

CONTENTS

Preface xvii

CHAPTER 1

Overview of Nutrition and Health 1

Food Choices 3

The Nutrients 6

Six Classes of Nutrients 6

kCalories: A Measure of Energy 6

Nutrient Recommendations 8

Dietary Reference Intakes 8

Acceptable Macronutrient Distribution Ranges (AMDR) 9

National Nutrition Surveys 10

Coordinating Nutrition Survey Data 10

National Health Goals 10

Dietary Guidelines and Food Guides 12

Dietary Ideals 12

Dietary Guidelines for Americans 13

Fitness Guidelines 15

The USDA Food Guide 17

MyPyramid 23

Food Labels 24

The Ingredient List 24

Nutrition Facts Panel 25

Claims on Labels 26

NUTRITION IN PRACTICE Finding the Truth about Nutrition 33

CHAPTER 2

Digestion and Absorption 37

Anatomy of the Digestive Tract 38

The Digestive Organs 38

The Involuntary Muscles and the Glands 39

The Process of Digestion 44

Digestion in the Mouth 44

Digestion in the Stomach 44

Digestion in the Small and Large Intestines 45

The Absorptive System 46

The Small Intestine 46

Absorption of Nutrients 48

Transport of Nutrients 48

The Vascular System 48

The Lymphatic System 49

Transport of Lipids: Lipoproteins 50

The System at Its Best 52

NUTRITION IN PRACTICE Food Safety 54

CHAPTER 3

Carbohydrates 63

The Chemist's View of Carbohydrates 64

Monosaccharides 64

Disaccharides 65

Polysaccharides 65

Health Effects of Sugars and Alternative Sweeteners 67

Sugars 68

Alternative Sweeteners: Sugar Alcohols 72

Alternative Sweeteners: Artificial Sweeteners 72

Health Effects of Starch and Dietary Fibers 77

Carbohydrates: Disease Prevention and Recommendations 77

Carbohydrates: Food Sources 80

Carbohydrates: Food Labels and Health Claims 82

NUTRITION IN PRACTICE The Glycemic Index in Nutrition Practice 86

CHAPTER 4

Lipids 91

Roles of Body Fat 92

The Chemist's View of Lipids 93

Triglycerides 93

Fatty Acids 94

Phospholipids 96

Sterols 97

Health Effects and Recommended Intakes of Fats 98

Fats and Heart Health 98

Recommendations 101

Fats in Foods 102

Finding the Fats in Foods 102

Cutting Fat Intake and Choosing Unsaturated Fats 104

NUTRITION IN PRACTICE Figuring Out Fats 111

CHAPTER 5

Protein 119

The Chemist's View of Proteins 120

The Structure of Proteins 120

Essential Amino Acids 121

Protein Turnover and Nitrogen Balance 122

Protein Turnover 122

Nitrogen Balance 122

Roles of Body Proteins 122

As Structural Components 123

As Enzymes 123

- As Transporters 124
- As Regulators of Fluid and Electrolyte Balance 124
- As Regulators of Acid-Base Balance 124
- As Antibodies 124
- As Hormones 125
- As a Source of Energy and Glucose 125
- Protein and Health 126
 - Protein-Energy Malnutrition 126
 - Protein Excess 129
 - Protein and Amino Acid Supplements 130
 - Protein Recommendations and Intakes 131
- Protein in Foods 131
 - Protein Quality 131
 - Protein Sparing 133
 - Protein on Food Labels 133
- NUTRITION IN PRACTICE Vegetarian Diets 136

CHAPTER 6

Energy Balance and Body Composition 141

- The Body's Energy Budget 142
 - The Economics of Feasting 142
 - The Economics of Fasting 143
- Energy Balance 145
 - Energy In 145
 - Energy Out 146
 - Estimating Energy Requirements 147
- Body Weight and Body Composition 150
 - Defining Healthy Body Weight 150
 - Body Composition 152
 - How Much Body Fat Is Too Much? 154
- Risks of Overweight and Obesity 155
 - Health Risks of Obesity 155
 - National Guidelines for Identifying Those at Risk from Obesity 156
 - Other Risks of Obesity 157
- NUTRITION IN PRACTICE Fad Diets 161

CHAPTER 7

Weight Management: Overweight and Underweight 167

- Causes of Obesity 168
 - Genetics and Weight 168
 - Environmental Stimuli 170
- Obesity Treatment: Who Should Lose? 172
- Inappropriate Obesity Treatments 173
 - Over-the-Counter Weight-Loss Supplements and Drugs 173
 - Herbal Products and Dietary Supplements 173
 - Other Gimmicks 175

