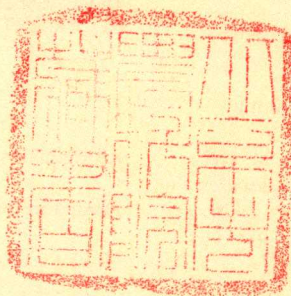

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NUTRITION

CONCEPTS AND CONTROVERSIES



Eva May Nunnelley Hamilton Eleanor Noss Whitney Frances Sienkiewicz Sizer



Fifth Edition Prepared by
Eleanor Noss Whitney
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■■■ PREFACE

For well over a decade, professors and students have been testing *Nutrition: Concepts and Controversies* in their classrooms. They have told us they appreciate our perspectives on established nutrition knowledge. They have liked taking glimpses with us into areas of rapid change, and they enjoy as we do the stories in nutrition that continue to intrigue us with their plot twists and surprise directions. In this fifth edition, we have updated our fundamentals with all available scientific advances in the field, including the (1989) *Recommended Dietary Allowances* and the latest dietary guidelines. To continue offering fast-breaking news, we have also written new Controversies on some beginnings of knowledge that are just now emerging from research scientists' reports. Some day, these may either develop fully into fundamentals of nutrition or retire to the pastures of the unproved.

We hope you will enjoy using this fifth edition. Along with its new topics come amenities such as airbrushed figures to lend clarity to nutrition concepts, cartoons that teach through humor, and photos of food that complement the book's accuracy, thoroughness, and personal style of writing.

Our new edition begins with a personal invitation to eat well, and to think in terms of how, when, and why people choose the foods they do. We also introduce the nutrients, and then move on to contrast sources of valid nutrition information with fraudulent claims. Chapter 2 brings together the concepts of diet planning through food grouping systems, the nutrient density concept, and exchange systems. Food labeling as a vehicle of nutrition and health information is a major topic of Chapter 2. Then Chapter 3 presents a brief but essential introduction to the workings of the body systems as they relate to nutrition. Chapters 4 through 6 are devoted to the energy-yielding nutrients—carbohydrates, lipids, and proteins. Chapters 7 and 8 present the vitamins, minerals, and water. Chapter 9 relates energy balance to the problems of overweight, obesity, and underweight, and presents life-long weight maintenance as a major new theme. For active people, and for those just starting exercise programs, Chapter 10 presents the relationships between fitness, physical activity, and nutrition. Chapter 11, new to this edition, describes how diet may be instrumental in the development of diseases. Chapters 12 and 13 point out the importance of nutrition throughout the lifespan, from gestation through old age. Chapter 14 considers the problems and advantages of food technology, and describes how to handle food safely at home. Chapter 15 touches on the vast problems of the global food supply—world hunger, contaminants and pesticides, environmental pollution, agribusiness, overpopulation, and the world's water supply—with an emphasis on solutions to these problems.

The Controversies of this book's title are optional readings printed on colored paper. Many are totally new to this edition, and the others have been updated. A few deserve special mention. Controversy 2 compares cuisines derived from many nations and religions and leaves it to the reader to answer its title question, "Who has the best way to eat?" Controversy 8, Osteoporosis

and Calcium, debates whether adequate calcium intakes can help prevent development of osteoporosis in light of other contributing factors. Controversy 10 provides a glimpse into headline nutrition news that prompts researchers to ask the question, "Are fat calories more fattening?" Controversy 13 wonders aloud what effects nutrition might really have on the processes of aging. This book's final Controversy touches on a topic that may well turn out to be a key to survival in the next century.

The Food Feature sections that appear in Chapters 1, 2, and 4 through 14 act as bridges between theory and practice; they are personal applications of the concepts in the chapters. The Self-Study sections at the ends of the chapters offer the reader a means of comparing personal dietary habits to recommendations. Consumer Cautions in each chapter present information on supplements, other nutrition-related products, and marketplace choices to provide consumers with the information they need to make informed decisions.

New or major terms are defined in the margins of the pages where they are first used in the text. Each term is printed in boldface type at its first use, to call attention to its importance. The reader who wishes to locate any defined term may do so by consulting the index. The index lists in boldface type the page numbers of all terms defined in the text.

The appendixes have been updated to provide you with current references. Notice especially Appendix A, which presents the nutrient contents of well over 1000 foods; Appendix C, which presents aids to calculations in nutrition; and Appendix E which lists nutrition resources that provide materials for those interested in additional information.

As always, one of our tasks has been to present more updated information in fewer words and pages. To this end, we have removed older source notes to make room for the new, but anyone who wishes to check older sources can do so easily by consulting an older edition of this book, or by contacting our publisher, who will request them from us.

We hope that this edition of *Nutrition: Concepts and Controversies* proves useful to you in its classroom testing ground. We also hope that you enjoy using it.

