Contents

1 Fundamentals of Pathology

Pathology 2
Methods

Disease 5
Etiology
Causal Pathogenesis
Formal Pathogenesis
Clinical Course

Signs of Death 5
Equivocal Signs of Death
Brain Death
Unequivocal Signs of Death

Statistics 5

Autopsy 5

2 Cellular Pathology

Nuclear Lesions 6
Forms of Nuclei
Chromosomes

DNA Repair Defects 6
Xeroderma pigmentosum

Chromosome Abnormalities 6

Change in the Size of the Nucleus 8
Relation of Nucleus to Cytoplasm
Nuclear Euploidy
Nuclear Polyploidy
Nuclear Aneuploidy

Chromatin Change 8
Heterochromatin Condensation
Dyskaryosis
Perinuclear Hyperchromatosis
Karyolysis

Inclusions 8
Cytoplasmic inclusions
Paraplasmic inclusions

Change in the Number of Nuclei 10
Polynuclear Cells
Anuclear Cells

Antinuclear Autoantibodies 10

Nucleolar Change 10
Inflammatory nucleoli
Tumor nucleoli
Giant nucleoli

Lesions of the Rough Endoplasmic Reticulum (RER) 12

Quantitative Change 12
Increase in the number of cisterns
Decrease in the number of cisterns

Morphologic Change 12
Fragmentation of the RER
Formation of vacuoles in the RER
Swelling of the RER
RER cistern collapse

Inclusions 12
Amorphous inclusions
Crystalline inclusions
Particulate inclusions

Oncofetal Lesion 12
Ribosome-lamellae complexes
Annulated lamellae layers
Mitochondria-lamellar-layer complexes

Lesions of the Smooth Endoplasmic Reticulum (SER) 14

Quantitative Change 14
Proliferation of SER
Atrophy of the SER

Morphologic Change 14
Formation of Vesicles in the SER
„Cytoplasmic Nuclei“

Inclusions 14

Golgi Lesions 16

Atrophy of the Golgi Apparatus 16

Hypertrophy of the Golgi Apparatus 16

Golgi-associated disorders 16
Cholestasis
Fatty Liver
Achondroplasia
Alveolar Proteinosis

Mitochondrial Lesions 18

Quantitative Change 18
Mitochondrial Proliferation
Mitochondrial Depletion

Morphologic Change 18
Megamitochondria
Mitochondrial Swelling

Structural Change in Mitochondrial DNA . . 20

Mitochondrial DNA Mutations 20
Congenital Forms
Acquired Forms

Changes in the Mitochondrial Cristae 20
Membrane proliferation
Membrane loss

Inclusions 20
Matrix inclusions
Crista inclusions
Grana inclusions

Mitochondrial Disorders 22

Mitochondrial Myopathies 22

Hypoxia 22
Hypoxemic Hypoxia
Ischemic Hypoxia
Hyperglycemic Hypoxia
Histotoxic Hypoxia

Mitochondrial Autoantibodies 22

Peroxisomal Lesions 24

Peroxisomal Diseases 24
Acatalasemia
Refsum Disease
Cerebrohepatorenal Syndrome
Adrenoleukodystrophy
Systemic Carnitine Deficiency

Lysosomal Lesions 26

Prelysosomal Phase 26
Heterophagy
Autophagy

Lysosomal Phase 28
Heterophagy
Autophagy

Post-lysosomal Phase 28
Lysosomal Lipid Pigments

Lysosomal Diseases 30
Delayed Enzyme Release
Increased Enzyme Release
Lysosomal Enzyme Deficiency

Cytomembrane Lesions 32
Apical Cell Edema
Disrupted Communication

Receptor Lesions 32
Receptor dysfunction

Cytoskeletal Lesions 34

Microtubular Lesions 34
Polymerization Block
Microfilament Lesions

Intermediate Filament Lesions 34
Actin Bodies
Mallory Bodies

3 Connective Tissue Lesions

Collagen Lesions 36

Types of Collagen 36

Biosynthesis Disorders 38
Ehlers-Danlos Syndrome (EDS)
Scurvy
Osteogenesis Imperfecta

