

Contents

UNIT I GENERAL ASPECTS OF PHARMACOLOGY

1 Drug Regulation, Actions, and Responses, 1

- Drug Therapy, 2
 - Overview, 2
 - Drug Names, 3
 - Drug Categories, 4
 - Drug Regulation, 5
- Ways in Which Drugs Affect the Body (Pharmacodynamics), 5
 - Mechanisms of Action, 5
 - Physiologic Effects, 8
- How the Body Uses and Changes Drugs (Pharmacokinetics), 10
 - Absorption, 11
 - Distribution, 14
 - Metabolism, 14
 - Elimination, 15
- Life Span Considerations, 17
 - Size, 17
 - Organ Health, 18
 - Special Populations, 20
- Drug Interactions, 22

2 Safely Preparing and Giving Drugs, 26

- Overview, 27
- The Eight Rights of Safe Drug Administration, 27
 - The Right Patient, 27
 - The Right Drug, 27
 - The Right Dose, Route, and Time, 28
 - The Right Documentation, 28
 - The Right Diagnosis, 28
 - The Right Response, 28
 - The Right to Refuse, 28
- Types and Interpretation of Drug Orders, 28
 - Reading and Interpreting Drug Labels, 28
 - Types of Drug Orders, 29
- Drug Errors, 29
 - Preventing Drug Errors, 30
 - Reporting Drug Errors, 30
- Principles of Administering Drugs, 31
 - Getting Ready to Give Drugs, 31
- Giving Enteral Drugs, 32
 - Oral Drugs, 32
 - Oral Drugs Given by Feeding Tube, 32
 - Giving Rectal Drugs, 34

- Giving Parenteral Drugs, 34
 - Giving Intradermal Drugs, 35
 - Giving Subcutaneous Drugs, 36
 - Giving Intramuscular Drugs, 36
 - Giving Intravenous Drugs, 38
- Giving Percutaneous Drugs, 38
 - Giving Topical or Transdermal Drugs, 39
 - Giving Drugs Through the Mucous Membranes, 39

UNIT II MATHEMATICS FOR PHARMACOLOGY AND DOSAGE CALCULATION

3 Mathematics Review and Introduction to Dosage Calculation, 43

- Why Do Health Professionals Need Mathematics?, 43
- Math Check, 44
 - Math Check Problems, 44
- Getting Started, 46
- Talking About Numbers: A Whole Number Versus a Part of a Number, 46
 - Fractions, 46
 - Decimals, 50
 - Rounding Parts of Numbers, 53
 - Percents, 53
- Solving Dosage and Calculation Problems, 54
 - Introduction, 54
 - Using Proportions to Solve for X, 56

4 Medical Systems of Weights and Measures, 63

- Overview, 63
- Math Check, 64
 - Math Check Problems, 64
- Measuring Systems Temperature: Fahrenheit and Celsius, 65
- Apothecary System for Drug Measurements, 66
- Household System for Liquid and Dry Measurements, 66
 - Metric System, 68
 - Switching Between Household and Metric Systems, 69
- Milliequivalent Measures, 70
- Unit Measures, 70

Two-Step Drug Dosage Calculations, 71
 Dimensional Analysis, 71

5 Dosage Calculation of Intravenous Solutions and Drugs, 76

Overview, 76

IV Mechanics, 77
 Regulating IV Fluids, 78
 IV Calculations, 79

UNIT III PHARMACOLOGY FOR MULTISYSTEM APPLICATION

6 Anti-Inflammatory Drugs, 83

Review of Related Physiology and Pathophysiology, 84

Stage I: Vascular, 84
 Stage II: Exudate, 84
 Stage III: Tissue Repair, 84

Types of Anti-Inflammatory Drugs, 85

Corticosteroids, 86
 Nonsteroidal Anti-Inflammatory Drugs, 89
 Antihistamines, 93
 Leukotriene Inhibitors, 95
 Disease-Modifying Antirheumatic Drugs, 96

7 Drugs for Pain Control, 101

Pain, 101

Review of Related Physiology and Pathophysiology, 102
 Pain Origin and Transmission, 102
 Pain Perception, 103
 Types of Pain, 104