- Aggressive Treatments of Obesity 175
 - Obesity Drugs 175
 - Surgery 176
- Reasonable Strategies for Weight Loss 176
 - A Healthful Eating Plan 177
 - Physical Activity 180
 - Behavior and Attitude 182
- Underweight 186
- Strategies for Weight Gain 186
 - Physical Activity to Build Muscles 186
 - Energy-Dense Foods 186
 - Three Meals Daily 187
 - Large Portions 187
 - Extra Snacks 187
 - Juice and Milk 187
- NUTRITION IN PRACTICE Eating Disorders 192

CHAPTER 8

The Vitamins 200

- The Vitamins—An Overview 201
 - Bioavailability 201
 - Precursors 201
 - Organic Nature 202
 - Solubility 202
- The Fat-Soluble Vitamins 202
 - Vitamin A and Beta-Carotene 203
 - Vitamin D 207
 - Vitamin E 210
 - Vitamin K 211
- The Water-Soluble Vitamins 214
 - The B Vitamins 214
 - Thiamin 215
 - Riboflavin 216
 - Niacin 216
 - Pantothenic Acid and Biotin 217
 - Vitamin B₆ 217
 - Folate 218
 - Vitamin B₁₂ 219
 - Non-B Vitamins 221
 - Vitamin C 221

- NUTRITION IN PRACTICE Phytochemicals and Functional Foods 229

CHAPTER 9

Water and the Minerals 237

- Water and Body Fluids 238
 - Water Balance 238
 - Fluid and Electrolyte Balance 241
 - Acid-Base Balance 242

The Major Minerals 242

- Sodium 243
- Chloride 244
- Potassium 245
- Calcium 246
- Phosphorus 250
- Magnesium 251
- Sulfate 252

The Trace Minerals 252

- Iron 252
- Zinc 257
- Selenium 259
- Iodine 260
- Copper 260
- Manganese 261
- Fluoride 261
- Chromium 262
- Other Trace Minerals 262

NUTRITION IN PRACTICE Vitamin and Mineral Supplements 267

CHAPTER 10

Nutrition through the Life Span: Pregnancy and Infancy 271

Pregnancy: The Impact of Nutrition on the Future 272

- Nutrition Prior to Pregnancy 272
- Prepregnancy Weight 272
- Healthy Support Tissues 273
- The Events of Pregnancy 274
- Nutrient Needs during Pregnancy 276
- Food Assistance Programs 282
- Weight Gain 283
- Weight Loss after Pregnancy 284
- Physical Activity 285
- Common Nutrition-Related Concerns of Pregnancy 286
- Problems in Pregnancy 287
- Practices to Avoid 288
- Adolescent Pregnancy 291

Breastfeeding 292

- Nutrition during Lactation 292
- Contraindications to Breastfeeding 293

Nutrition of the Infant 295

- Nutrient Needs during Infancy 295
- Breast Milk 297
- Infant Formula 300
- The Transition to Cow's Milk 302
- Introducing First Foods 302
- Looking Ahead 304
- Mealtimes 304

NUTRITION IN PRACTICE Encouraging Successful

Breastfeeding 312

CHAPTER 11

Nutrition through the Life Span: Childhood and Adolescence 316

Nutrition during Childhood 317

- Energy and Nutrient Needs 317
- Hunger and Malnutrition in Children 321
- Lead Poisoning in Children 322
- Food Allergy 325
- Hyperactivity 326
- Childhood Obesity 327
- Mealtimes at Home 332
- Nutrition at School 336

Nutrition during Adolescence 338

- Growth and Development during Adolescence 339
- Energy and Nutrient Needs 339
- Food Choices and Health Habits 340

NUTRITION IN PRACTICE Childhood Obesity and the Early Development of Chronic Diseases 347

CHAPTER 12

Nutrition through the Life Span: Later Adulthood 353

Nutrition and Longevity 354

- Slowing the Aging Process 355
- Nutrition and Disease Prevention 357

Nutrition-Related Concerns during Late Adulthood 358

- Cataracts and Macular Degeneration 358
- Arthritis 358
- The Aging Brain 359

Energy and Nutrient Needs during Late Adulthood 361

- Energy and Energy Nutrients 361
- Water 363
- Vitamins and Minerals 363
- Nutrient Supplements for Older Adults 364
- The Effects of Drugs on Nutrients 365

Food Choices and Eating Habits of Older Adults 366

- Individual Preferences 367
- Meal Setting 367
- Depression 367
- Food Assistance Programs 367
- Meals for Singles 368

