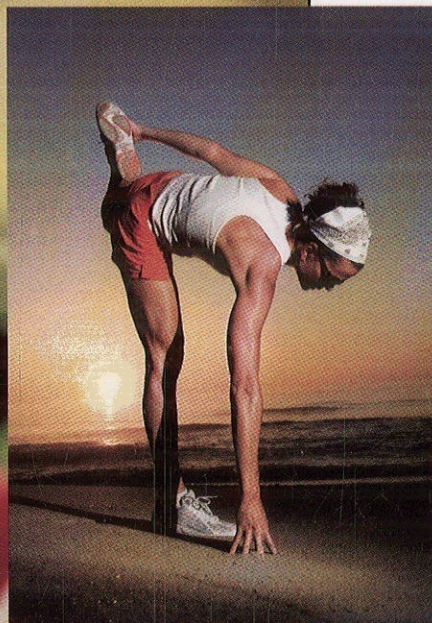


This INTERNATIONAL STUDENT EDITION is not to be sold or purchased in North America and contains content that is different from its North American version.

# Nutrition for Health, Fitness, and Sport

Ninth Edition

Melvin H. Williams



McGraw-Hill International Edition





# Brief Contents

## **CHAPTER ONE**

Introduction to Nutrition for Health, Fitness,  
and Sports Performance 1

## **CHAPTER TWO**

Healthful Nutrition for Fitness and Sport:  
The Consumer Athlete 35

## **CHAPTER THREE**

Human Energy 85

## **CHAPTER FOUR**

Carbohydrates: The Main Energy Food 117

## **CHAPTER FIVE**

Fat: An Important Energy Source during Exercise 167

## **CHAPTER SIX**

Protein: The Tissue Builder 211

## **CHAPTER SEVEN**

Vitamins: The Organic Regulators 261

## **CHAPTER EIGHT**

Minerals: The Inorganic Regulators 308

## **CHAPTER NINE**

Water, Electrolytes, and Temperature Regulation 351

## **CHAPTER TEN**

Body Weight and Composition for Health and Sport 402

## **CHAPTER ELEVEN**

Weight Maintenance and Loss through  
Proper Nutrition and Exercise 441

## **CHAPTER TWELVE**

Weight Gaining through Proper Nutrition and Exercise 498

## **CHAPTER THIRTEEN**

Food Drugs and Related Supplements 524

# Contents

Preface xiv

## CHAPTER ONE



### Introduction to Nutrition for Health, Fitness, and Sports Performance 1

#### Health-Related Fitness: Exercise and Nutrition 4

##### Exercise and Health-Related Fitness 4

- What is health-related fitness? 4
- What are the basic principles of exercise training? 5
- What is the role of exercise in health promotion? 5
- How does exercise enhance health? 6
- Do most of us exercise enough? 7
- How much physical activity is enough for health benefits? 7
- What are some general guidelines for exercising properly for someone who wants to be more physically active? 8
- Can too much exercise be harmful to my health? 10

##### Nutrition and Health-Related Fitness 11

- What is nutrition? 11
- What is the role of nutrition in health promotion? 12
- Do we eat right? 12
- What are some general guidelines for healthy eating? 13
- Am I eating right? 14
- Are there additional health benefits when both exercise and diet habits are improved? 14

##### Sports-Related Fitness: Exercise and Nutrition 15

- What is sports-related fitness? 15
- What is sports nutrition? 16
- Is sports nutrition a profession? 16
- Are athletes today receiving adequate nutrition? 17
- How does nutrition affect athletic performance? 18
- What should athletes eat to help optimize sport performance? 18

##### Ergogenic Aids and Sports

##### Performance: Beyond Training 19

- What is an ergogenic aid? 19
- Why are nutritional ergogenics so popular? 20
- Are nutritional ergogenics effective? 20
- Are nutritional ergogenics safe? 20
- Are nutritional ergogenics legal? 21

##### Nutritional Quackery in Health and Sports 21

- What is nutritional quackery? 21
- Why is nutritional quackery so prevalent in athletics? 22
- How do I recognize nutritional quackery in health and sports? 23
- Where can I get sound nutritional information to combat quackery in health and sports? 23