General Issues Related to Analgesic Drug Therapy, 104

Opioids (Narcotics), 106

Nonopioid Pain-Control Drugs, 110

Acetaminophen, 110
 Nonsteroidal Anti-Inflammatory Drugs, 111
 Antidepressants, 111
 Anticonvulsants, 111
 Muscle Relaxants, 112

8 Anti-Infectives: Antibacterial Drugs, 114

Review of Related Physiology and Pathophysiology, 114
 Bacterial Features, 115

Antibacterial Therapy, 115

Bactericidal and Bacteriostatic Drugs, 115
 Spectrum of Efficacy, 116

General Issues in Antibacterial Therapy, 116

Types of Antibacterial Drugs, 118

Penicillins, Cephalosporins, and Other Cell Wall Synthesis Inhibitors, 119
 Aminoglycosides, Macrolides, Tetracyclines, and Other Protein Synthesis Inhibitors, 124

Metabolism Inhibitors: Sulfonamides and Trimethoprim, 130

DNA Synthesis Inhibitors: Fluoroquinolones, 132

Antibacterial Drug Resistance, 134

9 Anti-Infectives: Antiviral Drugs, 137

VIRAL INFECTION, 137

Review of Related Physiology and Pathophysiology for Common Viruses, 138

General Issues in Antiviral Therapy, 139

Antiviral Drugs, 140

Acyclovir and Valacyclovir, 140
 Adefovir Dipivoxil, 142
 Amantadine and Rimantadine, 143
 Ribavirin, 143

Oseltamivir and Zanamivir, 145

RETROVIRAL INFECTION, 146

Review of Related Physiology and Pathophysiology, 146

General Issues in Antiretroviral Therapy, 147

Types of Antiretroviral Drugs, 149

Nucleoside Analog Reverse Transcriptase Inhibitors, 149

Non-Nucleoside Analog Reverse Transcriptase Inhibitors, 150

Protease Inhibitors, 151

Integrase Inhibitors, 152

Fusion Inhibitors, 153

Entry Inhibitors, 154

Drug for Preexposure Prophylaxis, 155

10 Anti-Infectives: Antitubercular and Antifungal Drugs, 157

TUBERCULOSIS, 157

Review of Related Physiology and Pathophysiology, 157

Types of Drugs for Tuberculosis, 158

First-Line Antitubercular Drugs, 158

FUNGAL INFECTIONS, 162

Review of Related Physiology and Pathophysiology, 162

Types of Antifungal Drugs, 163

Drugs for Superficial Fungal Infections, 163

Drugs for Deep or Systemic Fungal Infections, 163

11 Drugs That Affect the Immune System, 172

Overview of the Immune System and Immunity, 173

Antibody Production, 174

Antibody Protection, 176

Life Span Considerations for Vaccination, 181

Immunosuppressive Therapy, 182

Review of Related Physiology and Pathophysiology, 183

Types of Immunosuppressant Drugs, 184

12 Anticancer Drugs, 192

- Review of Related Physiology and Pathophysiology, 193
 - Cancer Cells*, 193
 - Cancer Development*, 194
 - Cancer Causes*, 194
 - Cancer Classification*, 195
- Types of Cancer Treatment, 195
 - Chemotherapy*, 195
 - Hormone Manipulation*, 200
 - Targeted Therapy*, 202
 - Immunotherapy: Biological Response Modifiers*, 205

UNIT IV DRUG THERAPY FOR ENDOCRINE PROBLEMS

13 Drug Therapy for Diabetes, 209

- Overview, 210
- Review of Related Physiology and Pathophysiology, 210
 - Normal Physiology*, 210
 - Pathophysiology*, 212
- Types of Drugs for Diabetes, 213
 - Insulin Therapy*, 213
 - Noninsulin Antidiabetic Drugs*, 219
 - Oral Combination Noninsulin Antidiabetic Drugs*, 225

