

Tietz Fundamentals of CLINICAL CHEMISTRY AND MOLECULAR DIAGNOSTICS

Seventh Edition

Carl A. Burtis, Ph.D.

Emeritus

Oak Ridge National Laboratory

Oak Ridge, Tennessee

Clinical Professor of Pathology

University of Utah School of Medicine

Salt Lake City, Utah

David E. Bruns, M.D.

Professor of Pathology

University of Virginia School of Medicine

Director of Clinical Chemistry and

Associate Director of Molecular
Diagnostics

University of Virginia Health System
Charlottesville, Virginia

Consulting Editor

Barbara G. Sawyer, Ph.D., M.L.S.

(A.S.C.P.)^{CM}, MB (A.S.C.P.)^{CM}

Professor, Clinical Laboratory Science/

Molecular Pathology

Texas Tech University Health Sciences

Center

Lubbock, Texas

ELSEVIER

Contents

PART I PRINCIPLES OF LABORATORY MEDICINE, 1

1. Clinical Chemistry, Molecular Diagnostics, and Laboratory Medicine, 1
2. Selection and Analytical Evaluation of Methods—With Statistical Techniques, 6
3. Clinical Evaluation of Methods, 33
4. Evidence-Based Laboratory Medicine, 40
5. Establishment and Use of Reference Values, 60
6. Specimen Collection, Processing, and Other Preanalytical Variables, 72
7. Quality Management, 90
8. Principles of Basic Techniques and Laboratory Safety, 107

PART II ANALYTICAL TECHNIQUES AND INSTRUMENTATION, 129

9. Optical Techniques, 129
10. Electrochemistry and Chemical Sensors, 151
11. Electrophoresis, 171
12. Chromatography, 183
13. Mass Spectrometry, 202
14. Enzyme and Rate Analyses, 216
15. Immunochemical Techniques, 236
16. Automation, 254
17. Point-of-Care Instrumentation, 272

PART III ANALYTES, 286

18. Amino Acids, Peptides, and Proteins, 286
19. Serum Enzymes, 318
20. Tumor Markers and Cancer Genes, 337
21. Kidney Function Tests—Creatinine, Urea, and Uric Acid, 364
22. Carbohydrates, 376
23. Lipids, Lipoproteins, Apolipoproteins, and Other Cardiac Risk Factors, 388
24. Electrolytes and Blood Gases, 412
25. Hormones, 430
26. Catecholamines and Serotonin, 442
27. Vitamins, Trace Elements, and Nutritional Assessment, 459
28. Hemoglobin, Iron, and Bilirubin, 499
29. Porphyrins and Porphyrias, 522
30. Therapeutic Drugs and Their Management, 536
31. Clinical Toxicology, 559
32. Toxic Metals, 592

PART IV PATHOPHYSIOLOGY, 608

- 33. Diabetes, 608
- 34. Cardiovascular Disease, 632
- 35. Kidney Disease, 651
- 36. Physiology and Disorders of Water, Electrolyte, and Acid-Base Metabolism, 680
- 37. Liver Disease, 700
- 38. Gastrointestinal and Pancreatic Diseases, 724
- 39. Disorders of Bone and Mineral Metabolism, 741
- 40. Disorders of the Pituitary, 769
- 41. Disorders of the Adrenal Cortex, 785
- 42. Thyroid Disorders, 806
- 43. Reproduction-Related Disorders, 824
- 44. Pregnancy and Prenatal Testing, 848
- 45. Newborn Screening and Inborn Errors of Metabolism, 870
- 46. Pharmacogenetics, 885

PART V MOLECULAR DIAGNOSTICS, 899

- 47. Principles of Molecular Biology, 899
- 48. Nucleic Acid Techniques and Applications, 915
- 49. Genomes and Nucleic Acid Variations, 946

PART VI REFERENCE INFORMATION, 951

- 50. Reference Information for the Clinical Laboratory, 951