##### Research and Prudent Recommendations 25

- What types of research provide valid information? 25

- Why do we often hear contradictory advice about the effects of nutrition on health or physical performance? 27
- What is the basis for the dietary recommendations presented in this book? 27
- How does all this relate to me? 28

## CHAPTER TWO



### Healthful Nutrition for Fitness and Sport: The Consumer Athlete 35

#### Essential Nutrients and Recommended Nutrient Intakes 37

- What are essential nutrients? 37
- What are nonessential nutrients? 38
- How are recommended dietary intakes determined? 38

#### The Balanced Diet and Nutrient Density 40

- What is a balanced diet? 40
- What foods should I eat to obtain the nutrients I need? 40
- What is the MyPyramid Food Guide? 41
- What is the Food Exchange System? 43
- What is the key-nutrient concept for obtaining a balanced diet? 43
- What is the concept of nutrient density? 45
- Will use of MyPyramid Food Guide or the Food Exchange System guarantee me optimal nutrition? 46

#### Healthful Dietary Guidelines 47

- What is the basis underlying the development of healthful dietary guidelines? 47
- What are the recommended dietary guidelines for reducing the risk of chronic disease? 48

#### Vegetarianism 53

- What types of foods does a vegetarian eat? 53
- What are some of the nutritional concerns with a vegetarian diet? 55
- Is a vegetarian diet more healthful than a nonvegetarian diet? 56
- How can I become a vegetarian? 58
- Will a vegetarian diet affect physical performance potential? 59

#### Consumer Nutrition—Food Labels and Health Claims 60

- What nutrition information do food labels provide? 60
- How can I use this information to select a healthier diet? 60
- What health claims are allowed on food products? 62
- What are functional foods? 64

#### Consumer Nutrition—Dietary Supplements and Health 66

- What are dietary supplements? 66
- Will dietary supplements improve my health? 66
- Can dietary supplements harm my health? 67

#### Consumer Nutrition—Food Quality and Safety 68

- Is current food biotechnology effective and safe? 68
- Do pesticides in food present significant health risks? 69
- Are organic foods safer and healthier choices? 70

- Does commercial food processing affect food quality and safety? 71
- Does home food processing affect food quality and safety? 71
- What is food poisoning? 72
- Are food additives safe? 73
- Why do some people experience adverse reactions to some foods? 74

### Healthful Nutrition: Recommendations for Better Physical Performance 75

- What should I eat during training? 75
- When and what should I eat just prior to competition? 76
- What should I eat during competition? 77
- What should I eat after competition? 77
- Should athletes use commercial sports foods? 77
- How can I eat more nutritiously while traveling for competition? 78
- How do gender and age influence nutritional recommendations for enhanced physical performance? 80

## CHAPTER THREE

### Human Energy 85

#### Measures of Energy 86

- What is energy? 86
- How do we measure work, physical activity, and energy expenditure? 87
- What is the most commonly used measure of energy? 89

#### Human Energy Systems 90

- How is energy stored in the body? 90
- What are the human energy systems? 91
- What nutrients are necessary for the operation of the human energy systems? 95

#### Human Energy Metabolism during Rest 96

- What is metabolism? 96
- What factors account for the amount of energy expended during rest? 96
- What effect does eating a meal have on the metabolic rate? 96
- How can I estimate my daily resting energy expenditure (REE)? 97
- What genetic factors affect my REE? 97
- How does body composition affect my REE? 97
- What environmental factors may also influence the REE? 98
- What energy sources are used during rest? 98

#### Human Energy Metabolism during Exercise 98

- How do my muscles influence the amount of energy I can produce during exercise? 98
- What effect does muscular exercise have on the metabolic rate? 99
- How is exercise intensity measured? 100
- How is the energy expenditure of exercise metabolism expressed? 100
- How can I tell what my metabolic rate is during exercise? 101
- How can I determine the energy cost of exercise? 103
- What are the best types of activities to increase energy expenditure? 103
- Does exercise affect my resting energy expenditure (REE)? 105
- Does exercise affect the thermic effect of food (TEF)? 106
- How much energy do I need to consume daily? 106