Fibrosis 40

Sequelae of Fibrosis 40
Pulmonary Fibrosis

Sequelae of Fibrosis 42
Cirrhosis of the Liver

Collagenolysis Disorders 44
α_1-Antitrypsin Deficiency
Fibrinoid Necrosis
Collagen Hyalinization

Collagen Vascular Diseases 46

Microfibril Lesions 48
Marfan's Syndrome

Amyloidosis 48
General Definitions 48
Structure of Amyloid 50
Types of Amyloid 50
AL Amyloid
AA Amyloid
AF Amyloid
AE Amyloid
AS Amyloid
Classification of Amyloidoses 52
Systemic Amyloidosis
Localized Amyloidosis

Elastin Lesions 54

Biosynthesis Disorders 54
Restrictive Dermopathy
Senile Elastosis
Trichopoliodystrophy
Type V Ehlers-Danlos Syndrome
Elastosis 56
Actinic Elastosis
Pseudoxanthoma Elasticum
Fibroelastosis 56
Sequelae of Fibroelastosis 56
Intimal Fibroelastosis
Endocardial Fibroelastosis

Elastin Lysis Disorders 58
Sequelae of Elastin Lysis Disorders 58
Polyarteritis nodosa
Temporal Arteritis
Syphilitic Aortitis

Proteoglycan Lesions 60

Proteoglycan Complexing Disorders 60
Mucoid Degeneration
Sequelae of Mucoid Degeneration 60
Mucoid Meniscopathy
Ganglion
Cystic Vascular Degeneration
Mitral Valve Prolapse Syndrome
Sequelae of Mucoid Degeneration 62

Proteoglycan Secretion Disorders 64
Cystic Fibrosis 64
Sequelae of Cystic Fibrosis 64
Bronchiectasis
Cystic fibrosis of the pancreas
Meconium ileus
Liver cirrhosis

Proteoglycan Lysis Deficiencies 66
Mucopolysaccharidoses 66
Hurler's Syndrome
Hunter's Syndrome
Mucolipidoses 66

4 Errors of Metabolism: Inorganic Compounds

Oxygen 68

Acute Generalized Hypoxia 68

Acute Local Hypoxia 69

Chronic Hypoxia 69
Fatty Degeneration
Organ Atrophy
Interstitial Fibrosis

Calcium 70

Hypocalcemia 70

Hypercalcemia 70

Iron 72

Iron Deficiency 72
Absolute Iron Deficiency
Relative Iron Deficiency

Iron Overload 72
Hemochromatosis
Secondary Siderosis

Copper 74

Copper Deficiency 74
Chronic Copper Deficiency
Trichopoliodystrophy

Copper Overload 74
Wilson's Disease

5 Errors of Metabolism: Organic Compounds

Carbohydrates 76

Glycogenoses 76
Type I Glycogenosis
Type II Glycogenosis
Type III Glycogenosis

Carbohydrate Malabsorption 78
Lactose Intolerance
Saccharose-Isomaltose Intolerance

Glucose Synthesis Disorders 78
Fructose-1,6-Diphosphatase Deficiency
Hereditary Fructose Intolerance

Deficient Carbohydrate Metabolism 78
Diabetes Mellitus 78
Type I Diabetes mellitus
Type II Diabetes mellitus
Sequelae 80
Galactosemia 80

Lipids 82

Fat Uptake Disorders 82
Malabsorption Syndromes 82
Disorders Associated with Malabsorption ... 82
Gluten Enteropathy
Whipple Disease

Fatty Degeneration 84
Dietary Steatosis
Transport Steatosis
Absorptive Steatosis
Retention Steatosis

Disorders of Fat Catabolism 84
Starvation
Obesity
Ketonemia
Phytanic Acid Storage Disease
Propionic Acidemia
Methylmalonic Aciduria

Hypolipoproteinemia Disorders 86
Abetalipoproteinemia
Analphalipoproteinemia

Hyperlipoproteinemia Disorders 88
Type I Hyperlipoproteinemia
Type II Hyperlipoproteinemia

Type III Hyperlipoproteinemia
Type IV Hyperlipoproteinemia
Type V Hyperlipoproteinemia
Familial LCAT Deficiency
Sequelae of Hyperlipoproteinemia 90
Atherosclerosis
Xanthoma