NUTRITION IN PRACTICE Hunger and Community Nutrition 375

CHAPTER 13

Nutrition Care and Assessment 381

Nutrition in Health Care 382

- How Illness Affects Nutrition Status 382
- Responsibility for Nutrition Care 383
- Identifying Risk for Malnutrition 384
- The Nutrition Care Process 385

- Nutrition Assessment 387
 - Historical Information 387
 - Dietary Assessment Methods 388
 - Anthropometric Data 391
 - Biochemical Analyses 394
 - Physical Examinations 397

NUTRITION IN PRACTICE Nutritional Genomics 402

CHAPTER 14

Nutrition Intervention and Diet-Drug Interactions 406

- Implementing Nutrition Care 407
 - Care Planning 407
 - Approaches To Nutrition Care 409
- Dietary Modifications 410
 - Determining Energy Requirements 410
 - Modified Diets 411
 - Variations in the Diet Order 415
 - Improving Food Intake 416
- Foodservice 417
 - Food Selection 417
 - Food Safety 418
- Diet-Drug Interactions 419
 - Drug Effects on Food Intake 419
 - Drug Effects on Nutrient Absorption 419
 - Dietary Effects on Drug Absorption 421
 - Drug Effects on Nutrient Metabolism 421
 - Dietary Effects on Drug Metabolism 422
 - Drug Effects on Nutrient Excretion 422
 - Dietary Effects on Drug Excretion 422
 - Diet-Drug Interactions and Toxicity 423

NUTRITION IN PRACTICE Complementary and Alternative Therapies 427

CHAPTER 15

Enteral and Parenteral Nutrition Support 435

- Enteral Nutrition Support 436
 - Enteral Formulas 436
 - Enteral Nutrition in Clinical Care 439
 - Administration of Tube Feedings 443
 - Medication Delivery through Feeding Tubes 446
 - Tube Feeding Complications 447
 - Transition to Table Foods 447
- Parenteral Nutrition Support 450
 - Candidates for Parenteral Nutrition 450
 - Venous Access 450
 - Parenteral Solutions 451
 - Administering Parenteral Nutrition 454
 - Managing Metabolic Complications 456

- Nutrition Support at Home 457
 - Candidates for Home Nutrition Support 458
 - Planning Home Nutrition Care 458
 - Quality-of-Life Issues 459

NUTRITION IN PRACTICE Inborn Errors of Metabolism 464

CHAPTER 16

Nutrition in Metabolic and Respiratory Stress 468

- The Body's Responses to Stress and Injury 469
 - Hormonal Responses to Stress 470
 - The Inflammatory Response 471
- Nutrition Treatment of Acute Stress 472
 - Determining Nutritional Requirements 473
 - Approaches to Nutrition Care in Acute Stress 475
- Nutrition and Respiratory Stress 476
 - Chronic Obstructive Pulmonary Disease 476
 - Respiratory Failure 480

NUTRITION IN PRACTICE Multiple Organ Dysfunction Syndrome 485

CHAPTER 17

Nutrition and Upper Gastrointestinal Disorders 488

- Conditions Affecting the Mouth and Esophagus 489
 - Dry Mouth 489
 - Dysphagia 489
 - Gastroesophageal Reflux Disease 493
- Conditions Affecting the Stomach 496
 - Dyspepsia 496
 - Nausea and Vomiting 496
 - Gastritis 497
 - Peptic Ulcer Disease 497
- Gastric Surgery 499
 - Gastroectomy 500
 - Bariatric Surgery 503

NUTRITION IN PRACTICE Nutrition and Oral Health 509

CHAPTER 18

Nutrition and Lower Gastrointestinal Disorders 513

- Common Intestinal Problems 514
 - Constipation 514
 - Intestinal Gas 515
 - Diarrhea 516
- Malabsorption 518
 - Fat Malabsorption 518
 - Bacterial Overgrowth 519
 - Lactose Intolerance 522

- Conditions Affecting the Pancreas 522
 - Pancreatitis* 523
 - Cystic Fibrosis* 524
- Conditions Affecting the Small Intestine 525
 - Celiac Disease* 525
 - Inflammatory Bowel Diseases* 527
 - Short Bowel Syndrome* 531
- Conditions Affecting the Large Intestine 533
 - Irritable Bowel Syndrome* 533
 - Diverticular Disease of the Colon* 534
 - Colostomies and Ileostomies* 535
- NUTRITION IN PRACTICE Probiotics and Intestinal Health 541