#### Human Energy Systems and Fatigue during Exercise 108

- What energy systems are used during exercise? 108
- What energy sources are used during exercise? 109
- What is fatigue? 110

- What causes acute fatigue in athletes? 110
- How can I delay the onset of fatigue? 112
- How is nutrition related to fatigue processes? 112

## CHAPTER FOUR

### Carbohydrates: The Main Energy Food 117

#### Dietary Carbohydrates 118

- What are the different types of dietary carbohydrates? 118
- What are some common foods high in carbohydrate content? 119
- How much carbohydrate do we need in the diet? 121

#### Metabolism and Function 122

- How are dietary carbohydrates digested and absorbed and what are some implications for sports performance? 123
- What happens to the carbohydrate after it is absorbed into the body? 123
- What is the metabolic fate of blood glucose? 125
- How much total energy do we store as carbohydrate? 125
- Can the human body make carbohydrates from protein and fat? 128
- What are the major functions of carbohydrate in human nutrition? 128

#### Carbohydrates for Exercise 129

- In what types of activities does the body rely heavily on carbohydrate as an energy source? 130
- Why is carbohydrate an important energy source for exercise? 130
- What effect does endurance training have on carbohydrate metabolism? 131
- How is hypoglycemia related to the development of fatigue? 131
- How is lactic acid production related to fatigue? 133
- How is low muscle glycogen related to the development of fatigue? 134
- How are low endogenous carbohydrate levels related to the central fatigue hypothesis? 135
- Will eating carbohydrate immediately before or during an event improve physical performance? 135
- When, how much, and in what form should carbohydrates be consumed before or during exercise? 139
- What is the importance of carbohydrate replenishment after prolonged exercise? 143
- Will a high-carbohydrate diet enhance my daily exercise training? 144

#### Carbohydrate Loading 145

- What is carbohydrate, or glycogen, loading? 145
- What type of athlete would benefit from carbohydrate loading? 145
- How do you carbohydrate load? 146
- Will carbohydrate loading increase muscle glycogen concentration? 148
- How do I know if my muscles have increased their glycogen stores? 148
- Will carbohydrate loading improve exercise performance? 148
- Are there any possible detrimental effects relative to carbohydrate loading? 150

#### Carbohydrates: Ergogenic Aspects 151

- Do the metabolic by-products of carbohydrate exert an ergogenic effect? 151

#### Dietary Carbohydrates: Health Implications 153

- How do refined sugars and starches affect my health? 153
- Are artificial sweeteners safe? 154

- Why are complex carbohydrates thought to be beneficial to my health? 155
- Why should I eat foods rich in fiber? 156
- Do some carbohydrate foods cause food intolerance? 157
- Does exercise exert any beneficial health effects related to carbohydrate metabolism? 158

## CHAPTER FIVE

### Fat: An Important Energy Source during Exercise 167

#### Dietary Fats 168

- What are the different types of dietary fats? 168
- What are triglycerides? 168
- What are some common foods high in fat content? 169
- How do I calculate the percentage of fat Calories in a food? 170
- What are fat substitutes? 171
- What is cholesterol? 172
- What foods contain cholesterol? 172
- What are phospholipids? 173
- What foods contain phospholipids? 173
- How much fat and cholesterol do we need in the diet? 173

#### Metabolism and Function 175

- How does dietary fat get into the body? 175
- What happens to the lipid once it gets in the body? 175
- What are the different types of lipoproteins? 176
- Can the body make fat from protein and carbohydrate? 178
- What are the major functions of the body lipids? 178
- How much total energy is stored in the body as fat? 179

#### Fats and Exercise 180

- Are fats used as an energy source during exercise? 180
- Does gender or age influence the use of fats as an energy source during exercise? 181
- What effect does exercise training have on fat metabolism during exercise? 182