14 Drug Therapy for Thyroid and Adrenal Gland Problems, 228

- OVERVIEW, 228
- HYPOTHYROIDISM, 228
 - Review of Related Physiology and Pathophysiology, 228
 - Types of Thyroid Hormone Replacement Drugs, 229
 - Levothyroxine and Liothyronine*, 229
- HYPERTHYROIDISM, 232
 - Review of Related Physiology and Pathophysiology, 232
 - Types of Thyroid-Suppressing Drugs, 232
 - Methimazole and Propylthiouracil*, 232
- ADRENAL GLAND HYPOFUNCTION, 234
 - Review of Related Physiology and Pathophysiology, 234
 - Types of Adrenal Hormone Replacement Drugs, 234
- ADRENAL GLAND HYPERFUNCTION, 235
 - Review of Related Physiology and Pathophysiology, 235
 - Types of Drugs for Adrenal Gland Hyperfunction, 235

UNIT V DRUG THERAPY FOR PROBLEMS OF THE CIRCULATORY AND CARDIAC SYSTEMS

15 Drugs That Affect Urine Output, 239

- DIURETICS, 239
 - Review of Related Physiology and Pathophysiology, 239
 - General Issues in Diuretic Therapy, 241
 - Types of Diuretics, 242
 - Thiazide Diuretics*, 242
 - Loop Diuretics*, 244
 - Potassium-Sparing Diuretics*, 246
- OVERACTIVE BLADDER, 248
 - Review of Related Physiology and Pathophysiology, 248
 - Types of Drugs for Overactive Bladder, 248
 - Urinary Antispasmodics*, 248

16 Drug Therapy for Hypertension, 252

- Overview, 253
- Review of Related Physiology and Pathophysiology, 253
 - Arteriosclerosis and Atherosclerosis*, 253
 - Primary (Essential) Hypertension*, 254
 - Secondary Hypertension*, 254
- General Issues for Antihypertensive Therapy, 255
- Types of Antihypertensive Drugs, 256
 - Diuretics*, 256
 - Angiotensin-Converting Enzyme (ACE) Inhibitors*, 256
 - Angiotensin II Receptor Blockers (ARBs)*, 259
 - Calcium Channel Blockers*, 260
 - Beta Blockers*, 262
 - Alpha Blockers*, 264
 - Alpha-Beta Blockers*, 265
 - Central-Acting Adrenergic Agents*, 267
 - Direct Vasodilators*, 268

17 Drug Therapy for Heart Failure, 272

- Overview, 272
- Review of Related Physiology and Pathophysiology, 273
 - Left Heart Failure*, 274
 - Right Heart Failure*, 276
 - Compensatory Mechanisms for Heart Failure*, 277
- Treatment for Heart Failure, 277
- General Issues in Heart Failure Therapy, 277
- Types of Drugs Used to Treat Heart Failure, 278
 - ACE Inhibitors*, 278
 - Beta Blockers*, 279
 - Vasodilators*, 279
 - Cardiac Glycosides (Digoxin)*, 281
 - Diuretics*, 283

Human B-Type Natriuretic Peptides, 284
Positive Inotropes (Heart Pump Drugs), 285
Potassium and Magnesium, 286
Other Drugs Used to Treat Heart Failure, 288

18 Drug Therapy for Dysrhythmias, 291

Review of Related Physiology and Pathophysiology, 291
Pacemakers and the Cardiac Conduction System, 292
Heart Rate, 292
 General Issues Related to Antidysrhythmic Therapy, 296
 Types of Antidysrhythmic Drugs, 296
Atropine for Bradydysrhythmias, 296
Digoxin, 298
 Drugs for Tachydysrhythmias, 298
 CLASS I: SODIUM CHANNEL BLOCKERS, 299
Class Ia Drugs, 299
Class Ib Drugs, 301
Class Ic Drugs, 303
 CLASS II: BETA BLOCKERS, 304
 CLASS III: POTASSIUM CHANNEL BLOCKERS, 305
 CLASS IV: CALCIUM CHANNEL BLOCKERS, 307
 Unclassified Antidysrhythmic Drugs, 307
Adenosine, 307
Magnesium Sulfate, 309
Other Drugs Used to Treat Dysrhythmias, 309

