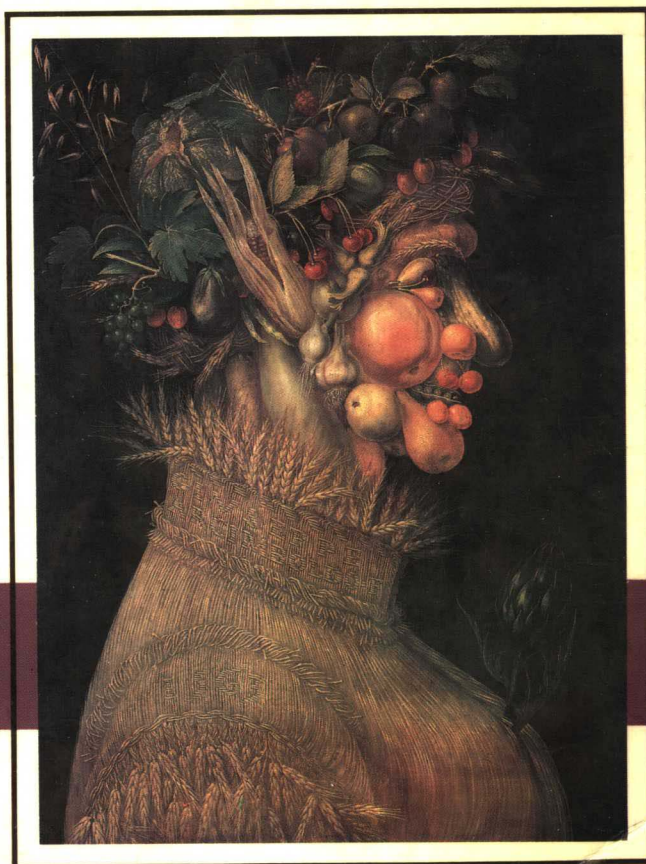


Food Science and Nutritional Health:

An Introduction

Theodore P. Labuza
John W. Erdman Jr.



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*In memory of
Dr. Howard Appledorf
who stimulated the ideas
for the first edition
of this book.*

Preface

This book represents the cumulative changes that have occurred in the fields of food science and nutrition in the seven years since T.P. Labuza first published *Food and Your Well-Being*. And like *Food and Your Well-Being*, the purpose of this book remains the same: to provide a reliable source of information on the connection between food and health.

This connection is often steeped in controversy and exaggerated claims and, if anything, these controversies and exaggerations have become even more intense since *Food and Your Well-Being* was published. As this book goes to press, EDB is making news as a contaminant and many grain products are being recalled from supermarket shelves. In the recent past, there have been newspaper headlines on the partial banning of saccharin; news articles on sulfite as a cause of instant death; and an alleged connection between the new sweetener, Aspartame®, and brain dysfunction. These controversies will continue and new ones will appear; rarely will these controversies be completely resolved. This places the consumer in an awkward position: whom and what to believe, what to eat and what not to eat, and, above all, how to make the best choices for personal and family health.

These choices can best be made by being informed, by understanding the basic concepts of food science and nutrition. It is our goal to present these basic concepts in a clear and straightforward manner so that the reader can make a better connection between food and food processing, nutrition and health. The hope is that this book will be an invaluable tool in the home as well as in the classroom. Toward this end, and beginning with *Food and Your Well-Being*, John Erdman has extensively revised and expanded the coverage of nutrition in the first half of the book and Ted Labuza has revised and expanded the second half of the book on the technology and preservation of food.

Acknowledgements

No book is written alone, and we owe much to others.

Ted Labuza would like to thank his students for continually asking penetrating questions during and after class, the many consumers who call for help on food problems, the media in the Twin Cities area who call seeking a resource and, collectively, the FDA, the Food Drug Law Institute, and Peter Barton Hutt for instilling the legal sense which helped put the complex food/nutrition issue into a proper perspective. Finally, a large measure of thanks to those who endured the grueling two years of "working on the book," especially Mary Schmidl.

John Erdman would like to recognize the editorial assistance of Edith Erdman and Donald Thompson, the suggestions of Mary Grummer, and the typing of Rita Craighead. A special thanks is due his family and graduate students for their considerable patience during the preparation of this book.

