

CONTENTS

CONTRIBTORS TO VOLUME 13

Recent Advances in the Freeze-Drying of Food Products

I.	Introduction	1
II.	Fundamental Aspects of Freezing and Drying	3
III.	Equipment Developments	47
IV.	Applications to Foods	73
V.	Additional	80
	References	82

Etiological Status and Associated Studies of Pale,
Soft, Exudative Porcine Musculature

I.	Introduction	90
II.	Post-Mortem Transformations	91
III.	Nature of Post-Mortem Changes	97
IV.	Histology of Pale, Soft, Exudative Musculature	107
V.	Incidence of PSE Muscle	120
VI.	Variations in PSE Muscle within a Carcass	129
VII.	Related Post-Mortem Studies	132
VIII.	Ante-Mortem Treatment vs , PSE Musculature	134
IX.	Enzymes and Metabolites in PSE Muscle	145
X.	Hormonal Considerations	150
XI.	Additional Considerations	152
XII.	Comparison with Muscle Diseases	156
XIII.	Post-Mortem Handling	159
XIV.	Processing and Monetary Value Differences	165
XV.	Prevention	167
XVI.	Additional Research Needs	167
	References	168

Astringency of Fruits and Fruit Products
in Relation to Phenolic Content

I.	Introduction	179
II.	The Sensation of Astringency	180
III.	Protein Precipitation and Protein Binding	185
IV.	Analytical Methods for Tannin and Astringency Assay	191
V.	Astringency in Fruits	195
	References	209

Fundamentals of Low-Temperature Food Preservation

I.	Introduction	220
II.	Structure of Water and Ice	221
III.	Phase Diagram of Pure Water	236
IV.	Some Additional Physical Properties of water and Ice	238
V.	Crystallization	244
VI.	Freezing Diagrams	259
VII.	Concentration of Nonaqueous Constituents during Freezing	270
VIII.	Volume Changes during Freezing and Thawing	272
IX.	Rate of Freezing	274
X.	A Search for Protective Chemical Additives	288
XI.	The Effect of Freezing Storage, and Thawing on the Physical and Chemical Properties of Food	289
XII.	Conclusions Concerning Possible Causes of Freezing Food Deterioration	311
XIII.	General Aspects of Commercial Freezing Processes	317
XIV.	Closing Comments	329
	References	330

**Minimum Growth Temperatures for Food-Poisoning
Fecal-Indicator, and Psychrophilic Microorganisms**

I.	Introduction	349
II.	Determination of Minimum Growth Temperature	350
III.	Food-Poisoning Organisms	355
IV.	Fecal Indicators	358
V.	Psychrophiles	360
VI.	Environmental Factors Affecting Minimum Growth Temperature	370
VII.	Possible Explanations of Minimum Growth Temperature	378
VIII.	Conclusions	381
	References	382
SUBJECT INDEX		397

CONTENTS

SAMUEL CATE PRESCOTT

I.	Introduction	1
II.	Early Education	3
III.	MIT Undergraduate Education	3
IV.	Early Career	5
V.	Prescott’s Work on Thermal Processing with William Lyman Underwood	7
VI.	Prescott’s Career During and after World War I	8
VII.	Prescott’s Contributions to Refrigeration (and Freezing) of Foods	8
VIII.	Prescott’s Contributions to the Chemistry of Coffee	10
IX.	Prescott and the Institute of the Food Technologists	11
X.	Prescott’s Contemporaries	12
XI.	Prescott’s Honors, Awards, and Public Service	14
XII.	Prescott and MIT	16
XIII.	In Conclusion	18
	References	20

MECHANICALLY DEBONED RED MEAT

I.	Introduction	23
II.	Potential Yield	26
III.	Regulations Governing Mechanically Deboned Meat	31
IV.	Economic Implications	35
V.	Composition of Mechanically Deboned Meat	39
VI.	Safety Aspects of Mechanically Deboned Meat	53
VII.	Functional Properties of Mechanically Deboned Meat	68
VIII.	Nutritional Value of Mechanically Deboned Meat	74
IX.	Palatability of Mechanically Deboned Meat	88
X.	Additional Research Needs	93
	References	95

MECHANICAL DEBONING OF POULTRY AND FISH

I.	Introduction	110
II.	Types of Mechanical Deboners	111
III.	Composition and Nutritive Properties	111
IV.	Flavor Stability	120
V.	Color Stability	127
VI.	Functional Characteristics	129

VII. Utilization of Bone Residue	137
VIII. Microbial Quality	138
IX. Regulations	140
X. Research Needed	142
References	143

**NATURALLY OCCURRING FOOD TOXICANTS: PHENOLIC SUBSTANCES
OF PLANT ORIGIN COMMON IN FOODS**

I. Introduction	149
II. Origins and Types Plant Phenols	151
III. Evolutionary Considerations	153
IV. Examples of Common Plant Phenols with Actual or Potential Significance in Animal Consumption (Toxic or Beneficial)	162
V. Mechanisms of Toxicity by Phenols	210
VI. Conclusion and Assessment of Risks	218
VII. Research Needs	221
References	221

TECHNOLOGY AND FLAVOR OF PASSION FRUIT JUICES AND CONCENTRATES

I. Introduction	243
II. Passion Fruit Pulp and Juice	247
III. Concentration of Passion Fruit Juice	265
IV. Chemistry of Volatile Flavoring Constituents	269
V. Needs and Application for Research and Development	288
References	290

**PHASE TRANSITIONS OF WATER IN SOME PRODUCTS OF PLANT ORIGIN
AT LOW AND SUPERLOW TEMPERATURES**

I. Introduction	297
II. Water – The Basic Component of Plant Tissue	299
III. Initial Crystallization of Water in Fruits and Vegetables	307
IV. Phase Transitions at Low Temperatures (to- 70 C)	315
V. Phase Transitions at Superlow Temperatures (-70 to – 196 C)	344
VI. Conclusion	349
References	352

INDEX	363
-------	-----

CONTENTS

Hydrolytic and Transgalactosylic Activities of Commercial B-Galactosidase (Lactase) in Food Processing	
I.	Introduction 1
II.	Hydrolase Activity 22
III.	Transgalactosylase Activity 59
IV.	Summary and Research Needs 89
	References 90
Glass Transitions and Water-Food Structure Interactions	
I.	Introduction 103
II.	Foundation of the: Food Polymer Science” Approach 106
III.	Key Elements and Applications of the “Food Polymer Science” Approach 138
IV.	Research Needs: Outstanding Problems, Issues, and Unanswered Questions 226
V.	Conclusions and Future Prospects 233
	References 234
Corn Wet Milling: Separation Chemistry and Technology	
I.	Introduction 271
II.	Corn: Structure and Types Used 273
III.	Steeping: Process and Equipment 278
IV.	Milling and Final Processing 287
V.	Laboratory versus Commercial Milling 288
VI.	Research to Improve Wet Milling 290
VII.	End products 292
VIII.	Summary 296
	References 297
	INDEX 301

CONTENTS

CONTRIBUTORS TO VOLUME 44	ix
Pulsed Electric Field Processing of High Acid Liquid Foods : A Review	
Structure and Mechanical Properties of FAT Crystal Networks	
Thermal Inactivation of Pathogens and Verification of Adequate Cooking in Meat and Poultry Products	
Phytoestrogens in Foods	
Taste and Smell Perception in the Elderly : Effect of Medication and Disease	
Development and Application of Multicomponent Edible Coatings and Films : A Review	
Buckwheat : Composition, Chemistry and Processing	
INDEX	435
Colour Plates are located between pp. 246-247	

CONTENTS

CONTRIBUTORS TO VOLUME 51.	vii
------------------------------------	-----

Flaxseed

Clifford Hall III, Mehmet C. Tulbek, and Yingying Xu

I. Introduction	2
II. Flaxseed Components	3
III. Health Benefits	21
IV. Flaxseed Quality and End Use Functionality	47
V. Conclusion	76
References	76

Lycopene

A. V. Rao, M. R. Ray, and L. G. Rao

I. Introduction	100
II. Oxidative Stress and Chronic Diseases	101
III. Chemistry and Dietary Sources of Lycopene	102
IV. Analytical Methods of Measuring Lycopene in Food and Other Biological Materials	106
V. Stability and Antioxidant Properties of Lycopene and Its Isomers	107
VI. Bioavailability, Tissue Distribution, Metabolism, and Safety of Lycopene	108
VII. Mechanisms of Action of Lycopene	113
VIII. Lycopene and Human Diseases	115
IX. Dietary Intake Levels of Lycopene	146
X. Conclusions	149
References	150

Food Components That Reduce Cholesterol Absorption

Timothy P. Carr and Elliot D. Jesch

I. Introduction	165
II. Mechanisms of Cholesterol Absorption	166
III. Food Components That Reduce Cholesterol Absorption.	170
IV. Conclusions	192
References	193