#### Fats: Ergogenic Aspects 183

- What is fat loading? 183
- Will fasting help improve my performance? 185
- Can the use of medium-chain triglycerides improve endurance performance? 185
- Is the glycerol portion of triglycerides an effective ergogenic aid? 186
- Are phospholipid dietary supplements effective ergogenic aids? 186
- Why are omega-3 fatty acids suggested to be ergogenic, and do they work? 187
- Can carnitine supplements enhance fat metabolism and physical performance? 188
- Can hydroxycitrate (HCA) enhance endurance performance? 189
- Can conjugated linoleic acid (CLA) enhance exercise performance? 190
- What's the bottom line regarding the ergogenic effects of fat-burning diets or strategies? 190

#### Dietary Fats and Cholesterol: Health Implications 191

- How does cardiovascular disease develop? 191
- How do the different forms of serum lipids affect the development of atherosclerosis? 192

- Can I reduce my serum lipid levels and possibly reverse atherosclerosis? 194
- What should I eat to modify my serum lipid profile favorably? 195
- Can exercise training also elicit favorable changes in the serum lipid profile? 202

## CHAPTER SIX

### Protein: The Tissue Builder 211

#### Dietary Protein 212

- What is protein? 212
- Is there a difference between animal and plant protein? 213
- What are some common foods that are good sources of protein? 214
- How much dietary protein do I need? 214
- How much of the essential amino acids do I need? 216
- What are some dietary guidelines to ensure adequate protein intake? 216

#### Metabolism and Function 217

- What happens to protein in the human body? 217
- Can protein be formed from carbohydrates and fats? 218
- What are the major functions of protein in human nutrition? 219

#### Proteins and Exercise 220

- Are proteins used for energy during exercise? 220
- Does exercise increase protein losses in other ways? 221
- What happens to protein metabolism during recovery after exercise? 222
- What effect does exercise training have upon protein metabolism? 222
- Do individuals in strenuous physical training, including the developing adolescent athlete, need more protein in the diet? 223
- What are some general recommendations relative to dietary protein intake for athletes? 224

#### Protein: Ergogenic Aspects 228

- What types of special protein supplements are marketed to physically active individuals? 228
- Do high-protein diets or protein supplements increase muscle mass and strength in resistance-trained individuals? 229
- Do high-protein diets or protein supplements improve aerobic endurance performance in endurance-trained individuals? 230
- Are amino acid, amine, and related nitrogen-containing supplements effective ergogenic aids? 232

#### Dietary Protein: Health Implications 249

- Does a deficiency of dietary protein pose any health risks? 249
- Does excessive protein intake pose any health risks? 250
- Does the consumption of individual amino acids pose any health risks? 252

## CHAPTER SEVEN

### Vitamins: The Organic Regulators 261

#### Basic Facts 262

- What are vitamins and how do they work? 262
- What vitamins are essential to human nutrition? 264
- In general, how do deficiencies or excesses of vitamins influence health or physical performance? 264

## Fat-Soluble Vitamins 265

- Vitamin A (retinol) 265
- Vitamin D (cholecalciferol) 268
- Vitamin E (alpha-tocopherol) 271
- Vitamin K (menadione) 273

## Water-Soluble Vitamins 274

- Thiamin (vitamin B<sub>1</sub>) 274
- Riboflavin (vitamin B<sub>2</sub>) 276
- Niacin 276
- Vitamin B<sub>6</sub> (pyridoxine) 277
- Vitamin B<sub>12</sub> (cobalamin) 278
- Folate (folic acid) 279
- Pantothenic acid 281
- Biotin 281
- Choline 282
- Vitamin B complex 283
- Vitamin C (ascorbic acid) 283

## Vitamin Supplements: Ergogenic Aspects 286

- Should physically active individuals take vitamin supplements? 286
- Can the antioxidant vitamins prevent fatigue or muscle damage during training? 286
- How effective are the special vitamin supplements marketed for athletes? 288
- What's the bottom line regarding vitamin supplements for athletes? 290