CHAPTER 19

Nutrition and Liver Diseases 544

- Fatty Liver and Hepatitis 545
 - Fatty Liver* 545
 - Hepatitis* 545
- Cirrhosis 547
 - Consequences of Cirrhosis* 548
 - Treatment of Cirrhosis* 551
 - Medical Nutrition Therapy for Cirrhosis* 551
- Liver Transplantation 555
 - Nutrition Status of Transplant Patients* 555
 - Posttransplantation Concerns* 555
- NUTRITION IN PRACTICE Alcohol in Health and Disease 559

CHAPTER 20

Nutrition and Diabetes Mellitus 562

- Overview of Diabetes Mellitus 563
 - Symptoms of Diabetes Mellitus* 563
 - Diagnosis of Diabetes Mellitus* 564
 - Types of Diabetes Mellitus* 564
 - Prevention of Type 2 Diabetes Mellitus* 566
 - Acute Complications of Diabetes Mellitus* 566
 - Chronic Complications of Diabetes Mellitus* 568
- Treatment of Diabetes Mellitus 569
 - Treatment Goals* 569
 - Evaluating Diabetes Treatment* 570
 - Body Weight Concerns* 571
 - Medical Nutrition Therapy: Nutrient Recommendations* 571
 - Medical Nutrition Therapy: Meal-Planning Strategies* 573
 - Insulin Therapy* 576
 - Antidiabetic Drugs* 578
 - Physical Activity and Diabetes Management* 579
 - Sick-Day Management* 580
- Diabetes Management in Pregnancy 582
 - Pregnancy in Type 1 or Type 2 Diabetes* 582
 - Gestational Diabetes* 582
- NUTRITION IN PRACTICE Metabolic Syndrome 587

CHAPTER 21

Nutrition and Disorders of the Heart and Blood Vessels 591

- Atherosclerosis 592
 - Consequences of Atherosclerosis* 593
 - Causes of Atherosclerosis* 593
 - Coronary Heart Disease 595
 - Symptoms of Coronary Heart Disease* 595
 - Evaluating Risk for Coronary Heart Disease* 595
 - Therapeutic Lifestyle Changes for Lowering CHD Risk* 596
 - Lifestyle Changes for Hypertriglyceridemia* 600
 - Vitamin Supplementation and CHD Risk* 602
 - Drug Therapies for CHD Prevention* 603
 - Treatment of Heart Attack* 604
 - Hypertension 604
 - Factors That Influence Blood Pressure* 605
 - Factors That Contribute to Hypertension* 606
 - Treatment of Hypertension* 606
 - Heart Failure 610
 - Consequences of Heart Failure* 610
 - Medical Management of Heart Failure* 611
 - Stroke 612
 - Stroke Prevention* 612
 - Stroke Management* 612
 - NUTRITION IN PRACTICE Helping People with Feeding Disabilities 617
- ## CHAPTER 22
- ### Nutrition and Renal Diseases 621
- The Nephrotic Syndrome 623
 - Consequences of the Nephrotic Syndrome* 623
 - Treatment of the Nephrotic Syndrome* 623
 - Acute Kidney Injury 626
 - Causes of Acute Kidney Injury* 626
 - Consequences of Acute Kidney Injury* 626
 - Treatment of Acute Kidney Injury* 627
 - Chronic Kidney Disease 629
 - Consequences of Chronic Kidney Disease* 629
 - Treatment of Chronic Kidney Disease* 631
 - Kidney Transplants* 635
 - Kidney Stones 638
 - Formation of Kidney Stones* 638
 - Consequences of Kidney Stones* 639
 - Prevention and Treatment of Kidney Stones* 640
 - NUTRITION IN PRACTICE Dialysis 644