Imaging Techniques for the Study of Food Microstructure: A Review

Pasquale M. Falcone, Antonietta Baiano, Amalia Conte,
Lucia Mancini, Giuliana Tromba, Franco Zanini,
and Matteo A. Del Nobile

I. Introduction	207
II. Image Acquisition Techniques.	214
III. Data Processing	233
IV. Summary	256
References	256

Electrodialysis Applications in the Food Industry

Marcello Fidaleo and Mauro Moresi

I. Introduction	269
II. ED Principles.	270
III. ED Applications	304
IV. Mathematical Modeling of an ED Device.	342
V. Present Problems and Future Perspectives	347
References	351

Index	361
-----------------	-----

CONTENTS

Contributors

vii

1. Ginsenosides: Chemistry, Biosynthesis, Analysis, and Potential Health Effects	1
Lars P. Christensen	
I. Introduction	2
II. Chemistry	23
III. Biosynthesis	37
IV. Analysis	45
V. Potential Health Effects of Ginsenosides	64
VI. Conclusion	79
References	80
2. Adherence, Anti-Adherence, and Oligosaccharides: Preventing Pathogens from Sticking to the Host	101
Kari D. Shoaf-Sweeney and Robert W. Hutkins	
I. Introduction	102
II. Route of Infection	103
III. Adherence Basics	105
IV. Specific Pathogen–Host Interactions	108
V. Intestinal Target Tissues	111
VI. Bacterial Adhesins	114
VII. Common Bacterial Adherence Mechanisms	117
VIII. Anti-Adhesives	128
IX. Conclusions and Future Prospects	139
References	140
3. Lung Disease in Flavoring and Food Production: Learning from Butter Flavoring	163
Nancy Sahakian and Kathleen Kreiss	
I. Introduction	164
II. Respiratory Tract Anatomy and Defense Mechanisms	165
III. Medical Tests Used to Diagnose Lung Disease	165
IV. Types of Occupational Respiratory Disease	169

CONTENTS

Contributors

vii

1. Understanding the Mechanisms by Which Probiotics Inhibit Gastrointestinal Pathogens 1

Sinead C. Corr, Colin Hill, and Cormac G. M. Gahan

- I. Introduction
- II. Evidence for Potential Mechanisms of Action
- III. Conclusions
- Acknowledgment
- References

2. Sensory Impacts of Food–Packaging Interactions 17

Susan E. Duncan and Janet B. Webster

- I. Introduction 18
- II. Consumer Perception 20
- III. Threshold Concept 21
- IV. Sensory Effects 22
- V. Methods for Examining Taint and Other Sensory Effects from Packaging 26
- VI. Taints 27
- VII. Scalping/Sorption 47
- VIII. Protection of Sensory Quality by Food Packaging 49
- IX. Using Packaging to Improve Sensory Quality 53
- X. Conclusions 56
- Acknowledgment 57
- References 57

3. Developmental Trajectories in Food Allergy: A Review 65

A. DunnGalvin and J' O. B. Hourihane

- I. Background 66
- II. Prevalence, Mechanisms, and Clinical Manifestations of Food Allergy 68
- III. The Impact of Food Allergy on HRQL 73
- IV. The Psychological Burden of Food Allergy 76
- V. The Influence of Parents on Child Adjustment 78

VI. Social Support	79
VII. The Impact of Stress on Biopsychosocial Development	80
VIII. The Impact of Sex and Gender in Food Allergy	81
IX. Risk Behavior in Food Allergy	84
X. Developmental Pathways in Food Allergy	86
XI. Discussion and Implications for Future Research	92
References	95

4. Maple Syrup—Production, Composition, Chemistry, and Sensory Characteristics **101**

Timothy D. Perkins and Abby K. van den Berg

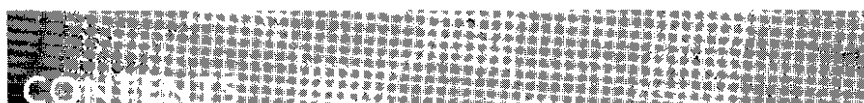
I. Introduction	102
II. History	102
III. Maple Sap Flow	104
IV. Sap Collection	106
V. Sap Processing: Evaporation	107
VI. Annual Syrup Production	110
VII. Sap Chemistry	111
VIII. Scale/Sugar Sand Formation During Sap Processing	121
IX. Syrup Standards	124
X. Syrup Chemistry	126
XI. Other Maple Products	136
XII. Contamination	137
XIII. Adulteration	137
XIV. Summary	140
References	140

5. Maternal Fumonisin Exposure as a Risk Factor for Neural Tube Defects **145**

J. Gelineau-van Waes, K. A. Voss, V. L. Stevens, M. C. Speer, and R. T. Riley

I. Introduction	146
II. Neural Tube Defects	148
III. Fumonisin Exposures	153
IV. Reproductive Toxicology of Fumonisin	155
V. Mechanisms of Fumonisin Toxicity	158
VI. Conclusions	170
References	171

<i>Index</i>	183
--------------	-----

*Contributors*

ix

1. Fish-Induced Keriorrhea 1

Ka Ho Ling, Peter D. Nichols, and Paul Pui-Hay But

I. Introduction	2
II. Fish Incriminated	6
III. Regulation and Litigation	15
IV. Biochemistry and Toxicity	18
V. Identification and Detection	23
VI. Wax Ester-Rich Fish and Other Potential Hazards	30
VII. Discussion and Recommendations	40
VIII. Conclusions	44
References	45

2. Haze in Beverages 53

Karl J. Siebert

I. The Physics of Haze	54
II. Visual Perception of Haze	57
III. Causes of Hazes in Beverages	58
IV. Diagnosing Haze Problems	59
V. Protein–Polyphenol Haze	60
VI. Analyses Related to Protein–Polyphenol Haze Formation	75
VII. Preventing or Delaying Haze Development	76
VIII. Summary	81
References	82

3. Carnosine and Its Possible Roles in Nutrition and Health 87

Alan R. Hipkiss

I. Introduction	89
II. Carnosine Metabolism	91
III. Carnosine and Neurological Activity	91
IV. Carnosine and Other Tissues	92
V. Possible Functions of Carnosine	92
VI. Control of pH	92

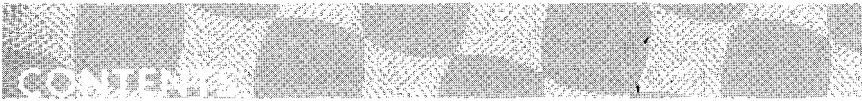
VII. Carnosine and Chelation of Zinc and Copper Ions	93
VIII. Carnosine and Aging	93
IX. Carnosine and the Causes of Aging	94
X. Proteotoxicity and Aging	95
XI. Carnosine, Oxygen Free Radicals, and Oxidative Stress	96
XII. Carnosine and Nonenzymic Protein Glycosylation (Glycation)	97
XIII. Carnosine and Proteolysis of Altered Proteins	99
XIV. Carnosine and Gene Expression	100
XV. Carnosine, Anticonvulsants, and Aging	102
XVI. Carnosine and Dietary Restriction-Mediated Delay of Aging	103
XVII. Carnosine, Regulation of Protein Synthesis, and Aging	108
XVIII. Carnosine and Corticosteroids	109
XIX. Carnosine and Age-Related Pathology	110
XX. Carnosine, Diabetes, and Secondary Complications	110
XXI. Carnosine and Neurodegeneration	112
XXII. Alzheimer's Disease	114
XXIII. Parkinson's Disease	116
XXIV. Carnosine and Ischemia	119
XXV. Carnosine and Osteoporosis	120
XXVI. Carnosine and Cataractogenesis	120
XXVII. Carnosine and Deafness	121
XXVIII. Carnosine and Cancer	121
XXIX. Carnosine and Wound Healing	122
XXX. Carnosine and Immune Function	122
XXXI. Carnosine, Calcium, and Heart Failure	123
XXXII. Carnosine and Autistic Spectrum Disorders	123
XXXIII. Carnosine and Blood Pressure	124
XXXIV. Carnosine and Consumption of Alcoholic Beverages	124
XXXV. Carnosine and High Fructose Foods and Drinks	125
XXXVI. Carnosine and Dialysis Fluids	125
XXXVII. Possible Ways to Increase Tissue Carnosine Levels: Physiological Regulation	126
XXXVIII. Possible Ways to Increase Tissue Carnosine Levels: Dietary Supplementation	128
XXXIX. Is there any Evidence that Changes in Dietary Carnosine Have any Effects in Humans?	129
XXXX. Would Vegetarians Benefit from Carnosine Supplementation?	130
XXXXI. Deleterious Effects of Carnosine	131
XXXXII. Conclusions	132
References	133