## Vitamin Supplements: Health Aspects 290

- Can I obtain the vitamins I need through my diet? 291
- Why are vitamin supplements often recommended? 291
- Why do individuals take vitamin megadoses? 293
- Do foods rich in vitamins, particularly antioxidant vitamins, help deter chronic disease? 293
- Do vitamin supplements help deter disease? 294
- How much of a vitamin supplement is too much? 297
- If I want to take a vitamin-mineral supplement, what are some prudent guidelines? 297

## CHAPTER EIGHT

# Minerals: The Inorganic Regulators 308

## Basic Facts 309

- What are minerals, and what is their importance to humans? 309
- What minerals are essential to human nutrition? 310
- In general, how do deficiencies or excesses of minerals influence health or physical performance? 310

## Macrominerals 312

- Calcium (Ca) 312
- Phosphorus (P) 321
- Magnesium (Mg) 323

## Trace Minerals 325

- Iron (Fe) 325
- Copper (Cu) 332
- Zinc (Zn) 333
- Chromium (Cr) 334
- Selenium (Se) 337
- Boron (B) 338

Vanadium (V) 339

Other trace minerals 340

## Mineral Supplements: Exercise and Health 341

- Does exercise increase my need for minerals? 341
- Can I obtain the minerals I need through my diet? 341
- Are mineral megadoses or some nonessential minerals harmful? 342
- Should physically active individuals take mineral supplements? 343

## CHAPTER NINE

# Water, Electrolytes, and Temperature Regulation 351

## Water 352

- How much water do you need per day? 352
- What else is in the water we drink? 353
- Where is water stored in the body? 353
- How is body water regulated? 355
- How do I know if I am adequately hydrated? 356
- What are the major functions of water in the body? 356
- Can drinking more water or fluids confer any health benefits? 356

## Electrolytes 358

- What is an electrolyte? 358
- Sodium (Na) 358
- Chloride (Cl) 359
- Potassium (K) 360

## Regulation of Body Temperature 361

- What is the normal body temperature? 361
- What are the major factors that influence body temperature? 362
- How does the body regulate its own temperature? 362
- What environmental conditions may predispose an athletic individual to hyperthermia? 363
- How does exercise affect body temperature? 364
- How is body heat dissipated during exercise? 365

## Exercise Performance in the Heat: Effect of Environmental Temperature and Fluid and Electrolyte Losses 365

- How does environmental heat affect physical performance? 366
- How do dehydration and hypohydration affect physical performance? 366
- How fast may an individual dehydrate while exercising? 368
- How can I determine my sweat rate? 368
- What is the composition of sweat? 369
- Is excessive sweating likely to create an electrolyte deficiency? 369

## Exercise in the Heat: Fluid, Carbohydrate, and Electrolyte Replacement 370

- Which is most important to replace during exercise in the heat—water, carbohydrate, or electrolytes? 370
- What are some sound guidelines for maintaining water (fluid) balance during exercise? 370
- What factors influence gastric emptying and intestinal absorption? 372
- How should carbohydrate be replaced during exercise in the heat? 373
- How should electrolytes be replaced during or following exercise? 375
- What is hyponatremia and what causes it during exercise? 375
- Are salt tablets or potassium supplements necessary? 376
- What are some prudent guidelines relative to fluid replacement while exercising under warm or hot environmental conditions? 377

## Ergogenic Aspects 380

- Does oxygen water enhance exercise performance? 381
- Do pre-cooling techniques help reduce body temperature and enhance performance during exercise in the heat? 381
- Does sodium loading enhance endurance performance? 381
- Does glycerol supplementation enhance endurance performance during exercise under warm environmental conditions? 382

## Health Aspects: Heat Illness 384

- Should I exercise in the heat? 384
- What are the potential health hazards of excessive heat stress imposed on the body? 384
- What are the symptoms and treatment of heat injuries? 386
- Do some individuals have problems tolerating exercise in the heat? 388
- How can I reduce the hazards associated with exercise in a hot environment? 389
- How can I become acclimatized to exercise in the heat? 389

## Health Aspects: High Blood Pressure 390

- What is high blood pressure, or hypertension? 390
- How is high blood pressure treated? 392
- What dietary modifications may help reduce or prevent hypertension? 392
- Can exercise help prevent or treat hypertension? 395