Eleanor N. Whitney

Frances S. Sizer

October, 1990

■■■ Acknowledgments

We are grateful to our associates, Linda DeBruyne, Sharon Rolfes, and Lori Turner for their continued assistance in our writing. Thanks to Linda DeBruyne for Controversies 11 and 12 of this edition, and to Lori Turner for Chapter 9 of the text, much of the *Instructor's Manual*, and the special Instructor's Edition of the text. Linda Patton provided invaluable research and references throughout this edition. Our thanks, also, to Valerie West and Nancie Hopkins for their efficient word processing. We are grateful to Bob Celandar, Bill Celandar, and Gary Carroll who produced this edition's cartoons.

Our special thanks to our editors who supported us with their many efforts throughout this writing—Peter Marshall, Becky Tollerson, and Stacy Lenzen—and to their staff who supported them and who worked tirelessly to ensure the quality of this book. We thank also Jana Kicklighter for preparing the *Student*

Study Guide and the *Test Bank*; and also Margaret Hedley who prepared the Canadian portion of the Instructor's Manual. Thanks also to Bob Geltz and Betty Hands and their staff at ESHA research for creating the food composition table (Appendix A), and the computerized diet analysis program that accompanies this book. Thanks, too, to Kristen Weber for her creativity and style in design.

To May Hamilton, our continued thanks for infusing the first edition with her spirit and for her unending enthusiasm for our work. And to our reviewers, heartfelt thanks for your many good ideas.

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Nutrients, Food Choices, and Human Health



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- Food Feature* First Facts about Foods
- Controversy* Who Speaks on Nutrition

The Luncheon of the Boating Party by Pierre Auguste Renoir. The Phillips Collection, Washington D.C.

energy: the capacity to do work. The energy in food is chemical energy. It can be converted to mechanical, electrical, heat, or other forms of energy in the body. Food energy can be measured in *calories*, described later.

nutrients: components of food that help to nourish the body, that is, to provide energy, to serve as building material, or to help maintain or repair body parts. The nutrients include carbohydrate, fat, protein, vitamins, minerals, and water.

|||| If you live for 65 years or longer, you will have consumed more than 70,000 meals, and your remarkable body will have disposed of 50 tons of food. The effects on your body of the foods you choose accumulate. At 65 years of age you will see and feel those effects, if you know what to look for.

Your body renews its structures continuously, and each day it builds a little muscle, bone, skin, and blood, replacing old tissues with new. In this way some of the food you eat today becomes part of “you” tomorrow. The best food for you, then, is the kind that supports the growth and maintenance of strong muscles, sound bones, healthy skin, and sufficient blood to cleanse and to nourish all parts of your body.

Do you choose the foods that best meet your body’s needs? If you are like most people, you may choose foods you like or that are most convenient whenever you feel hungry or thirsty or when the clock says it is mealtime. This strategy does at least one thing for you: it loosens the grip of hunger or thirst on your attention, freeing you to turn to higher purposes, such as studying for examinations.

Foods, however, must provide at least two other benefits besides relief from distraction. They must provide **energy** to fuel your activities, and they must offer at least some **nutrients** too. In fact, these two constituents of foods, their energy and their nutrients, occupy center stage in the study of nutrition. They are introduced formally later in this chapter, but before focusing on them, this chapter focuses on your food choices. After all, you choose foods, not nutrients—so how do you make your choices?

Do the foods you choose provide all the nutrients you need to maintain your body’s structures? The answer is probably “sometimes.” You must be doing something right because you have been eating for years and you are still here. You may be doing better than you think. For example, you may consider a meal at a pizza place an indulgence, a tasty but forbidden treat. Of course, experts do recommend that most people cut down on fat, and pizza can deliver a great deal of fat in sausages and cheese. But overall pizza provides a nourishing meal, contributing something from each food group: bread (the crust), vegetables (the tomato sauce and toppings), milk (the cheese), and meats. If you can order it with a whole-wheat crust, light on cheese and meat, and heavy on vegetables, so much the better. And if you balance the food energy it delivers by expending energy in physical activity, so much the better still. Your muscles, heart, and lungs thrive on activity as well as on energy and nutrients.

So that pizza you thought was just a treat turns out to be more than that. But that was just by chance, and leaving nutrition to chance may not work out optimally over 65 years or more. A diet of nothing but pizza would leave some of the body’s needs unmet. A look at the health of the nation’s older people makes clear that without sound nutrition, a person’s chances for optimal health in later life are slim. The earlier you learn and begin to apply sound nutrition principles, the better your health will remain. In fact, in a 1988 report, the surgeon general remarked that only two lifestyle habits can influence your long-term health prospects more profoundly than your choice of diet. As you might expect, these two, both negative, are smoking and excessive drinking.¹ Many older people suffer from debilitating conditions that could have been largely prevented had they known and applied the nutrition and fitness principles that we know today throughout their lives.

We should hasten to say that not all of the so-called diseases of old age can be prevented by choice. The tendencies to develop heart disease, diabetes,



You may be doing better than you think.