4. Recent Advances in the Microbial Safety of Fresh Fruits and Vegetables	155
Keith Warriner, Ann Huber, Azadeh Namvar, Wei Fan, and Kari Dunfield	
I. Introduction	156
II. Outbreaks Linked to Fresh Produce	157
III. Characteristics of Pathogens Recovered from Salad Vegetables	160
IV. Transmission of Human Pathogens in Manure, Soil, and Water to the Vegetable Production Chain	168
V. Interaction of Pathogens with Fresh Produce	179
VI. Interventions to Enhance the Safety of Fresh Produce	188
VII. Conclusions and Future Research	192
References	192
5. Understanding Oil Absorption During Deep-Fat Frying	209
Pedro Bouchon	
I. Food Deep-Fat Frying: A General Overview	210
II. Nutritional Aspects of Food Deep-Fat Frying	218
III. Oil Absorption	222
References	231
6. Introduction of Oats in the Diet of Individuals with Celiac Disease: A Systematic Review	235
Olga M. Pulido, Zoe Gillespie, Marion Zarkadas, Sheila Dubois, Elizabeth Vavasour, Mohsin Rashid, Connie Switzer, and Samuel Benrejeb Godefroy	
I. Introduction	237
II. Methods	239
III. Results	250
IV. Discussion	255
V. Conclusions	261
VI. Appendix I	262
Acknowledgments	279
References	279
<i>Index</i>	287

CONTENTS

<i>Contributors</i>	vii
1. Quinoa (<i>Chenopodium quinoa</i> Willd.): Composition, Chemistry, Nutritional, and Functional Properties	1
Lilian E. Abugoch James	
I. Introduction	2
II. Chemical, Nutritional, and Physical Properties	4
III. Proteins	6
IV. Carbohydrates	10
V. Lipids and Lipidic Compound	15
VI. Antioxidant Capacity, Phenolic Compounds, and Flavonoids	18
VII. Saponins	18
VIII. Minerals and Vitamins	19
IX. Functional Properties	20
X. Present and Future Uses of QS	24
References	25
2. Chemoinformatics—Applications in Food Chemistry	33
Karina Martinez-Mayorga and Jose L. Medina-Franco	
I. Introduction	34
II. Molecular Descriptors and Physicochemical Properties	36
III. Molecular Databases and Chemical Space	37
IV. Chemoinformatics in Food Chemistry	40
V. Examples of Molecular Similarity, Pharmacophore Modeling, Molecular Docking, and QSAR in Food or Food-Related Components	43
VI. Concluding Remarks and Perspectives	52
Acknowledgments	53
References	53
3. Processing of Food Wastes	57
Maria R. Kosseva	
I. Introduction	58
II. Sources and Characterization of Food Wastes	63
III. Recovering of Added-Value Products from FVW (Upgrading Concept)	69

IV. Multifunctional Food Ingredient Production from FVW	82
V. Vegetable Residues as Bioadsorbents for Wastewater Treatment	94
VI. Using Eggshell	98
VII. Added-value Products from Whey	98
VIII. Food Waste Treatment	100
IX. FCM Aspects Aimed in Sustainable Food System Development	116
X. Summary and Future Prospects	120
References	123
4. Technological and Microbiological Aspects of Traditional Balsamic Vinegar and Their Influence on Quality and Sensorial Properties	137
Paolo Giudici, Maria Gullo, Lisa Solieri, and Pasquale Massimiliano Falcone	
I. Introduction	138
II. Basic Technology	148
III. Chemical Composition	168
IV. Physical Properties	176
V. Conclusion	177
References	178
5. Nanostructured Materials in the Food Industry	183
Mary Ann Augustin and Peerasak Sanguansri	
I. Introduction	184
II. Approaches for Nanoscale Manipulation of Materials	185
III. Processes for Structuring of Food Materials	185
IV. Nanostructured Materials	192
V. Functionality and Applications of Nanostructured Materials	199
VI. Nanotechnology and Society	206
VII. The Future	206
Acknowledgment	207
References	207
6. Gossypol-A Polyphenolic Compound from Cotton Plant	215
Xi Wang, Cheryl Page Howell, Feng Chen, Juanjuan Yin, and Yueming Jiang	
I. Overview of Cotton and Cottonseed Products	216
II. Occurrence of Gossypol	218
III. Physiochemical Properties of Gossypol	218
IV. Gossypol Analyses	226
V. Agricultural Implication	228
VI. Biological Properties	233
VII. Clinical Implication	249
VIII. Conclusions	251
References	251
<i>Index</i>	265



Contributors ix

1. Dairy Food Consumption and Obesity-Related Chronic Disease 1

Eva Warensjo, Deborah Nolan, and Linda Tapsell

I. Introduction	2
II. Obesity-Related Chronic Disease	4
III. Dietary Fat and Obesity-Related Chronic Disease	6
IV. Dairy Foods and Obesity-Related Chronic Disease	7
V. Components of Dairy Food	13
VI. Effects of Dairy Food Components	15
VII. Effects of Individual Dairy Foods	21
VIII. Biomarkers of Milk Fat Intake	23
IX. Possible Mechanisms of Effect	27
X. Conclusion	30
References	33

2. Pesticides' Influence on Wine Fermentation 43

Pierluigi Caboni and Paolo Cabras

I. Introduction	44
II. Grapevine Pathogens	45
III. Pesticides	49
IV. Fermentation Process	50
V. Malolactic Fermentation	58
References	60

3. Transmission of Chagas Disease (American Trypanosomiasis) by Food 63

Karen Signori Pereira, Flávio Luis Schmidt, Rodrigo L. Barbosa, Ana M. A. Guaraldo, Regina M. B. Franco, Viviane L. Dias, and Luiz A. C. Passos

I. Chagas Disease (American Trypanosomiasis)	64
II. Discovery	65
III. <i>T. cruzi</i> Life Cycle	66
IV. Phases and Symptoms	67

V. Diagnoses and Treatment	67
VI. Transmission Routes	68
VII. Chagas Disease Experimentally Transmitted by the Oral Route in Animals	69
VIII. Transmission of Chagas Disease by the Oral Route in Humans	70
IX. The Influence of the <i>T. cruzi</i> Strain in the Transmission of Chagas Disease by the Oral Route	72
X. Acute Chagas Disease Outbreaks Associated with Food in Brazil	72
XI. Other Acute Chagas Disease Outbreaks Associated with Food	77
XII. <i>T. cruzi</i> Control (in food)	78
XIII. Final Considerations	80
References	80
4. Nuclear Magnetic Resonance and Chemometrics to Assess Geographical Origin and Quality of Traditional Food Products	87
R. Consonni and L. R. Cagliani	
I. Introduction	88
II. Geographical Origin of Foods	96
III. Quality and Authenticity of Foods	131
IV. Conclusions	156
References	157
5. Chemical and Instrumental Approaches to Cheese Analysis	167
Anand Subramanian and Luis Rodriguez-Saona	
I. Introduction	168
II. Sampling Techniques	168
III. Compositional Analysis	169
IV. Monitoring Cheese Ripening	173
V. Novel and Rapid Instrumental Methods	196
VI. Concluding Remarks	200
References	201
6. Finger Millet: <i>Eleusine coracana</i>	215
Arun Chandrashekar	
I. Introduction	216
II. Taxonomy	216
III. Antiquity of Cultivation of the <i>Eleusine</i>	223
IV. Seed Development	223
V. Proximate Composition	225
VI. Color and Polyphenols	226

VII. Carbohydrate	231
VIII. Protein	236
IX. Processing and Utilization	243
X. Glycemic Index	251
XI. Resistance to Herbicide and Transformation	253
Acknowledgments	253
References	253

<i>Index</i>	263
--------------	-----

CONTENTS

Contributors vii

1. Transmission of Toxoplasmosis (*Toxoplasma gondii*) by Foods 1

Karen Signori Pereira, Regina M. B. Franco, and Diego A. G. Leal	
I. Toxoplasmosis	2
II. Discovery	3
III. <i>T. gondii</i> Life Cycle	3
IV. Transmission of Toxoplasmosis	5
V. Pathogenesis and Human Infection Spectra	6
VI. Laboratory Diagnosis and Treatment	8
VII. Toxoplasmosis Transmission by Foods	10
VIII. Toxoplasmosis Outbreaks Associated with Water and Foods	12
IX. <i>T. gondii</i> Control (in Foods)	13
References	15

2. The Importance of Dietary Protein in Human Health: Combating Protein Deficiency in Sub-Saharan Africa through Transgenic Biofortified Sorghum 21

E. C. Henley, J. R. N. Taylor, and S. D. Obukosia	
I. Introduction	22
II. Role and Importance of Protein in Human Health	24
III. Protein Quality and Its Measurement	31
IV. Sorghum Protein Quality	32
V. Research to Improve Sorghum Protein Quality	39
VI. Will Protein Biofortification of Sorghum Make a Difference?	42
VII. Conclusions	46
Acknowledgments	47
References	47