## CHAPTER TEN



## Body Weight and Composition for Health and Sport 402

### Body Weight and Composition 404

- What is the ideal body weight? 404
- What are the values and limitations of the BMI? 404
- What is the composition of the body? 404
- What techniques are available to measure body composition and how accurate are they? 406
- What problems may be associated with rigid adherence to body fat percentages in sport? 409
- How much should I weigh or how much body fat should I have? 410

### Regulation of Body Weight and Composition 411

- How does the human body normally control its own weight? 411
- How is fat deposited in the body? 414
- What is the cause of obesity? 415
- Can the set point change? 418
- Why is prevention of childhood obesity so important? 419

### Weight Gain, Obesity, and Health 420

- What health problems are associated with overweight and obesity? 420
- How does the location of fat in the body affect health? 421
- Does being obese increase health risks in youth? 423
- Does losing excess body fat reduce health risks and improve health status? 423
- Does being physically fit negate the adverse health effects associated with being overweight? 424

### Excessive Weight Loss and Health 425

- What health problems are associated with improper weight-loss programs and practices? 425

- What are the major eating disorders? 428
- What eating problems are associated with sports? 429

## Body Composition and Physical Performance 432

- What effect does excess body weight have on physical performance? 432
- Does excessive weight loss impair physical performance? 433

## CHAPTER ELEVEN



## Weight Maintenance and Loss through Proper Nutrition and Exercise 441

### Basics of Weight Control 443

- How many Calories are in a pound of body fat? 443
- Is the caloric concept of weight control valid? 443
- How many Calories do I need per day to maintain my body weight? 444
- How much weight can I lose safely per week? 447
- How can I determine the amount of body weight I need to lose? 447

### Behavior Modification 448

- What is behavior modification? 448
- How do I apply behavior-modification techniques in my weight-control program? 449

### Dietary Modifications 452

- How can I determine the number of Calories needed in a diet to lose weight? 452
- How can I predict my body-weight loss through dieting alone? 453
- Why does a person usually lose the most weight during the first week on a reducing diet? 453
- Why does it become more difficult to lose weight after several weeks or months on a diet program? 454
- What are the major characteristics of a sound diet for weight control? 454
- Is it a good idea to count Calories when attempting to lose body weight? 457
- What is the Food Exchange System? 458
- How can I determine the number of Calories I eat daily? 458
- What are some general guidelines I can use in the selection and preparation of foods to promote weight loss or maintain a healthy body weight? 461
- How can I plan a nutritionally balanced, low-Calorie diet? 466
- Are very-low-Calorie diets effective and desirable as a means to lose body weight? 468
- Is it harmful to overeat occasionally? 469

### Exercise Programs 469

- What role does exercise play in weight reduction and weight maintenance? 469
- Does exercise affect the appetite? 472
- Does exercise affect the set point? 473
- What types of exercise programs are most effective for losing body fat? 473
- If I am inactive now, should I see a physician before I initiate an exercise program? 475
- What other precautions would be advisable before I start an exercise program? 476
- What is the general design of exercise programs for weight reduction? 476

- What is the stimulus period of exercise? 477
- What is an appropriate level of exercise intensity? 478
- How can I determine the exercise intensity needed to achieve my target HR range? 480
- How can I design my own exercise program? 481
- How much exercise is needed to lose weight? 484
- From what parts of the body does the weight loss occur during an exercise weight-reduction program? 485
- Should I do low-intensity exercises to burn more fat? 485
- Is spot reducing effective? 486
- Is it possible to exercise and still not lose body weight? 486
- What about the five or six pounds a person may lose during an hour of exercise? 487

### **Comprehensive Weight-Control Programs 488**

- Which is more effective for weight control—dieting or exercise? 488
- If I want to lose weight through a national or local weight-loss program, what should I look for? 489
- What type of weight-reduction program is advisable for young athletes? 490
- What is the importance of prevention in a weight-control program? 490

## **CHAPTER TWELVE**



### **Weight Gaining through Proper Nutrition and Exercise 498**

#### **Basic Considerations 500**

- Why are some individuals underweight? 500
- What steps should I take if I want to gain weight? 500