Together, we would like to thank Gary Woodruff and Marge Johnson of West and the reviewers whose comments and suggestions materially helped shape the book into what it now is: Michael E. Mangino, Ohio State University, Clarice Schlickling, Orange Coast College, James Acton, Clemson University, Stan Biede, Louisiana State University. Michael E. Mangino deserves a special mention for his authorship of the accompanying Instructor's Manual.

TPL

JWE

Biographical sketches

Dr. Theodore P. Labuza

Dr. Theodore P. Labuza is a professor of food science and technology in the Department of Food Science and Nutrition at the University of Minnesota. Dr. Labuza is a native of New Jersey. He received a B.S. in Food Science at MIT and a Ph.D. in Food Science and Nutrition at MIT in 1965. After receiving his degree, Dr. Labuza taught at MIT in the Department of Nutrition and Food Science until July of 1971. At that time he joined the University of Minnesota. Dr. Labuza is the author of over 110 scientific articles as well as articles for the popular press concerning food technology and nutrition. He has written three other nutrition books: *Food For Thought* (AVI Publishing Company 1974), *The Nutrition Crisis: A Reader* (West Publishing Company 1975) and *Contemporary Nutrition Controversies* (West Publishing Company 1975). He is a member of many professional organizations. In 1975 he was the National Program Chairman for the Institute of Food Technologists and was responsible for its annual meeting. Dr. Labuza received the IFT award for outstanding research in 1972 and the IFT teaching award in 1978. Besides his regular course in food technology, he also teaches an introductory food processing course and a food law course. Over the last ten years, Dr. Labuza's major research has been in the properties of water in foods as related to nutrient losses and microbiological activity during processing and storage of dehydrated and intermediate moisture foods as well as developing methods for shelf life testing of foods and drugs.

Dr. John W. Erdman, Jr.

Dr. John W. Erdman, Jr., is an associate professor of food science in the Department of Food Science at the University of Illinois. Dr. Erdman received a B.S. degree in food science at Rutgers University. He worked for six months as a flavor chemist for Pepsico, and served for two years in the United States Army before returning to Rutgers for graduate

school. Dr. Erdman received his Ph.D in 1975. He joined the University of Illinois in 1975. Dr. Erdman is the author of over 50 scientific articles, many dealing with the effects of food processing upon the bioavailability of minerals from foods and others dealing with vitamin A metabolism in man and animals. He has co-authored seven book chapters, and since 1980 has written a monthly column for the magazine *Cereal Foods World*.

Dr. Erdman is a member of many professional organizations including the American Institute of Nutrition, Institute of Food Technologists (IFT), and the Society of Nutrition Education. He is a member of the Subcommittee on the Uses of the RDA, National Research Council, National Academy of Science. He has served on a number of national committees for IFT and is currently chairman-elect of the Nutrition Division of IFT. In 1980 Dr. Erdman received the Samuel Cate Prescott Award for Research from IFT. He has been recognized on numerous occasions by his students at the University of Illinois for his excellence in teaching. In 1983 the University of Illinois presented Dr. Erdman with the Excellence in Off-campus Teaching Award. Dr. Erdman is married and has two children aged three and seven.

Contents

Preface *vii*

Biographical sketches *ix*

1 Nutritional Adequacy and the State of the Body **1**

Characteristics of Nutritional Adequacy	2
Size, Weight, and Longevity	3
Ability to Withstand Stress	4
Reproduction	4
Biochemical, Clinical, and Dietary Status	5
Testing of Nutritional Status and Diets	6
Animal Tests	6
Biochemical Analysis	9
The Psychological and Physical Qualities of the Body	9
The Engine	10
Body Composition	10
Summary	14

2 Nutrient Requirements and Energy Needs of the Body **17**

Discovery of Nutritional Requirements	18
Human Nutritional Requirements	19
Calories Do Count: A Definition	25
Choosing an Adequate Diet	28
Determination of Energy Needs	28
Summary	32

3 Water and Oxygen: Two Essential Substances 37

Oxygen	38
Water	38
Summary	40

4 Carbohydrates and Their Effect on Health 43

The Different Forms of Carbohydrates	44
The Use of Carbohydrates in the Body	50
Carbohydrate Intake and Health	54
Athletes and the Use of Carbohydrates	58
Summary	59