3. *Clostridium difficile*: Its Potential as a Source of Foodborne Disease 53

Maja Rupnik and J. Glenn Songer	
I. Introduction	54
II. Methods for Detection of <i>C. difficile</i> in Food: We Lack a Standard Approach	55

III. <i>C. difficile</i> in Meat and Meat Products: Isolation in Multiple Locations in the United States and Europe Establish this as a Widespread Phenomenon	57
IV. <i>C. difficile</i> in Other Foods: Possible Association with Environmental Strains or Organisms from Animal Feces	57
V. <i>C. difficile</i> in Companion Animal Feed: Animal Exposure may have Far-Reaching Effects on Human Disease	60
VI. Possible Sources of Food Contamination: <i>C. difficile</i> is Widespread in Animals, Humans, and the Environment	60
VII. Occurrence of Common Genotypes in Animals, Humans, and Foods: Crossover is Very Common	61
VIII. <i>C. difficile</i> in Food as a Source of Human Colonization: Contaminated Food may be a Source of the Organism in the Hospital and the Community	62
IX. Conclusions: We have Much to Learn	63
References	63
 4. <i>Escherichia coli</i> O157:H7: Recent Advances in Research on Occurrence, Transmission, and Control in Cattle and the Production Environment	 67
Elaine D. Berry and James E. Wells	
I. Introduction	68
II. Sources and Transmission of <i>E. coli</i> O157:H7 in Cattle	70
III. Factors Affecting the Prevalence and Levels of <i>E. coli</i> O157:H7 in Cattle and the Production Environment	76
IV. Preharvest Control of <i>E. coli</i> O157:H7	89
V. Linking Preharvest and Postharvest Reduction of <i>E. coli</i> O157:H7	97
VI. Conclusions and Future Prospects	99
Acknowledgments	100
References	100
 5. Fish Gelatin	 119
Gokhan Boran and Joe M. Regenstein	
I. General Information on Gelatin	120
II. Fish Gelatin	129
III. Methodological Challenges in Quality Determination of Gelatin	139
IV. Conclusions and Suggested Readings	140
References	140
 <i>Index</i>	 145

1. Visual Perception of Effervescence in Champagne and Other Sparkling Beverages	1
Gérard Liger-Belair	
I. Introduction	2
II. Within a Champagne Bottle	3
III. The Bubble Nucleation Process	12
IV. During the Bubble Rise	27
V. CO ₂ Volume Fluxes Outgassing from Champagne Glasses in Tasting Conditions	34
VI. Close-Up on Bubbles Bursting at the Liquid Surface	43
Acknowledgments	53
References	53
2. Chemometric Brains for Artificial Tongues	57
Paolo Oliveri, M. Chiara Casolino, and Michele Forina	
I. Introduction	58
II. Terminology	61
III. History	62
IV. Main Application Sectors	63
V. Analytical Techniques	66
VI. Chemometrics	69
VII. Artificial Tongue Applications in the Food Science	98
VIII. Conclusions	108
References	109
3. Photodynamic Treatment: A New Efficient Alternative for Surface Sanitation	119
Lubov Brovko	
I. Introduction	120
II. Interaction of Light with Matter and History of PDT	121
III. Mechanisms of Photodynamic Production of Cytotoxic Species	124
IV. Mechanisms of Photodynamic Killing of Bacteria and Viruses	126

V. Examples of Photoactive Dyes used for Photodynamic Killing of Microorganisms	133
VI. PDT for Environmental Cleaning and Disinfection	138
VII. Conclusions	143
References	144
4. Microoxidation in Wine Production	149
Paul A. Kilmartin	
I. Introduction	150
II. Microoxygenation in Industry	151
III. Oxidation Processes in Wine	154
IV. Microoxygenation Research Findings	159
V. Final Comments	181
References	182
5. The Morama Bean (<i>Tylosema esculentum</i>): A Potential Crop for Southern Africa	187
Jose C. Jackson, Kwaku G. Duodu, Mette Holse, Margarida D. Lima de Faria, Danie Jordaan, Walter Chingwaru, Aase Hansen, Avrelia Cencic, Martha Kandawa-Schultz, Selalelo M. Mpotokwane, Percy Chimwamurombe, Henrietta L. de Kock, and Amanda Minnaar	
I. Introduction	189
II. Agronomic Characteristics	190
III. Chemistry, Nutritional, and Health Potential	195
IV. Food-Processing Applications and Utilization	213
V. Potential Marketing Strategies for Morama-Processed Products	223
VI. Socio-Economic Analysis of Communities Where Morama is Found	230
VII. Challenges and Future Research	238
References	239
<i>Index</i>	247

CONTENTS

v. 62

Contributors

vii

1. Norovirus as a Foodborne Disease Hazard 1

Kirsten Mattison

I. Introduction to Norovirus	2
II. Norovirus Genetic Types and Outbreak Association	3
III. Norovirus Outbreaks Spread Person to Person	7
IV. Norovirus Outbreaks Spread by Fomite Contamination	10
V. Norovirus Outbreaks Spread by Food Handlers	15
VI. Norovirus Outbreaks Attributed to Water and Food	16
VII. Conclusions	20
References	21

2. Mitigation of Greenhouse Gas Emissions in the Production of Fluid Milk 41

Peggy M. Tomasula and Darin W. Nutter

I. Introduction	42
II. Sustainable Development and the Pillars of Sustainability	44
III. Life Cycle Assessment Methodology	45
IV. LCA of the Fluid Milk Supply Chain	46
V. On-farm GHG Emission Mitigation Strategies	62
VI. Mitigation Strategies for GHG Emissions in Processing Plants	70
VII. Conclusions and Future Prospects	79
References	80

3. Chemical Composition, Characterization, and Differentiation of Honey Botanical and Geographical Origins 89

Jun Wang and Qing X. Li

I. Introduction	90
II. Authenticity Issues	93
III. Chemical Composition and Analytical Methods for Discrimination of the Botanical and Geographical Origins of Honeys	98
IV. Special Marker Compounds	121

V. Conclusions	122
References	122
4. Japan Food Allergen Labeling Regulation—History and Evaluation	139
Hiroshi Akiyama, Takanori Imai, and Motohiro Ebisawa	
I. Assessment of Immediate-type Food Allergies in Japan	140
II. Japanese Food Allergy-labeling System	144
III. Regulation of Detection Methods for Food Allergenic Ingredients	147
IV. Patient Evaluation of Allergy Food Labeling	167
Acknowledgments	169
References	169
5. Extrusion Texturized Dairy Proteins: Processing and Application	173
Charles I. Onwulata, Michael H. Tunick, and Phoebe X. Qi	
I. Dairy Proteins	174
II. Processing	179
III. Development	188
IV. Applications	192
V. Conclusions	194
References	195
6. A Review of the Application of Atomic Force Microscopy (AFM) in Food Science and Technology	201
Shaoyang Liu and Yifen Wang	
I. Introduction	202
II. Principles of AFM	202
III. Representative Applications	206
IV. Conclusions	237
References	238
<i>Index</i>	241

CONTENTS

Contributors

ix

1. Carbonic Maceration Wines: Characteristics and Winemaking Process 1

C. Tesniere and C. Flanzy

I. Introduction	2
II. Historical Development	2
III. Distinctive Sensory Characteristics	3
IV. Economic Interest and Importance of Carbonic Maceration in the World	5
V. Carbonic Maceration Winemaking Process	5
VI. Specific Characteristics of Grape Berries in Carbonic Maceration: Anaerobic Metabolism	11
VII. Originality of Grape-Berry Ripening	13
VIII. Conclusions	13
Acknowledgments	14
References	14

2. Sherry Wines 17

M. Ángeles Pozo-Bayón and M. Victoria Moreno-Arribas

I. Introduction	18
II. Winemaking Process	19
III. Microbiota of the <i>Flor</i> Film	22
IV. Changes in the Chemical Composition of Sherry Wines During the Biological and Oxidative Aging	23
V. Aroma and Sensory Characteristics of Sherry Wines: Evolution During Aging	29
VI. New Trends in Sherry Winemaking Technology	32
VII. Conclusion and Future Trends	35
Acknowledgments	35
References	35

3. Vin Santo 41

Paola Domizio and Livio Lencioni

I. General Definition and Production Areas	42
II. History	45

III. Italian Vin Santo	46
IV. Production Rules: Italian and European Union Regulations	66
V. Production and Marketing	67
VI. The Making Vin Santo	73
References	95
4. Mead Production: Tradition Versus Modernity	101
Elsa Ramalhosa, Teresa Gomes, Ana Paula Pereira, Teresa Dias, and Leticia M. Estevinho	
I. Introduction	102
II. Honey Characterization	103
III. Mead Production	110
IV. Final Considerations	115
References	116
5. Port Wine	119
N. Moreira and P. Guedes de Pinho	
I. Introduction	120
II. The Douro Demarcated Region	122
III. The Benefício	129
IV. Wine Production	130
V. Types of Port Wines	133
VI. Chemical Composition	137
Acknowledgments	143
References	143
6. Botrytized Wines	147
Ildikó Magyar	
I. Introduction	148
II. The Main Types of Botrytized Wines	149
III. Noble Rot	161
IV. Production of Botrytized Wines	173
V. Health Related Aspects of Botrytized Wines	189
VI. Summary and Conclusions	195
Acknowledgments	197
References	197