Sphingolipidoses 92
Gaucher's Disease
Sphingomyelin Lipidosis
Krabbe's Disease
Metachromatic Leukodystrophy
Fabry Disease
Type I GM_2 Gangliosidosis
GM_1 Gangliosidosis

Proteins 96

Defective Serum Proteins 96

Disorders of Amino Acid Metabolism 96
Phenylketonuria
Albinism
Alkaptonuria[1]
Maple Syrup Urine Disease
Primary Hyperoxaluria
Type I Homocystinuria
Cystinuria
Cystinosis

Urea Synthesis Disorders 100

Nucleotides 102

Hyperuricemia 102
Primary Gout
Sequelae of Adult Gout
Secondary Gout

6 Pigment Lesions

Exogenous Pigments 104

Cosmetic Pigments 104

Occupational Toxin Pigments 104
Anthracosis
Plumbism
Chalcosis

Iatrogenic Pigments 104
Argyria
Amalgam
Tetracycline
Carotene

Endogenous Pigments 106

Hematogenous Pigments 106
Porphyria 106
Congenital Erythropoietic Porphyria
Hemoglobin Breakdown Pigments 106
Hyperbilirubinemia 108
Excessive Bilirubin Production
Defective Bilirubin Uptake
Defective Bilirubin Conjugation
Defective Bilirubin Excretion

Tyrosine-Derivative Pigments 112
Cutaneous Melanin 112
Vitiligo
Albinism
Hemochromatosis
Addison's Disease
Phenylketonuria
Melasma
Neuromelanin 114
Parkinson's Disease
Non-Melanin Pigments 114
Brown Colon
Alkaptonuria

Lipogenic Pigments 114

7 Sublethal Cell Damage

Hypertrophy 116
Types of Hypertrophy 116
Diseases Associated with Hypertrophy 116
Hypertrophic Cardiomyopathy
Congenital Hypertrophic Pyloric Stenosis

Hyperplasia 118
Types of Hyperplasia 118
Diseases Associated with Hyperplasia 118
Endometrial Hyperplasia
Prostatic Hyperplasia

Endocrinal Hyperplasia 120
Thyroid Hyperplasia
Parathyroid Hyperplasia
Hyperplasia of the Adrenal Cortex 122
Adrenal Cortex Hyperfunction Syndrome .. 122
Hyperaldosteronism
Hypercortisolism
Adrenogenital Syndrome

Atrophy 124
Types of Atrophy 124
Disorders Associated with Generalized Atrophy 124
Senile Atrophy
Atrophy Due to Inanition (Cachexia)
Disorders Associated with Organ Atrophy . 126
Osteoporosis
Alzheimer's Disease
Pick's Disease

8 Lethal Cell Injury

Apoptosis ... 128
Programmed Cell Death ... 128
Commitment phase
Executive phase
Accidental Cell Death ... 130
Necrosis ... 130
Focal Cytoplasmic Necrosis ... 130
Coagulative Necrosis ... 130
Special Forms of Coagulative Necrosis ... 130
Liquefactive Necrosis ... 132
Special Forms of Liquefactive Necrosis ... 132
Shrinking Necrosis ... 132
Autolysis ... 132

9 Calcification and Stone Disorders

Calcification ... 134
Dystrophic Calcification ... 134
Degenerative Calcification ... 134
Disorders Associated with Degenerative Calcification ... 134
Calcinosis cutis
Myositis ossificans
Valvular calcific degeneration
Mönckeberg medial calcific sclerosis
Necrotic Calcification ... 136
Metastatic Calcification ... 136
Disorders Associated with Metastatic Calcification ... 136
Pulmonary calcinosis
Renal calcinosis
Gastric calcinosis
Myocardial calcinosis
Stone Disorders ... 138
Urolithiasis
Cholelithiasis