#### **Nutritional Considerations 501**

- How many Calories are needed to form one pound of muscle? 501
- How can I determine the amount of Calories I need daily to gain one pound per week? 501
- Is protein supplementation necessary during a weight-gaining program? 501
- Are dietary supplements necessary during a weight-gaining program? 502
- What is an example of a balanced diet that will help me gain weight? 503
- Would such a high-Calorie diet be ill advised for some individuals? 505

#### **Exercise Considerations 505**

- What are the primary purposes of resistance training? 505
- What are the basic principles of resistance training? 506
- What is an example of a resistance-training program that may help me to gain body weight as lean muscle mass? 508
- Are there any safety concerns associated with resistance training? 510
- How does the body gain weight with a resistance-training program? 515
- Is any one type of resistance-training program or equipment more effective than others for gaining body weight? 516
- If exercise burns Calories, won't I lose weight on a resistance-training program? 517
- Are there any contraindications to resistance training? 518
- Are there any health benefits associated with resistance training? 518
- Can I combine aerobic and resistance-training exercises into one program? 519

## **CHAPTER THIRTEEN**



### **Food Drugs and Related Supplements 524**

#### **Alcohol: Ergogenic Effects and Health Implications 526**

- What is the alcohol and nutrient content of typical alcoholic beverages? 526
- What is the metabolic fate of alcohol in the body? 526
- Is alcohol an effective ergogenic aid? 527
- What effect can drinking alcohol have upon my health? 529

#### **Caffeine: Ergogenic Effects and Health Implications 533**

- What is caffeine and in what food products is it found? 533
- What effects does caffeine have on the body that may benefit exercise performance? 534
- Does caffeine enhance exercise performance? 534
- Does drinking coffee, tea, or other caffeinated beverages provide any health benefits or pose any significant health risks? 539

#### **Ephedra (ephedrine): Ergogenic Effects and Health Implications 542**

- What is ephedra (ephedrine)? 542
- Does ephedrine enhance exercise performance? 542
- Do dietary supplements containing ephedra pose any health risks? 543

#### **Sodium Bicarbonate: Ergogenic Effects, Safety, and Legality 544**

- What is sodium bicarbonate? 544
- Does sodium bicarbonate, or soda loading, enhance physical performance? 544
- Is sodium bicarbonate supplementation safe and legal? 547

#### **Anabolic Hormones and Dietary Supplements: Ergogenic Effects and Health Implications 547**

- Is human growth hormone (HGH) an effective, safe, and legal ergogenic aid? 547
- Are testosterone and anabolic/androgenic steroids (AAS) effective, safe, and legal ergogenic aids? 548
- Are anabolic prohormone dietary supplements effective, safe, and legal ergogenic aids? 550

#### **Ginseng, Herbals, and Exercise and Sports Performance 551**

- Do ginseng or ciwujia enhance exercise or sport performance? 552
- What herbals are effective ergogenic aids? 553

#### **Sports Supplements: Efficacy, Safety, and Permissibility 554**

- What sports supplements are considered to be effective, safe, and permissible? 554

#### **APPENDIX A Units of Measurement: English System—Metric System Equivalents 564**

#### **APPENDIX B Approximate Caloric Expenditure per Minute for Various Physical Activities 566**

#### **APPENDIX C Self-Test on Drinking Habits and Alcoholism 572**

#### **APPENDIX D Determination of Healthy Body Weight 574**

#### **APPENDIX E Exchange Lists for Meal Planning 579**



**APPENDIX F** Calories, Percent Fat, Sodium, and Dietary Fiber Cholesterol in Selected Fast-Food Restaurant Products 590

**APPENDIX G** Energy Pathways of Carbohydrate, Fat, and Protein 592

**APPENDIX H** Small Steps: 120 Small Steps to a Healthier Diet and Increased Physical Activity 596

**APPENDIX I** Sample Menu for a 2,000-Calorie Food Pattern 598

**APPENDIX J** MyPyramid for Kids 601

Glossary 602

Credits 618

Index 619