7. Distinctive Characteristics of Madeira Wine Regarding Its Traditional Winemaking and Modern Analytical Methodologies	207
Rosa Perestrelo, Francisco Albuquerque, Sílvia M. Rocha, and José S. Câmara	
I. Introduction	208
II. The History	209
III. The Tradition	210
IV. Chemical and Sensorial Characterization of Madeira Wine	215
V. Madeira Wine Authenticity	242
References	244
8. Vermouth: Technology of Production and Quality Characteristics	251
P. S. Panesar, V. K. Joshi, R. Panesar, and G. S. Abrol	
I. Introduction	252
II. History of Vermouth	253
III. Medicinal and Aromatic Value of Vermouth	255
IV. Classification of Vermouth	256
V. Technology of Preparation	258
VI. Preparation of Vermouth from Nongrape Fruits	264
VII. Vermouth Quality	270
VIII. Legal Requirements	280
IX. Future Research	280
References	280
9. Amarone: A Modern Wine Coming from an Ancient Production Technology	285
Lanfranco Paronetto and Franco Dellaglio	
I. History	286
II. Peculiarities of Amarone Wine	288
III. Alcoholic Fermentation and Maceration	296
IV. Malolactic Fermentation	299
V. Maturation in Cooperage (Aging)	300
VI. Biotechnology—New Possibilities for Amarone Wine	302
Acknowledgments	303
References	304
<i>Index</i>	307

CONTENTS

<i>Contributors</i>	xv
<i>Preface</i>	xxi

1. Medicinal Foods from Marine Animals: Current Status and Prospects	1
Se-Kwon Kim and Ramjee Pallela	
I. Introduction	2
II. Fish	3
III. Crustaceans	6
IV. Mollusks and Echinoderms	7
V. Other Marine Animals of Medicinal Value	7
VI. Conclusion	8
References	8
2. Nutraceutical Functionalities of Polysaccharides from Marine Invertebrates	11
Byeong-Dae Choi and Yeung Joon Choi	
I. Introduction	12
II. Sources of Polysaccharides	14
References	25
3. Marine By-product Phospholipids as Booster of Medicinal Compounds	31
Koretaro Takahashi and Yoshikazu Inoue	
I. Introduction	32
II. Marine Phospholipid must be More Effective than Fish Oil TG on Health Benefits	32
III. Boosting Effect on Cancer Cell Differentiation	35
IV. Boosting Effect on Cancer Suppression	38
V. Boosting Effect on Antiobesity Compounds	41
References	45

4. Characterization of Bioactive Peptides Obtained from Marine Invertebrates

47

Jung Kwon Lee, Joong-Kyun Jeon, Se-Kwon Kim,
and Hee-Guk Byun

I. Introduction	48
II. Preparation of Bioactive Peptides from Invertebrates	49
III. Antihypertensive Activity	50
IV. Anti-Alzheimer's Activity	58
V. Antioxidant Activity	61
VI. Antimicrobial Activity	65
VII. Other Biological Activity	67
VIII. Conclusion	67
References	68

5. Bioactive Marine Peptides: Nutraceutical Value and Novel Approaches

73

Anupam Giri and Toshiaki Ohshima

I. Introduction	74
II. Effect of The Structural Properties of Peptides on Bioactivity	75
III. Bioactive Peptides Derived from Marine Fish	79
IV. Bioactive Peptides Derived from Lobster, Shrimp, and Crabs	83
V. Bioactive Peptides Derived from Squid, Clams, and Sea Urchins	84
VI. Bioactive Peptides Derived from Mollusks and Oysters	84
VII. Fermented Marine Peptides and Novel Approaches	87
VIII. Concluding Remarks	96
References	99

6. Chitosan and Fish Collagen as Biomaterials for Regenerative Medicine

107

Yoshihiko Hayashi, Shizuka Yamada, Kajiro Yanagi Guchi,
Zenya Koyama, and Takeshi Ikeda

I. Introduction	108
II. General Properties of Scaffold for Regenerative Medicine	108
III. Chemical and Physical Properties of Scaffold	109
IV. Biocompatibility and Allergy	114
V. Biodegradation	115
VI. Conclusions	116
References	116

7. Chitosan as Potential Marine Nutraceutical	121
Jae-Young Je and Se-Kwon Kim	
I. Introduction	122
II. Preparation of Chitosan	123
III. Health Benefits of Chitosan and its Derivatives	125
IV. Future Prospects	132
References	132
8. Bioactive Compounds from Marine Sponges and Their Symbiotic Microbes: A Potential Source of Nutraceuticals	137
Se-Kwon Kim and Pradeep Dewapriya	
I. Introduction	138
II. Marine Sponges and Their Symbiotic Microbes	140
III. Bioactive Compounds	141
IV. Sustainable Production of Sponge Metabolite	147
References	148
9. Medicinal Benefits of Marine Invertebrates: Sources for Discovering Natural Drug Candidates	153
Mahanama De Zoysa	
I. Introduction	154
II. Phylum Porifera	156
III. Phylum Cnidaria	157
IV. Phylum Bryozoa	158
V. Phylum Molluska	159
VI. Phylum Arthropoda	162
VII. Limitations of Marine Invertebrates as Source for Health Foods and Drug Candidates	163
VIII. Conclusion	164
References	164
10. Sea-Originated Cytotoxic Substances	171
Norihito Maru and Daisuke Uemura	
I. Introduction	172
II. Halichondrins, Antitumor Compounds from <i>Halichondria Okadai</i>	172
III. Cytotoxic Compounds Related to the Coral Community	175
IV. Cytotoxic Compounds from Cyanobacteria	180
V. Conclusions	182
References	182

11. Secondary Metabolites with New Medicinal Functions from Marine Organisms	185
Osamu Ohno, Kiyotake Suenaga, and Daisuke Uemura	
I. Introduction	186
II. Halichlorine, A Bioactive Marine Natural Compound Isolated from A Marine Sponge <i>H. Okada</i> Kadota	186
III. Conclusion	191
Acknowledgments	191
References	191
12. Structure–Function Relationship of Anticoagulant and Antithrombotic Well-Defined Sulfated Polysaccharides from Marine Invertebrates	195
Vitor H. Pomin	
I. Introduction to Marine Sulfated Polysaccharides: A High Tendency for Regular Chemical Structures in Invertebrates	196
II. The Interaction of MSPs with Coagulation (co)-factors: Prevention of Blood Coagulation	200
III. Decoding the Regulating Structural Feature of MSPs in Interactions with Coagulation (co)-factors	201
IV. Remark Conclusions	206
Acknowledgments	207
References	207
13. Health Benefits of n-3 Polyunsaturated Fatty Acids: Eicosapentaenoic Acid and Docosahexaenoic Acid	211
Nalin Siriwardhana, Nishan S. Kalupahana, and Naima Moustaid-Moussa	
I. Sources and Intakes of Eicosapentaenoic Acid and Docosahexaenoic Acid	212
II. Health Benefits of n-3 PUFAs	213
III. Anti-inflammatory Effects of EPA and DHA	215
IV. n-3 PUFAs and Metabolic Disorders	216
V. Health Concerns	218
References	219
14. Biological Importance and Applications of Squalene and Squalane	223
Se-Kwon Kim and Fatih Karadeniz	
I. Background	224
II. Biological Roles of Squalene and Squalane	225

III. Conclusion	231
References	232
15. Development of Bioactive Peptides from Fish Proteins and Their Health Promoting Ability	235
Mahinda Senevirathne and Se-Kwon Kim	
I. Introduction	236
II. Structure–activity Relationship of Fish Peptides	237
III. Sources of Fish Peptides	238
IV. Production of Peptides from Various Fish Body Parts	239
V. Future Trends of Peptides from Fish Proteins	244
VI. Conclusions	245
References	245
16. Marine Fish-Derived Bioactive Peptides as Potential Antihypertensive Agents	249
Se-Kwon Kim, Dai-Hung Ngo, and Thanh-Sang Vo	
I. Introduction	250
II. Development of Marine Fish-Derived Antihypertensive Peptides	251
III. Antihypertensive Activity of Bioactive Peptides Derived from Marine Fishes	251
IV. Conclusion	257
Acknowledgment	257
References	258
17. Bioactive Sterols from Marine Resources and Their Potential Benefits for Human Health	261
Se-Kwon Kim and Quang Van Ta	
I. Introduction	262
II. Biological Activities of Sterols	262
III. Conclusions	266
References	267
18. Therapeutic Drugs: Healing Power of Marine Fish	269
N. S. Sampath Kumar, N. Satya Vijaya Kumar, and R. Jaiganesh	
I. Introduction	270
II. Chemical Composition of Fish	271
III. Conclusion	278
References	279

