okra (<i>Abelmoschus esculentus</i> (L.) Moench) .....</b>	<b>365</b>
Sa'eed Halilu Bawa and Neela Badrie	
Many Names .....	366
Agronomy .....	367
Nutrient Profile and Bioactive Components of Okra and their Health Effects .....	369
Dietary fiber.....	370
Okra consumption and diabetes mellitus.....	373
Minerals in okra and their role in the prevention and management of noncommunicable diseases.....	373
Mechanisms by which potassium lowers BP .....	374
Magnesium .....	376
Manganese.....	377
Vitamin C .....	378
Folate .....	379
Vitamin K .....	381
Vitamin B1 .....	382
Vitamin B6 .....	383
Effects of processing pretreatments on nutrients.....	384
Bioactive Components—Disease Prevention and Management.....	385
Flavonoids .....	385
Antioesity, antidiabetic, and antihypertensive effects of quercetin.....	386
Phytosterols .....	391
Screening and extraction techniques for bioactive compounds.....	393
Functional Properties .....	394
Medicinal.....	394
Food uses.....	395
Okra Food Dishes .....	397
Concluding Remarks.....	398
References.....	399
<b>CHAPTER 19 Fruit and vegetable consumption in the United States: patterns, barriers and federal nutrition assistance programs.....</b>	<b>411</b>
Ming-Chin Yeh, Marian Glick-Bauer and Seren Wechsler	
Fruit and Vegetable Consumption in the United States .....	411
Vegetarian Diets in the United States.....	412
Barriers to Fruit and Vegetable Consumption.....	415
Promoting Fruit and Vegetable Consumption.....	417

Conclusion .....	419
References.....	419
<b>CHAPTER 20 Dietary fiber and health: cardiovascular disease and beyond.....</b>	<b>423</b>
Yikyung Park	
Introduction.....	423
Total Mortality .....	425
Heart Disease and Stroke .....	426
Type-2 Diabetes .....	429
Weight Loss.....	430
Colorectal Cancer.....	431
Breast Cancer .....	432
Esophageal Cancer.....	435
Stomach Cancer .....	435
Kidney Cancer .....	436
Other Cancer .....	437
Inflammatory Diseases Mortality.....	438
Chronic Kidney Disease .....	439
Chronic Obstructive Pulmonary Disease and Respiratory Diseases Mortality .....	440
Conclusions.....	442
References.....	443
<b>CHAPTER 21 Fruits, vegetables, and herbs: bioactive foods promoting wound healing.....</b>	<b>451</b>
Lawrence W. Sanchez and Ronald Ross Watson	
Introduction.....	451
Stages of Healing .....	452
Vitamin A .....	453
Vitamin C .....	453
Vitamin E .....	454
Fat and Carbohydrates .....	455
Zinc .....	455
Protein .....	456
Iron .....	456
Honey .....	456
Bromelain.....	458
<i>Achillea millefolium</i> .....	459
<i>Centella asiatica</i> .....	460
<i>Arnebia densiflora</i> .....	460
<i>Aloe vera</i> .....	461
References.....	462

<b>CHAPTER 22 Curcumin in hepatic stellate cell activation in health .....</b>	<b>465</b>
Youcai Tang	
Introduction.....	466
Curcumin Alleviates Hepatic Fibrosis by Affecting Bioactivities of HSCs .	467
Curcumin inhibits the growth and proliferation and activation of HSC in vitro .....	467
Curcumin ameliorates HSC activation in animal models.....	468
Curcumin induces apoptosis of activated HSC .....	469
Curcumin suppresses accumulation of ECM .....	469
The Mechanisms by Which Curcumin Targets in Activated HSCs .....	470
Curcumin maintains redox homeostasis and antioxidant and suppresses inflammation in HSC.....	470
Curcumin activates PPAR $\gamma$ signaling pathway in activated HSCs.....	470
Curcumin blocks leptin signaling pathway in HSCs.....	471
Curcumin suppresses TGF $\beta$ and TGF $\beta$ -R signaling pathway in activated HSCs .....	472
Curcumin blocks insulin signaling and regulates intracellular glucose and its derivatives in activated HSCs .....	473
Curcumin modulates lipid metabolism in HSCs .....	475
Curcumin balances formation and degradation of ECM via distinctively regulating TIMPs and MMPs .....	477
Clinical Trials and Future Direction .....	478
Conclusions.....	478
Abbreviations .....	479
Acknowledgment .....	479
References.....	479
<b>CHAPTER 23 Curcumin against amyloid pathology in mental health and brain composition .....</b>	<b>487</b>
Ikuo Tooyama, Nor Faeizah Ibrahim, Lina Wati Durani, Hamizah Shahirah Hamezah, Mohd Hanafi Ahmad Damanhuri, Wan Zurinah Wan Ngah, Hiroyasu Taguchi and Daijiro Yanagisawa	
Introduction.....	487
A $\beta$ Oligomers Are the Main Therapeutic Targets for Preclinical AD.....	489
Curcumin Displays Antioxidant Effects and can Inhibit A $\beta$ Aggregations .....	491
Keto–Enol Tautomerism of Curcumin Is a Key to Its A $\beta$ -Binding Activity.....	493

Curcumin Inhibits $\beta$ -Secretase Activity .....	495
Curcumin and Neuroinflammation .....	495
Animal Studies With Curcumin .....	496
Clinical Trials of Curcumin for AD .....	498
New Approaches of Curcumin .....	499
Conclusion .....	500
Acknowledgments.....	500
References.....	500
<b>CHAPTER 24 Recent developments in using plant-derived natural products as tubulin inhibitors for the management of cancer .....</b>	<b>507</b>
Yogesh A. Kulkarni, Mayuresh S. Garud, R.S. Gaud and Anil B. Gaikwad	
Introduction.....	507
Microtubules .....	508
Polymerization dynamics of microtubules .....	508
Tubulin inhibitors as anticancer agents .....	510
Microtubule destabilizers .....	511
Microtubule stabilizers .....	517
Summary .....	520
References.....	520
<b>CHAPTER 25 Medicinal and nutritional qualities of <i>Zingiber officinale</i>.....</b>	<b>525</b>
Saima Khan, Pankaj Pandotra, Asif Khurshid Qazi, Sajad A. Lone, Malik Muzafar, Ajai P. Gupta and Suphla Gupta	
Introduction.....	525
Ginger in Traditional Use.....	527
Essential oil .....	528
Nutrient Composition.....	528
Bioactive Components of Ginger.....	529
Gingerol homologues .....	529
Analgesic Effect.....	534
Cardiovascular Effects .....	536
Gastrointestinal Effects .....	537
Effect on Migraine/Retinopathy.....	539
Metabolism of Ginger .....	540
Future Prospects.....	542
References.....	543

<b>CHAPTER 26 Antimicrobials from herbs, spices, and plants .....</b>	<b>551</b>
<i>Tarik Bor, Sulaiman O. Aljaloud, Rabin Gyawali and Salam A. Ibrahim</i>	
Introduction.....	551
Herbs, spices, and plant extracts .....	552
Major antimicrobial compounds of herbs and spices.....	560
Chemical components of EOs .....	564
Uses of plant-origin antimicrobials .....	565
Conclusion .....	571
References.....	571
Index .....	579