10 Chemical Cell Injury

Drug-Induced Disorders ... 140
Drug-Induced Damage to Blood Cells ... 140
Drug-Induced Skin Disease ... 140
Drug-Induced Liver Disease ... 141
Drug-Induced Kidney Disease ... 141
Drug-Induced Lung Disease ... 141
Drug-Induced Neurologic Disorders ... 141
Diseases from Environmental Factors 142
Carbon Monoxide Poisoning ... 142
Sequelae ... 142
Severe carbon monoxide poisoning
Acute carbon monoxide poisoning
Lead Poisoning ... 142
Sequelae ... 142
Metaphyseal lead lines
Acquired porphyria
Anemia
Erythrocyte disease
Lead nephropathy
Lead encephalopathy
Polyneuropathy
Asbestosis ... 142
Sequelae ... 142
Pneumoconiosis (asbestos lung)
Pleural plaques
Malignant mesotheliomas
Disease from Alimentary Factors ... 144
α-Amanitine Poisoning
Alcoholism
Sequelae of Alcoholism ... 144
Alcoholic Fatty Degeneration of the Liver
Alcoholic Hepatitis
Alcoholic Liver Cirrhosis
Megaloblastic Anemia
Wernicke-Korsakoff Syndrome
Cardiomyopathy

11 Physical Cell Injury

Thermal Injury ... 146
Heat-Induced Injuries ... 146
Heat Stroke
Burns
Cold-Induced Injuries ... 148
Hypothermia
Frostbite
Sequelae of Cold Injuries ... 148
Endangiitis obliterans
Raynaud Syndrome ... 148

Electrical Injuries ... 150
Radiation Injury ... 150
Microwaves and Infrared Radiation ... 150
Visible Light and Ultraviolet Radiation ... 150
Sequelae of Light Radiation ... 150
Acute photodermatosis
Chronic photodermatosis
Laser Radiation ... 150
Ionizing Radiation ... 152
Sequelae of Radiation ... 152
Radiation Vasculitis
Radiation Dermatitis
Radiation Enteritis
Radiation Bone Necrosis
Radiation-Induced Leukocyte Disease
Radiation Therapy ... 154

12 Immune Pathology

Antigen ... 156
Antigen Neutralization ... 156
Immune Organs ... 157
Central Immune Organs ... 157
Thymus
Bursa of Fabricius and Bone Marrow
Peripheral Immune Organs ... 157
Lymph Nodes
Spleen
MALT
SALT
Cell-Mediated Immunity ... 158
T Lymphocytes ... 158
Initial Immune Response ... 158
Effector Mechanisms
Secondary Immune Response
Humoral Immunity ... 160
B Lymphocytes ... 160
Initial Immune Response ... 160
Effector Mechanisms
Secondary Immune Response ... 162
Immune-Regulating Antigens ... 164
Classification of the HLA Genes ... 164
Function of the HLA Antigens ... 164
HLA-Associated Disorders ... 164
Pathogenic Immune Reactions ... 166
Hypersensitivity Reactions ... 166
Type I Hypersensitivity Reactions ... 166
Local Anaphylaxis
Systemic Anaphylaxis
Atopic Reaction
Disorders Associated with Type I Hypersensitivity Reaction ... 168
Bronchial Asthma
Allergic Rhinosinusitis
Type II Hypersensitivity Reactions ... 170
Type III Hypersensitivity Reactions ... 170
Serum Disease
Disorders Associated with Serum Disease ... 172
Immune Complex Vasculitis
Immune Complex Nephritis
Local Immune Complex Disease
Disorders Associated with Local Immune Complex Disease ... 174
Extrinsic Allergic Alveolitis
Type IV Hypersensitivity Reaction ... 174
Cutaneous Basophilic Hypersensitivity Reaction
Contact Allergy
Tuberculin Reaction
Granulomatous Hypersensitivity Reaction
Transplantation Pathology ... 178
Transplant Allergy
Graft-Versus-Host Disease
Autoimmune Disorders ... 180
Systemic Autoimmune Disorders ... 180
Systemic Lupus Erythematosus
Progressive systemic sclerosis
Dermatomyositis
Goodpasture's Syndrome
Wegener's Granulomatosis
Rheumatoid Arthritis
Sjögren's Syndrome
Autoimmune Disorders Organ specific ... 186
Hashimoto Thyroiditis
Autoimmune Adrenalitis
Type I Diabetes Mellitus
Myasthenia Gravis
Autoimmune Gastritis
Multiple Sclerosis
Immunodeficiency Disorders ... 188
Primary Immunodeficiency Disorders ... 188
X-Linked Agammaglobulinemia
Transient Hypogammaglobulinemia
Heavy-Chain Defect
κ Chain Defect
IgG Subclass Defect
Hyper IgM Syndrome
Isolated IgA Deficiency
Common Variable Immunodeficiency
Primary Immunodeficiency Syndromes: T-Cell Defects ... 189
DiGeorge Syndrome
Nezelof Syndrome
Chronic Myocutaneous Candidiasis
Primary Immunodeficiency Syndromes: B-Cell and T-Cell Defects ... 190
Severe combined immunodeficiency (= SCID)
Ataxia Telangiectasia
Wiskott-Aldrich Syndrome
Secondary Immunodeficiency Syndromes ... 190
Monoclonal Gammopathy
Acquired Immunodeficiency Syndrome (AIDS)
Sequelae of AIDS ... 192
HIV Lymphadenopathy
Kaposi's Sarcoma
HIV-Associated Pneumopathy
HIV Encephalitis