19. Beneficial Effect of Teleost Fish Bone Peptide as Calcium Supplements for Bone Mineralization	287
Se-Kwon Kim and Won-Kyo Jung	
I. Introduction	288
II. Preparation, Biochemical Properties, and Ca-binding Activity of Fish Bone Peptide	289
III. <i>In vitro</i> and <i>In vivo</i> Osteogenic Effects of Fish Bone Peptide	292
IV. Conclusion	294
Acknowledgment	294
References	294
20. Triterpene Glycosides from Sea Cucumbers and Their Biological Activities	297
Se-Kwon Kim and S. W. A. Himaya	
I. Introduction	298
II. The Structural Features of Triterpene Glycosides	298
III. Bioactivities of Triterpene Glycosides of Sea Cucumbers	300
IV. Structure–activity Relationships	315
V. Pros and Cons in Drug Development from Sea Cucumbers	316
VI. Concluding Remarks	316
References	317
21. Chitooligosaccharides as Potential Nutraceuticals: Production and Bioactivities	321
Jae-Young Je and Se-Kwon Kim	
I. Introduction	322
II. Preparation of Chitooligosaccharides from Chitosan	322
III. Biological Properties of Chitooligosaccharides	327
IV. Safety of Chitooligosaccharides	333
References	333
22. Biological Activities of Glucosamine and Its Related Substances	337
Isao Nagaoka, Mamoru Igarashi, and Koji Sakamoto	
I. Introduction	338
II. Effects of GlcN-derivatives and Uronic Acids on the Production of GAG by Human Synovial Cells and Chondrocytes	339
III. Incorporation of GlcN into GAG	342
IV. Effects of GlcN-derivatives and Uronic Acids on the Expression of HA-metabolizing Enzymes	342

V. Effects of GlcN and GlcNAc on the Mineralization of Osteoblastic MC3T3-E1 Cells	342
VI. Effects of GlcN and GlcNAc on the Osteoblastic Differentiation of MC3T3-E1 Cells	343
VII. Effects of GlcN and GlcNAc on the Expression of Receptor Activator of NF- κ B Ligand by MC3T3-E1 Cells	345
VIII. Other Biological Activities of GlcN	346
IX. Conclusions	348
References	350
23. Development of Marine Probiotics: Prospects and Approach	353
Se-Kwon Kim, Ira Bhatnagar, and Kyong-Hwa Kang	
I. Introduction	354
II. Prerequisites for Probiotics	355
III. Potential of Probiotics	356
IV. Approaches for Development of Marine Probiotics	358
V. Conclusion	359
References	360
24. Bioactive Secondary Metabolites from Marine Microbes for Drug Discovery	363
Chamilani Nikapitiya	
I. Introduction	364
II. Probable Candidates for Drug Discovery from Marine Microorganisms	366
III. Limitations in Use of Natural Products for Drug Development	375
IV. Advance Strategies to Exploit Marine Natural Products	376
V. Future Prospective of Marine Microbes and Conclusions	377
References	379
25. Marine Bacterial Sources of Bioactive Compounds	389
R. Jaiganesh and N. S. Sampath Kumar	
I. Introduction	390
II. Marine <i>Actinomycetes</i>	395
III. Marine Cyanobacteria	397
IV. Conclusion	402
References	402

26. Biological Activities and Health Effects of Terpenoids from Marine Fungi	409
Se-Kwon Kim and Yong-Xin Li	
I. Introduction	410
II. Diversity of Terpenoids Derived from Marine Fungi	410
III. Health Benefits and Biological Activities of Terpenoids from Marine Fungi	411
IV. Concluding Remarks	412
References	412
27. Antimetastasis Effect of Anthraquinones from Marine Fungus, <i>Microsporium</i> sp.	415
Chen Zhang and Se-Kwon Kim	
I. Introduction	415
II. Marine Fungi Resources and Anthraquinones	416
III. Effect of Chrysophanol, Physcion, and Emodin on the Inhibition of MMP-2 and -9 Expressions	417
IV. Conclusions	420
References	420
28. Application of Marine Microbial Enzymes in the Food and Pharmaceutical Industries	423
Chen Zhang and Se-Kwon Kim	
I. Introduction	424
II. Lipase	424
III. Protease	426
IV. Polysaccharide-degrading Enzymes	426
V. Conclusion	431
Acknowledgments	432
References	432
29. Enzymatic Properties of Starfish Phospholipase A2 and Its Application	437
Hideki Kishimura	
I. Introduction	438
II. PLA2 Activity of Starfish	440
III. Enzymatic Properties of Starfish PLA2	442
IV. Structural Properties of Starfish PLA2	445
V. Structure–Function Relationship of Starfish PLA2	448
VI. Application of Starfish PLA2	450

Acknowledgment	452
References	452

30. Applications of Marine Nutraceuticals in Dairy Products **457**

Janak K. Vidanarachchi, Maheshika S. Kurukulasuriya,
A. Malshani Samaraweera, and K. F. S. T. Silva

I. Introduction	458
II. Marine-derived Compounds Applied as Nutraceuticals	459
III. Applications of Marine-derived Nutraceuticals in Dairy Industry	462
IV. Applicability of the Marine-derived Nutraceuticals in the Dairy Industry	470
V. Conclusion	473
References	473

31. Upgrading of Sea By-products: Potential Nutraceutical Applications **479**

B. Cudennec, T. Caradec, L. Catiau, and R. Ravallec

I. Introduction	480
II. Enzymatic Process	481
III. CCK Secretion Stimulated Peptides	482
IV. CGRP-like Peptides	486
V. Antioxidant Peptides	487
VI. Conclusion	489
References	489

32. Utilization of Seafood Processing By-products: Medicinal Applications **495**

Mahinda Senevirathne and Se-Kwon Kim

I. Introduction	496
II. Protein and Peptides from Various Fish Wastes and their Bioactivities	497
III. Fish Skin Collagen and Gelatin	499
IV. Chitin, Chitosan, and their Derivatives from Crustacean Shells and Shellfish	501
V. Separation and Application of Fish Oil as Health-Promoting Agent	504
VI. Application of Fish Bone as Potential Calcium Source	506
VII. Conclusions	507
References	507

CONTENTS

<i>Contributors</i>	vii
<i>Preface</i>	ix

1. Sparkling Wines: Features and Trends from Tradition	1
Susana Buxaderas and Elvira López-Tamames	
I. Historical Background	2
II. Definition and Types of Sparkling Wines and Other Effervescent Wines	5
III. Cultivation and Harvest	7
IV. Elaboration Process	10
V. Organoleptic Characteristics	23
VI. Data of Production and Consumption	35
Acknowledgments	36
References	36

2. Occupational Allergies in Seafood-Processing Workers	47
Mohamed F. Jeebhay and Andreas L. Lopata	
I. Introduction	48
II. Seafood Industry, Processing Activities, and Populations at Risk	48
III. Health Effects Associated with Seafood Processing and Their Epidemiology	51
IV. Seafood Matrix, Allergen Structure, and Disease Mechanisms	53
V. Impact of Seafood-Processing Activities on Allergenicity and Airborne Exposure Levels	61
VI. Risk Factors for Occupational Allergies Associated with Seafood	64
VII. Diagnosing Seafood Allergy	66
VIII. Prevention	68
Acknowledgments	69
References	69

3. Health Benefits of Algal Polysaccharides in Human Nutrition	75
Ladislava Mišurcová, Soňa Škrovánková, Dušan Samek, Jarmila Ambrožová, and Ludmila Machů	
I. Introduction	76
II. Significance of Dietary Fiber in Human Nutrition	77

III. Algae as a Source of Dietary Fiber	99
IV. Biological Activities of Algal Polysaccharides	124
V. Conclusion	132
References	132
4. Fiber, Protein, and Lupin-Enriched Foods: Role for Improving Cardiovascular Health	147
Dr Regina Belski	
I. Introduction	148
II. Cardiovascular Disease	149
III. Overweight, Obesity, and Its Consequences	151
IV. Causes of Obesity	153
V. Macronutrients in the Control of Energy Intake, and Body Weight and Composition	157
VI. Protein and Fiber: Effects on Cardiovascular Disease Risk Factors	180
VII. Lupin	192
VIII. Conclusion	199
Acknowledgments	200
References	200
5. “Green Preservatives”: Combating Fungi in the Food and Feed Industry by Applying Antifungal Lactic Acid Bacteria	217
Agata M. Pawlowska, Emanuele Zannini, Aidan Coffey, and Elke K. Arendt	
I. Introduction	218
II. Food Quality and Safety	221
III. Lab as Biopreservatives	223
IV. Conclusions	231
References	232
<i>Index</i>	239