19 Drug Therapy for High Blood Lipids, 311

Overview, 311
 Review of Related Physiology and Pathophysiology, 312
Coronary Artery Disease, 312
Familial Hyperlipidemia, 312
 General Issues for Antihyperlipidemic Therapy, 313
 Types of Lipid-Lowering Drugs, 314
Statins, 314
Bile Acid Sequestrants, 316
Cholesterol Absorption Inhibitors, 317
Fibrates, 318
Nicotinic Acid Agents, 320

20 Drugs That Affect Blood Clotting, 324

Overview, 324
 Review of Related Physiology and Pathophysiology, 325
Clot Formation, 325
Thrombosis, 325
Embolus, 325
 General Issues for Anticoagulant Therapy, 325

Types of Drugs That Affect Blood Clotting, 328
 ANTICOAGULANT DRUGS, 328
Thrombin Inhibitors, 328
Clotting Factor Synthesis Inhibitors, 330
Antiplatelet Drugs, 332
Thrombolytic Drugs, 333
 DRUGS THAT IMPROVE BLOOD CLOTting, 335
Colony-Stimulating Factors, 335

UNIT VI DRUG THERAPY FOR RESPIRATORY SYSTEM PROBLEMS

21 Drug Therapy for Asthma and Other Respiratory Problems, 340

Overview, 340
 Review of Related Physiology and Pathophysiology, 341
Asthma, 342
Chronic Obstructive Pulmonary Disease, 342
 Types of Drugs for Asthma and COPD, 343
Bronchodilators, 343
Anti-Inflammatory Drugs, 347
Combination Bronchodilator and Anti-Inflammatory Drugs, 349
Mucolytics, 349
 Other Serious Respiratory Disorders, 349
Pulmonary Arterial Hypertension, 350
 Types of Drug Therapy for Pulmonary Artery Hypertension, 350
Pulmonary Fibrosis, 352

UNIT VII DRUG THERAPY FOR GASTROINTESTINAL SYSTEM PROBLEMS

22 Drug Therapy for Gastrointestinal Problems, 355

OVERVIEW, 356
 NAUSEA AND VOMITING, 356
 Review of Related Physiology and Pathophysiology, 356
 Types of Drugs for Nausea and Vomiting, 357
Antiemetic Drugs, 357
 CONSTIPATION, 362
 Review of Related Physiology and Pathophysiology, 362
 Types of Drugs for Constipation, 363
Laxatives, Lubricants, and Stool Softeners, 363
 DIARRHEA, 366
 Review of Related Physiology and Pathophysiology, 366
 Types of Drugs for Diarrhea, 368
Antimotility, Adsorbent/Absorbent, and Antisecretory Drugs, 368

23 Drug Therapy for Gastric Ulcers and Reflux, 373

- Overview, 373
- Review of Related Physiology and Pathophysiology, 373
 - Gastrointestinal Ulcers, 374
 - Gastroesophageal Reflux Disease, 376
- General Issues for Drugs for PUD and GERD, 378
- Types of Drugs for PUD and GERD, 379
 - Histamine H₂ Blockers, 379
 - Proton Pump Inhibitors, 381
 - Antacids, 383
 - Cytoprotective Drugs, 384
 - Promotility Drugs, 386
- Other Drugs Used to Treat Ulcers, 386
 - Antibiotics for H. pylori Infection, 386

24 Drug Therapy with Nutritional Supplements, 389

- Overview, 389
- Review of Related Physiology and Pathophysiology, 390
 - Vitamins, 390
 - Minerals, 392
- TYPES OF NUTRITIONAL SUPPLEMENTS, 396
 - Enteral Nutritional Supplements, 396

UNIT VIII DRUG THERAPY FOR NERVOUS SYSTEM PROBLEMS

25 Drug Therapy for Seizures, 401

- Overview, 401
- Review of Related Physiology and Pathophysiology, 401
 - Causes of Seizures, 402
 - Types of Seizures, 402
- Treatment of Seizures, 405
- Types of Antiseizure Drugs, 405
 - General Issues Related to Drug Therapy for Seizures, 406
 - First-Line Drugs for Partial and Generalized Seizures, 406
 - First-Line Drugs for Absence Seizures, 409
 - Second-Line (Alternative) Drugs for Seizures, 410