5 Fats, Fatty Acids, and Cholesterol 65

Composition of Fats	66
Triglycerides	66
Fatty Acids	67
Phospholipids	70
Cholesterol	71
Fat Metabolism	73
Deposition of Fat Tissue	73
Summary	74

6 Protein: How Much Do We Need? 79

Protein and Nutrition Ideas	80
Composition of Proteins	80
Essential Amino Acids	82
Functions and Metabolism of Protein	85
Evaluation of Protein Quality	85
Protein Requirements	89
Protein Consumption Problems	90
Protein Intolerance	91
Summary	92

7 The Vitamins: Biological Catalysts for Life 97

The Types of Vitamins in Foods	98
The Water-Soluble Vitamins	98
The Fat-Soluble Vitamins	108
Summary	113

8	The Other Nutrients: Minerals and Trace Elements	119
	Minerals	120
	Trace Elements	124
	Other Trace Elements	129
	Summary	132
9	The Process of Digestion and the Foods We Need	137
	The Pathways of Digestion in Humans	138
	Food and Requirements	142
	Summary	146
10	The American Diet: Is It Adequate?	151
	General Problems	152
	Malnutrition	152
	Food Disappearance Data	157
	Overnutrition	160
	Summary	162
11	Heart Disease: Relationship to the Diet	165
	Incidence of Heart Disease	166
	Progression of Heart Disease and Stroke	167
	Total Fat, Saturated Fat, and Cholesterol	168
	Other Dietary Factors	170
	Degree of Water Hardness	172
	Zinc/Copper Ratio	172
	Obesity	173
	Other Factors	173
	Heart Disease, a Multifactorial Disease	174
	A Prudent Diet	175
12	Obesity, Weight Control, and Dieting	179
	The Obesity Equation	180
	Am I Too Fat: Diagnosis of Obesity	180
	Causes of Obesity: Environmental and Social Factors	182
	Causes of Obesity: Physiological Factors	183
	Biochemical and Metabolic Consequences	184
	Treatment of Obesity by Means Other than Diet	185
	Treatment of Obesity by Fad Diets	187

Obesity Treatment by Starvation	191
A Good Weight-Reduction Plan	192
Behavior Modification and Dieting	194
Anorexia Nervosa and Bulimia	195
Summary	196

13 Nutritional Implications of Current Dietary Trends: We've Come a Long Way, America 201

Current Trends (Fads) in the U.S. Diet	203
Your Next-Door Neighbor—The Health Expert	207
Summary	207

14 The Basis of Food Preservation 211

The Food Deterioration Problem	212
Types of Food Loss Problems	212
Historical Aspects of Food Processing	220
Sociological Aspects of Food Processing	222
The Basic Food Preservation Methods	224
Summary	233

15 Microorganisms in Foods: Good Germs and Bad Ones 241

The Types of Microbes in Foods	242
Process Control	249
Hazard Analysis of Food Processing	249
Environmental Factors Controlling the Growth of Microorganisms	250
Summary	256

16 Food-Borne Disease: The Harmful Germs 261

Food Intoxications	262
Food Infections	269
Summary	272

17 Heat Preservation of Foods: Canning 277

History of Heat Processing	278
The Safety of Canned Foods	280
Home Canning	283
Nutrient Destruction in Canned Foods	284
Commercial Canning	285
Summary	289

18	Cold Preservation of Foods: Refrigeration and Freezing	293
	The Principles of Refrigeration and Freezing	294
	History of Cold Preservation	294
	Refrigerator/Freezer Design	295
	Uses of Refrigeration	297
	Holding Fresh Fruits and Vegetables	298
	Freezing	299
	Summary	305
19	The Drying of Foods	309
	Principles of Food Dehydration, Water Activity, and Stability	310
	Engineering Factors	313
	Methods of Drying	314
	Dry Food Storage	323
	Summary	323
20	Food Fermentations: The Useful Germs	329
	Principles of Fermentation	330
	Types of Fermentations	330
	Typical Food Fermentations	331
	A New Fermentation Idea for the Future	333
	Summary	333
21	The Use of Chemicals for Preservation and Other Purposes	337
	Chemical Preservation by Fermentation	339
	Chemical Microbial Inhibitors	339
	Additives That Prevent Chemical Deterioration	340
	Functional Additives for Texture	341
	Functional Additives for Aesthetic Purposes	343
	Nutritional Additives: Vitamins, Minerals, Proteins, and Amino Acids	347
	An Example of a Food with Additives: White Bread	348
	Summary	349
22	Nutritional Losses During Storage of Processed Foods	355
	General Considerations on Nutrient Loss	356
	Fresh Foods	357
	Canned Foods	358
	Frozen Foods	361