CONTENTS

<i>Contributors</i>	<i>ix</i>
1. Metabolomics in Food Science	1
Juan Manuel Cevallos-Cevallos and José Ignacio Reyes-De-Corcuera	
1. Introduction	1
2. Definitions	2
3. Metabolomic Analysis	7
4. Metabolomics in Food Safety	12
5. Metabolomics in Food Processing	14
6. Metabolomics in Food Quality	15
7. Future Trends	16
References	19
2. Implications of Light Energy on Food Quality and Packaging Selection	25
Susan E. Duncan and Hao-Hsun Chang	
1. Introduction	26
2. The Chemistry of Light Energy on Foods	28
3. The Effect of Light-Induced Oxidation on Food Quality	32
4. Effect of Light Energy on Susceptible Food Molecules	33
5. Effect of Selected Light Wavelengths on Light-Responsive Food Molecules and Food Quality	44
6. Food Packaging to Protect Food Quality by Interference with Light Energy	59
7. Conclusions	61
References	62
3. Antioxidant Activity and Protecting Health Effects of Common Medicinal Plants	75
Soňa Škrovánková, Ladislava Mišurcová, and Ludmila Machů	
1. Introduction	76
2. Oxidative Processes and Importance of Antioxidants	77
3. Antioxidants in Medicinal Plants	81
4. Medicinal Plants as Sources of Antioxidants	86
5. Antioxidant Activity of Medicinal Plants	106

6. Protecting Health Effects of Medicinal Plants	109
7. Conclusion	124
References	124
4. Fatty Acid Profile of Unconventional Oilseeds	141
Latha Sabikhi and M.H. Sathish Kumar	
1. Introduction	141
2. Significance of Lipids in Human Nutrition	143
3. Lipid Requirements of Human Beings	146
4. Sources of Lipids for Human Consumption	148
5. Conventional Oilseeds: A Brief Overview	150
6. Unconventional Oilseeds: Genesis and Importance	156
7. Fatty Acid Profile of Selected Unconventional Oilseeds	157
8. Genetic Engineering: A Possibility for Novel Oilseeds	172
9. Single-Cell Oils—A Special Mention	174
10. Conclusions	177
References	178
5. Modern Approaches in Probiotics Research to Control Foodborne Pathogens	185
Mary Anne Roshni Amalaradjou and Arun K. Bhunia	
1. Introduction	186
2. Probiotics	196
3. Interaction of Gut Microbiota and Probiotics	209
4. Wild-Type and Bioengineered Probiotics to Control Foodborne Enteric Pathogens	213
5. Delivery System for Probiotics to the Gut	222
6. Conclusion and Future Perspectives	224
References	225
6. Bacteriophages for Detection and Control of Bacterial Pathogens in Food and Food-Processing Environment	241
Lubov Y. Brovko, Hany Anany, and Mansel W. Griffiths	
1. Overview of Bacteriophage	242
2. Using Bacteriophages as Biocontrol Tools for Bacterial Pathogens	248
3. Bacteriophages for Detection of Bacterial Pathogens	264
4. Conclusion	276
References	276

7. Carbon Dioxide and Ethanol Release from Champagne Glasses, Under Standard Tasting Conditions	289
Gérard Liger-Belair, Fabien Beaumont, Marielle Bourget, Hervé Pron, Bertrand Parvitte, Virginie Zéninari, Guillaume Polidori, and Clara Cilindre	
1. Introduction	290
2. The CO ₂ Within the Bottle	294
3. Losses of Dissolved CO ₂ During Champagne Serving	304
4. Ascending-Bubble-Driven Flow Patterns Within Glasses and Their Impact on Gaseous CO ₂ and Ethanol Release Under Standard Tasting Conditions	312
5. Conclusions and Future Prospects	336
Acknowledgments	337
References	337
 <i>Index</i>	 341

CONTENTS

<i>Contributors</i>	<i>xi</i>
<i>Preface</i>	<i>xv</i>
1. Kiwifruit: Taking Its Place in the Global Fruit Bowl	1
Carol Ward and David Courtney	
1. Introduction: History	1
2. Global Kiwifruit Industry: A Production Profile	4
3. Global Fruit Bowl: The Place of Kiwifruit	8
4. Growing Consumer Demand	10
5. Global Health Trends: The Position of Kiwifruit	11
References	13
2. Kiwifruit: The Wild and the Cultivated Plants	15
A. Ross Ferguson	
1. What are Kiwifruit?	16
2. The Genus <i>Actinidia</i>	17
3. <i>Actinidia</i> Species	19
4. <i>Actinidia</i> Species in Cultivation	20
5. The <i>A. chinensis</i> , <i>A. deliciosa</i> , <i>A. setosa</i> Complex	21
6. Nomenclature Used in Scientific and Horticultural Literature for <i>A. chinensis</i> and <i>A. deliciosa</i>	22
7. Fruit Diversity in <i>Actinidia</i>	23
8. Domestication of <i>Actinidia</i> Species	25
9. Cultivars of <i>A. chinensis</i> and <i>A. deliciosa</i>	26
10. Origin of Kiwifruit Cultivars	28
11. Kiwifruit: Past, Present, and Future	29
References	30
3. The Composition and Nutritional Value of Kiwifruit	33
Lynley Drummond	
1. Introduction	34
2. The Macro Components	42
3. Vitamins	46
4. Organic Acids	49
5. Pigments	50

6. Other Minor Components	52
7. Conclusion	54
References	54
4. Kiwifruit Proteins and Enzymes: Actinidin and Other Significant Proteins	59
Mike Boland	
1. Total Protein Content of Kiwifruit	60
2. Major Soluble Proteins and Patterns of Occurrence	61
3. Digestion of Kiwifruit Proteins	63
4. Actinidin	64
5. Kiwellin and its Fragments	68
6. Thaumatin-Like Protein	68
7. Kirola	69
8. Enzymes Involved in Kiwifruit Ripening	69
9. Other Kiwifruit Enzymes	73
Acknowledgments	74
References	74
5. Fiber: Composition, Structures, and Functional Properties	81
Ian M. Sims and John A. Monro	
1. Introduction	82
2. Composition of Kiwifruit Fiber	82
3. Structure of Kiwifruit Cell-Wall Polysaccharides	83
4. Structural Changes in Cell-Wall Polysaccharides	88
5. Functional Properties of Kiwifruit Dietary Fiber	89
6. Conclusion	96
References	97
6. Secondary Metabolite Components of Kiwifruit	101
Tony K. McGhie	
1. Introduction	102
2. Kiwifruit Secondary Metabolite Components	103
3. Using Secondary Metabolites to Improve the Health Enhancing Properties of Kiwifruit	117
4. Secondary Metabolites with Potential Negative Impacts on Health	118
5. Metabolite Discovery	119
Acknowledgments	122
References	122

7. The Bioavailability of Vitamin C from Kiwifruit	125
Margreet C.M. Vissers, Anitra C. Carr, Juliet M. Pullar, and Stephanie M. Bozonet	
1. Vitamin C and Scurvy	126
2. The Biological Activity of Vitamin C	127
3. The Recommended Dietary Intake	129
4. Vitamin C and the Prevention of Chronic Diseases	130
5. Vitamin C and Respiratory Diseases	131
6. Food Sources of Vitamin C	131
7. Vitamin C Content of Kiwifruit	133
8. Effect of Kiwifruit Supplementation on Vitamin C Intake	134
9. Effect of Kiwifruit Intake on Plasma Vitamin C	136
10. Effect of Kiwifruit Intake on Tissue Vitamin C Levels	137
11. Animal Studies with Kiwifruit	139
12. Effect of Other Plant Components on Uptake of Vitamin C	141
13. Natural versus Synthetic Vitamin C	142
14. Conclusion	143
References	143
 8. Influence of Kiwifruit on Protein Digestion	 149
Lovedeep Kaur and Mike Boland	
1. Introduction	150
2. Kiwifruit and Protein Digestion in the Stomach	150
3. Kiwifruit and Protein Digestion in the Small Intestine	161
4. Special Benefits and Commercial Preparations	164
5. Conclusions	165
Acknowledgment	166
References	166
 9. Kiwifruit, Mucins, and the Gut Barrier	 169
Paul J. Moughan, Shane M. Rutherford, and Prabhu Balan	
1. Introduction	170
2. The Gut Barrier and Significance of the Mucous Layer	170
3. Dietary Factors Known to Influence Gut Mucin Production	177
4. Chemical and Physical Properties of Kiwifruit Potentially Relevant to Gut Mucin Production	178
5. Empirical Evidence for an Effect of Kiwifruit on Gut Mucin Production	179
References	182