26 Drug Therapy for Alzheimer's and Parkinson's Diseases, 416

- OVERVIEW, 416
- ALZHEIMER'S DISEASE, 417
 - Review of Related Physiology and Pathophysiology, 417
 - Types of Drugs for Alzheimer's Disease, 418
 - Cholinesterase/Acetylcholinesterase Inhibitors and Memantine, 418
- PARKINSON'S DISEASE, 420
 - Review of Related Physiology and Pathophysiology, 421

- Types of Drugs for Parkinson's Disease, 422
 - Dopaminergic/Dopamine Agonists, COMT Inhibitors, MAO-B Inhibitors, Anticholinergics, 422

27 Drug Therapy for Psychiatric Problems, 430

- OVERVIEW, 430
- General Issues Related to Drug Therapy for Psychiatric Problems, 431
- DEPRESSION, 432
 - Review of Related Physiology and Pathophysiology, 433
 - Types of Drugs for Depression, 434
 - Antidepressants, 434
- ANXIETY, 438
 - Review of Related Physiology and Pathophysiology, 440
 - Types of Drugs for Anxiety, 440
 - Antianxiety Drugs, 440
- PSYCHOSIS, 443
 - Review of Related Physiology and Pathophysiology, 444
 - Types of Drugs for Psychosis, 444
 - Antipsychotics, 444

28 Drug Therapy for Insomnia, 450

- INSOMNIA, 450
 - Review of Related Physiology and Pathophysiology, 450
- Drugs for Insomnia, 451

29 Drug Therapy for Eye Problems, 456

- OVERVIEW, 456
- Review of Related Physiology and Pathophysiology, 456
 - Physiology, 456
 - Pathophysiology, 458
- General Issues for Local Eye Drug Therapy, 458
- Types of Drugs for Glaucoma, 461
 - Prostaglandin Agonists, 461
 - Beta-Adrenergic Blocking Agents, 462
 - Alpha-Adrenergic Agonists, 464
 - Cholinergic Drugs, 465
 - Carbonic Anhydrase Inhibitors, 466

UNIT IX DRUG THERAPY FOR PROBLEMS OF THE MUSCULOSKELETAL SYSTEM

30 Drug Therapy for Osteoporosis, Arthritis, and Skeletal Muscle Relaxation, 469

- THE MUSCULOSKELETAL SYSTEM, 469
- OSTEOPOROSIS, 470

Review of Related Physiology and Pathophysiology, 470
Types of Drugs to Manage or Slow Osteoporosis, 471

ARTHRITIS, 474

Review of Related Physiology and Pathophysiology, 474
Types of Drugs to Manage Arthritis, 474
Drugs for Pain Control, 474
Anti-Inflammatory Drugs, 474
Drugs for Hyperuricemia and Gout, 475

MUSCLE SPASMS, 476

Review of Related Physiology and Pathophysiology, 476
Skeletal Muscle Relaxants, 476

UNIT X DRUG THERAPY FOR PROBLEMS OF THE REPRODUCTIVE SYSTEM

31 Drug Therapy for Male Reproductive Problems, 481

BENIGN PROSTATIC HYPERPLASIA, 481
 Review of Related Physiology and Pathophysiology, 481

Types of Drugs for Benign Prostatic Hyperplasia, 482
DHT Inhibitors and Selective Alpha-1 Blockers, 482
 Male Hormone Replacement Therapy, 485
Review of Related Physiology and Pathophysiology, 485
 Erectile Dysfunction, 488
Review of Related Physiology and Pathophysiology, 488

32 Drug Therapy for Female Reproductive Issues, 492

Review of Related Physiology and Pathophysiology, 492
 MENOPAUSE, 493
 Types of Perimenopausal Hormone Replacement Drugs, 494
Conjugated Estrogens, 494
 CONTRACEPTION, 496
 Types of Drugs for Hormonal Contraception, 496

Appendix A: Medication Administration Skills, 501

Bibliography, 513