Dry Foods	363
Chemical Reactions Causing Quality Losses in Foods	365
Uses of Packaging to Control Deterioration	367
Summary	368

23 Food Legislation and Regulation: How the Government Protects Our Food Supply 375

Early History of Food Laws	376
The Food, Drug, and Cosmetic Act	377
Other Laws	377
Rules and Regulations	380
Adulteration and Misbranding	382
FDA Procedures	385
Other Regulatory Agencies	387
Summary	389

24 Read the Label and Set a Better Table 395

The Front Panel of a Food Package	397
The Right Side Panel	409
Non-Required Label Information	417
Summary	422

25 Food Safety: Legal Basis and Safety Testing 431

The Laws and Regulations Regarding Safety of Foods	432
Introducing a Chemical into the Food Supply	443
Additive Testing Procedures	444
Approval of a Chemical for Use in Food	451
Summary	453

26 The Food Additive Controversy: Is It or Was It Safe? 457

Controversial Food Additives	458
Natural Toxicants in Foods	470
Summary	472

Bibliography 475

Glossary 479

Appendix I: Table of Food Composition 491

Appendix II: Fast Foods	529
Appendix III: Food Units	539
Index	541



**NUTRITIONAL ADEQUACY
AND THE STATE
OF THE BODY**

1

The science of nutrition is a very young science. Prior to 1900 there were few scientific investigators working on nutritional studies. Then the explosion came. New laboratory analytical techniques and a better understanding of biochemical processes resulted in a wide interest in nutritional research. In addition, the ability to synthesize organic compounds increased the study of the effects of various chemicals on health. No vitamins were discovered until 1910. By 1970 there were over 1,300 papers published on vitamin B₁₂ alone, and in 1982 just one scientific meeting had almost 1,000 papers presented on various nutrition topics.

Unfortunately, much of this information has not been communicated to the public. This problem is due, in part, to our schools, which require neither an adequate science education nor an integrated food and nutrition education. Moreover, the scientific jargon of nutrition is often too difficult for most people to understand. Consequently, a person's ability to apply findings of nutritional research is limited.

So that we ourselves may begin to better understand how to keep healthy through a good diet, we will first define nutritional adequacy in the most simple terms. We should remember here that nutrition is the sum total of all the processes that occur in the body to break down foods into their various components. The body then uses these substances for growth, repair, and maintenance of all the systems that contribute to health. Food is the input to nutrition. Thus an adequate food intake is a prerequisite to nutritional adequacy, whereas an inadequate food intake can lead to poor health.

CHARACTERISTICS OF NUTRITIONAL ADEQUACY ←

What are some of the characteristics commonly attributed to nutritional adequacy (or inadequacy)? What state of mind or state of the body makes us feel healthy and gives us vitality? Factors such as body size, weight, longevity, ability to withstand stress, and ability to reproduce can be used as indicators of good health and thus nutritional adequacy. Biochemical and clinical analyses are also extremely helpful in determining nutritional status. Nutrition is not an exact science, however.

Each of us, due to our genetic makeup, differs in our needs for certain nutrients in our diets. Genetically, we all differ in our predisposition to chronic disease. Scientists often speak of the biochemical individuality of people. Just as each of us has different fingerprints, each of us is made up differently. Therefore, we must always think in terms of ranges of nutrient needs or average nutrient needs, not in terms of an absolute need for every person. One person may require 30 milligrams (mg.) of vitamin C daily and his or her neighbor only 15 mg.

Some of the measures we commonly use to define nutritional adequacy are discussed on the following page.