CHAPTER 23

Nutrition, Cancer, and HIV Infection 648

Cancer 649

How Cancer Develops 649

Nutrition and Cancer Risk 650

Consequences of Cancer 652

Treatments for Cancer 654

Medical Nutrition Therapy for Cancer 656

HIV Infection 660

Consequences of HIV Infection 660

Treatments for HIV Infection 662

Medical Nutrition Therapy for HIV Infection 664

NUTRITION IN PRACTICE Ethical Issues in Nutrition Care 670

APPENDIX A Table of Food Composition A-3

APPENDIX B WHO: Nutrition Recommendations

Canada: Guidelines and Meal Planning B

Nutrition Recommendations from WHO B

Eating Well with Canada's Food Guide B

Beyond the Basics: Meal Planning for Healthy Eating,

Diabetes Prevention and Management B-7

APPENDIX C Exchange Lists for Diabetes C-1

The Exchange System C-1

Serving Sizes C-1

The Foods on the Lists C-1

Controlling Energy, Fat, and Sodium C-2

Planning a Healthy Diet C-3

APPENDIX D Physical Activity and Energy Requirements D-1

Calculating Your Physical Activity Level D-1

Guesstimating Your Physical Activity Level D-1

Using a Shortcut to Estimate Total Energy Expenditure D-1

APPENDIX E Nutrition Assessment: Supplemental Information E-1

Weight Gain during Pregnancy E-1

Growth Charts E-1

Measures of Body Fat and Lean Tissue E-2

Nutritional Anemias E-9

Cautions about Nutrition Assessment E-12

APPENDIX F Aids to Calculation F-1

Conversion Factors F-1

Percentages F-1

Weights and Measures F-2

APPENDIX G Enteral Formulas G

APPENDIX H Answers to Self Check Questions H

GLOSSARY GL-1

INDEX I

CASE STUDIES

CHAPTER 10

Woman in Her First Pregnancy 300

CHAPTER 11

Boy with Disruptive Behavior 327

CHAPTER 12

Elderly Man with a Poor Diet 367

CHAPTER 13

Nutrition Screening and Assessment 399

CHAPTER 14

Implementing Nutrition Care 410

CHAPTER 15

Injured Hiker Requiring Enteral Nutrition Support 449

Man Requiring Parenteral Nutrition 457

CHAPTER 16

Patient with a Severe Burn 476

Elderly Man with Emphysema 480

CHAPTER 17

Woman with GERD 495

Nutrition Care for Patient after Gastric Surgery 502

CHAPTER 18

Patient with Short Bowel Syndrome 532

Patient with Irritable Bowel Syndrome 534

CHAPTER 19

Patient with Cirrhosis 554

CHAPTER 20

Child with Type 1 Diabetes 581

Woman with Type 2 Diabetes 583

CHAPTER 21

Patient with Cardiovascular Disease 609

CHAPTER 22

- Woman with Acute Kidney Injury 628
- Man with Chronic Kidney Disease 636

CHAPTER 23

- Woman with Cancer 659
- Patient with HIV Infection 665

HOW TO FEATURES

CHAPTER 1

- Calculate the Energy a Food Provides 7

CHAPTER 4

- Make Heart-Healthy Choices—by Food Group 106

CHAPTER 6

- Estimate Energy Requirements 150

CHAPTER 7

- Apply Behavior Modification to Manage Body Fatness 184

CHAPTER 8

- Estimate Dietary Folate Equivalents 219

CHAPTER 9

- Cut Salt Intake 245
- Add Calcium to Daily Meals 250
- Add Iron to Daily Meals 258

CHAPTER 11

- Protect against Lead Toxicity 324

CHAPTER 12

- Turn Convenience Foods into Nutritious Meals 370
- Plan Healthy, Thrifty Meals 378

CHAPTER 13

- Measure Length and Height 391
- Measure Weight 392
- Estimate and Evaluate %IBW and %UBW 394

CHAPTER 14

- Estimate the Energy Requirements of a Hospital Patient 411
- Help Hospital Patients Improve Their Food Intakes 416
- Prevent Diet-Drug Interactions 424

CHAPTER 15

- Help Patients Accept Oral Formulas 439
- Help Patients Cope with Tube Feedings 444
- Plan a Tube Feeding Schedule 445
- Administer Medications to Patients Receiving Tube Feedings 447
- Express the Osmolar Concentration of a Solution 450
- Calculate the Macronutrient and Energy Content of a Parenteral Solution 454

CHAPTER 17

- Improve Acceptance of Mechanically Altered Foods 491
- Manage Gastroesophageal Reflux Disease 495
- Alter the Diet to Reduce Symptoms of Dumping Syndrome 502
- Alter Dietary Habits to Achieve and Maintain Weight Loss after Bariatric Surgery 505

CHAPTER 18

- Follow a Fat-Controlled Diet 521

CHAPTER 19

- Help the Cirrhosis Patient Eat Enough Food 553

CHAPTER 20

- Use Carbohydrate Counting in Clinical Practice 574

CHAPTER 21

- Assess a Person's Risk of Heart Disease 597
- Implement a Heart-Healthy Diet 601
- Reduce Sodium Intake 609

CHAPTER 22

- Help Patients Comply with a Renal Diet 635

CHAPTER 23

- Increase kCalories and Protein in Meals 656
- Help Patients Handle Food-Related Problems 657