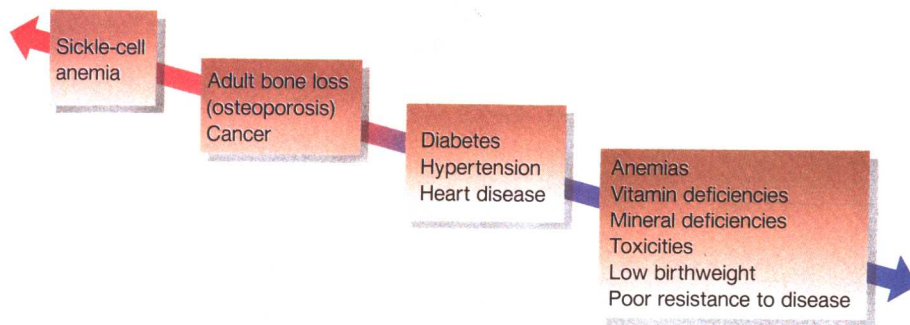
some kinds of cancer, dental disease, and others do depend somewhat on people's genetic constitutions. However, within the range set by your inheritance, the likelihood that you will develop these diseases is strongly influenced by the lifestyle choices you make—whether to smoke; to consume alcohol; to eat a nutritious, balanced diet; and to engage in regular, physical activity. Figure 1–1 shows that many different diseases are responsive to nutrition to a greater or lesser extent, and Table 1–1 (next page) lists the nutrition measures you can take to help prevent these diseases.

The study of nutrition can help you to become more conscious of these issues. A place to begin the study is to take a look at how you choose foods. Why did you eat as you did today? Perhaps some life condition, such as a disease or special requirement, dictates your food choices each day. But more likely you can point to a variety of reasons for your choices. You ate the same food as yesterday, or you ate foods you are accustomed to, or perhaps you ate whatever the crowd was eating. Among factors people cite to explain food choices are:

- Personal preference: You like them.
- Habit: They are familiar; you always eat them.
- Ethnic heritage or tradition: They are the foods of your ethnic group.
- Social pressure: They are offered; you feel you can't refuse them.
- Availability: There are no others to choose from.
- Convenience: They are quick and easy to prepare.
- Economy: They are within your means.
- Positive associations: They are eaten by people you admire, or they indicate status, or they remind you of fun.
- Emotional needs: Foods can make you feel better for awhile.
- Values or beliefs: They fit your religious tradition, square with your political views, or honor the environmental ethic.
- Nutritional value: You think they are good for you.

All but one of these reasons are behavioral and social reasons; only the last one reflects that you are conscious of nutrition's importance to your health.

Nutrition-unresponsive
(genetic) diseases



Nutrition-responsive diseases

■■■ Figure 1–1

Nutrition and Disease. Not all diseases are equally influenced by diet. Some are purely hereditary, like sickle-cell anemia. Some may be inherited (or the tendency to develop them may be inherited) but may be influenced by diet, like some forms of diabetes. Some are purely dietary, like the vitamin and mineral deficiency diseases.

■■■ Table 1-1 Nutrition Measures to Prevent Diseases

<p>Adequate intake of essential nutrients, especially protein, and food energy helps prevent:</p> <p>In pregnancy:</p> <ul style="list-style-type: none"> Low birthweight Poor resistance to disease Some forms of birth defects Some forms of mental/physical retardation <p>In infancy and childhood:</p> <ul style="list-style-type: none"> Growth deficits Poor resistance to disease <p>In adulthood and old age:</p> <ul style="list-style-type: none"> Poor resistance to infectious diseases Susceptibility to some forms of cancer <p>Moderation in food energy intake helps prevent:</p> <ul style="list-style-type: none"> Obesity and related diseases, such as diabetes and hypertension <p>Moderation in fat intake helps prevent:</p> <ul style="list-style-type: none"> Susceptibility to some cancers and atherosclerosis <p>Adequate fiber intake helps prevent:</p> <ul style="list-style-type: none"> Digestive malfunctions such as constipation and diverticulosis and possibly colon or other cancers Possibly heart disease <p>Moderation in sugar intake helps prevent:</p> <ul style="list-style-type: none"> Dental caries <p>Moderation in alcohol intake helps prevent:</p> <ul style="list-style-type: none"> Liver disease Malnutrition <p>Adequate intake of any essential nutrient prevents:</p> <ul style="list-style-type: none"> Deficiency diseases such as cretinism, scurvy, and folate-deficiency anemia <p>Moderation in intake of essential nutrients prevents:</p> <ul style="list-style-type: none"> Toxicity states <p>Adequate calcium intake helps prevent:</p> <ul style="list-style-type: none"> Adult bone loss <p>Adequate iron intake helps prevent:</p> <ul style="list-style-type: none"> Anemia <p>Adequate fluoride intake helps prevent:</p> <ul style="list-style-type: none"> Dental caries <p>Moderation in sodium intake helps prevent:</p> <ul style="list-style-type: none"> Hypertension and related diseases of the heart and kidney <p>Adequate vitamin A intake helps prevent:</p> <ul style="list-style-type: none"> Susceptibility to certain cancers
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This is not to say that your behavioral and social reasons for choosing foods are invalid or that the choices they lead you to make are bad for your health. After all, food nourishes not only the body but the mind and spirit too. For example, providing food can be a way of showing affection, such as parents feeding children or friends inviting others to share a meal. Food can be fun or