10. Digestion of Kiwifruit Fiber	187
Sharon J. Henare and Shane M. Rutherford	
1. Introduction	187
2. Food Digestion and Absorption	188
3. Dietary Fiber Digestion and Absorption	191
4. Kiwifruit Fiber Digestion	194
References	199
11. Modification of the Colonic Microbiota	205
Juliet Ansell, Shanthi Parkar, Gunaranjan Paturi, Douglas Rosendale, and Paul Blatchford	
1. Introduction	205
2. Modification of the Colonic Microbiota by Kiwifruit Polyphenolic Compounds	206
3. Modification of the Colonic Microbiota by Kiwifruit Carbohydrates	207
4. Kiwifruit Fermentation Offers Functional Benefits to the Gut	215
5. Conclusion	215
References	216
12. Kiwifruit Modulation of Gastrointestinal Motility	219
Lynley Drummond and Richard B. Geary	
1. Introduction	219
2. Functional Bowel Disorders	220
3. Constipation	220
4. Kiwifruit as an Effective Dietary Intervention for Constipation	223
5. Effect of Kiwifruit Fiber on Gastrointestinal Motility	227
6. Effect of Actinidin and Protein Fractions	228
7. Phytochemicals	229
8. Conclusion	229
References	230
13. Kiwifruit and Mineral Nutrition	233
Frances M. Wolber, Kathryn L. Beck, Cathryn A. Conlon, and Marlena C. Kruger	
1. Introduction	234
2. Essential Dietary Minerals	234
3. Mineral Absorption in the Digestive System	237
4. Mechanisms of Mineral Uptake	240

5. Minerals in Kiwifruit	243
6. Kiwifruit Components Facilitate Mineral Uptake	245
7. Conclusions	249
References	250
14. Kiwifruit, Carbohydrate Availability, and the Glycemic Response	257
John A. Monro	
1. Introduction	258
2. The Glycemic Potency of Kiwifruit	258
3. Expressing the Impact of Kiwifruit on Carbohydrate Availability	261
4. Factors Affecting the Availability of Carbohydrates Consumed in Kiwifruit	262
5. Conclusion	270
Acknowledgment	270
References	270
15. Cardioprotective Properties of Kiwifruit	273
Asim K. Duttaroy	
1. Introduction	273
2. Cardioprotective Properties of Kiwifruit	275
3. Discussion	279
References	281
16. Kiwifruit as a Modulator of DNA Damage and DNA Repair	283
Andrew R. Collins	
1. Introduction	283
2. Antioxidants in Kiwifruit	285
3. Antioxidant Effects of Kiwifruit in Humans	287
4. Other Effects of Kiwifruit Supplementation Related to DNA Stability	290
5. Studies of Gene Expression	294
6. Discussion	295
References	298
17. Effects of Kiwifruit on Innate and Adaptive Immunity and Symptoms of Upper Respiratory Tract Infections	301
Margot A. Skinner, Kerry Bentley-Hewitt, Douglas Rosendale, Suzuki Naoko, and Anton Pernthaner	
1. Introduction	302
2. <i>In Vitro</i> Studies	303

3. Animal Models	311
4. Human Intervention Trials	313
5. Conclusions	318
Acknowledgments	318
References	318

18. Kiwifruit Allergies **321**

Merima Bublin

1. Introduction: Food Allergy and Allergens	322
2. Kiwifruit Allergy	323
3. Kiwifruit Allergens	326
4. Allergenicity of Different Kiwifruit Cultivars	334
5. Conclusion	335
References	335

Index **341**

CONTENTS

<i>Contributors</i>	<i>vii</i>
<i>Preface</i>	<i>xi</i>
1. Finger Millet (<i>Ragi, Eleusine coracana</i> L.): A Review of Its Nutritional Properties, Processing, and Plausible Health Benefits	1
S. Shobana, K. Krishnaswamy, V. Sudha, N.G. Malleshi, R.M. Anjana, L. Palaniappan, and V. Mohan	
1. Introduction	2
2. History of Finger Millet	3
3. Millet Consumption in India	4
4. Nutritional Significance of Structural Features of Finger Millet	5
5. Nutrient Composition of Finger Millet	6
6. Phytonutrients/Phytochemicals	11
7. Processing and Utilization	12
8. Health Benefits of Finger Millet	17
9. <i>In Vitro</i> Studies on the Carbohydrate Digestibility of Finger Millet	26
10. Glycemic Response (GR) studies on Finger Millet (Human Studies)	28
11. Gaps in the Knowledge and Future Directions for Research	30
12. Conclusion	31
References	32
2. Advances in Food Powder Agglomeration Engineering	41
B. Cuq, C. Gaiani, C. Turchiuli, L. Galet, J. Scher, R. Jeantet, S. Mandato, J. Petit, I. Murrieta-Pazos, A. Barkouti, P. Schuck, E. Rondet, M. Delalonde, E. Dumoulin, G. Delaplace, and T. Ruiz	
1. Introduction	42
2. Food Powder Reactivity and Surface Properties	44
3. Hydrotextural Diagram	50
4. Agglomeration Mechanisms and Agglomerate Growth Maps	57
5. Agglomeration Processes	73
6. Dimensional Analysis of the Agglomeration Processes	82
7. Conclusions	95
Acknowledgments	95
References	95

3. Dietary Strategies to Increase Satiety	105
Candida J. Rebello, Ann G. Liu, Frank L. Greenway, and Nikhil V. Dhurandhar	
1. Introduction	106
2. Dietary Protein and the Regulation of Food Intake and Body Weight	110
3. Carbohydrates and the Regulation of Food Intake and Body Weight	128
4. Fats and the Regulation of Food Intake	143
5. Teas, Caffeine, and Pungent Foods	149
6. Energy Density	152
7. Meal Plans	156
References	162
4. Biotransformation of Polyphenols for Improved Bioavailability and Processing Stability	183
Apoorva Gupta, Lalit D. Kagliwal, and Rekha S. Singhal	
1. Introduction	184
2. Classification of Polyphenols	185
3. Biotransformation of Polyphenols: Strategies	186
4. Impact of Biotransformation	208
5. Conclusion	211
References	212
<i>Index</i>	219

CONTENTS

<i>Contributors</i>	<i>vii</i>
<i>Preface</i>	<i>ix</i>
1. Role of Proteins in Insulin Secretion and Glycemic Control	1
Viren Ranawana and Bhupinder Kaur	
1. Introduction	2
2. Blood Glucose Homeostasis and the Role of Insulin	3
3. Classification of Proteins and Protein Quality	6
4. Impact of Proteins and Amino Acids on Insulin Secretion	9
5. Impact of Proteins and Amino Acids on Glycemia	22
6. Conclusions	36
Acknowledgment	38
References	38
2. Physical Activity, Fitness and the Energy Cost of Activities: Implications for Obesity in Children and Adolescents in the Tropics	49
Xiao Chuan Lau, Kar Hau Chong, Bee Koon Poh, and Mohd Noor Ismail	
1. Introduction	50
2. Overweight and Obesity in the Tropics	53
3. Physical Activity in the Tropics	59
4. Physical Fitness in the Tropics	68
5. Energy Cost of Physical Activities in Children and Adolescents in the Tropics	72
6. Implications of PA, PF, and Energy Cost on Obesity in the Tropics	82
7. Conclusion	88
References	89
3. Starch Hydrolase Inhibitors from Edible Plants	103
Hongyu Wang, Tingting Liu, and Dejian Huang	
1. Introduction	104
2. α -Glucosidase Inhibitors from Botanical Sources	112
3. Amylase Inhibitors	122
4. Low GI Foods Containing Starch Hydrolase Inhibitors	125
5. Conclusions and Future Outlook	130
References	131

4. Food Microstructure and Starch Digestion	137
Jaspreet Singh, Lovedeep Kaur, and Harjinder Singh	
1. Introduction	138
2. Starch Digestion	139
3. Microstructure of Natural Foods and Starch Digestion	140
4. Rheology of Food Matrix and Starch Digestion	157
5. Formulated Foods and Starch Digestion	163
6. Conclusions	172
Acknowledgment	173
References	173
5. Food-Based Ingredients to Modulate Blood Glucose	181
Pariyarth Sangeetha Thondre	
1. Introduction	182
2. Maintaining Normal Blood Glucose Levels: The Role of Food	183
3. Blood Glucose and Chronic Diseases	185
4. Factors Affecting Glycemic Index of Food	189
5. Dietary Fiber and Blood Glucose	190
6. Cereal-Based Ingredients	193
7. Fruit-Based Ingredients	202
8. Spices	208
9. Legume-Based Ingredients	210
10. Effect of Protein and Fat on Blood Glucose	213
11. Sugars and Sugar Alcohols	216
12. Concluding Remarks	217
References	217
Index	229