13 Pathology of Inflammation ... 194

Definition of Inflammation ... 194

Etiology of Inflammation ... 194

Spread of Inflammation ... 194
Local inflammation
Metastatic inflammation
Generalized infection

Symptoms of Inflammation ... 194

Exudative Inflammatory Reaction ... 196
Changes in Microcirculation ... 196
Increased Permeability ... 198
Leukocyte Transmigration ... 200
Biologic Role of Inflammatory Cells ... 200
Inflammation Mediators ... 202
Cell-Derived Mediators
Plasma-Derived Mediators

Acute Exudative Inflammations ... 204

Serous Inflammation ... 204

Seromucous Inflammation ... 204
Associated Disorder ... 204
Acute Rhinitis

Fibrinous Inflammation ... 206
Fibrinous Parenchymal Inflammation ... 206
Fibrinous Serosal Inflammation ... 206
Associated Disorders ... 206
Fibrinous Pleuritis
Fibrinous Pericarditis
Fibrinous Peritonitis
Fibrinous Mucosal Inflammation ... 208
Pseudomembranous Croupous Form Influenza Type
Pseudomembranous Necrotizing Form (Diphtheria Type)

Fibrinous Suppurative Inflammation ... 210
Associated Disorder ... 210
Lobar Pneumonia

Suppurative Inflammation ... 212
Mucopurulent Inflammation ... 212
Empyema ... 212
Phlegmon ... 212
Abscess-Forming Inflammation ... 212
Appendicitis
Acute Pyogenic Pyelonephritis
Acute Pyogenic Meningitis

Hemorrhagic Inflammation ... 216
Scarlet Fever
Waterhouse-Friderichsen Syndrome
Plague
Influenzal Pneumonia
Disorders Associated with Enterohemorrhagic E. Coli
Hemorrhagic Viral Urocystitis
Anthrax
Viral Hemorrhagic Fever
Acute Pancreatitis

Necrotizing Inflammation ... 218
Ulcerous Necrotizing Inflammation ... 218
Acute Necrotizing Ulcerous Gingivitis
Peptic Gastroduodenal Ulcer
Ulcerous Colitis
Diffuse Necrotizing Inflammation ... 218
Necrotizing Fasciitis
A reactive Necrotizing Inflammation ... 220
Gangrenous Inflammation ... 220

Lymphocytic Inflammation ... 220

Fetal Inflammation ... 220

Courses of Acute Inflammation ... 222
Dissolution of the exudate
Regeneration
Secondary postinfectious disorders
Chronic inflammation
Hematogenous Dissemination

Chronic Inflammation ... 224

Chronic Nonsuppurative Inflammation ... 224
Associated Disorder ... 224
Chronic Bronchitis

Chronic Suppurative Inflammation ... 224
Chronic Mucopurulent Inflammation ... 224

Granulating Inflammations ... 226
Demarcation of Necrosis
Chronic Abscess
Chronic Fistula
Chronic Ulcer

Granulomatous Inflammations ... 228
Granuloma Cells ... 228
Histogenesis of Granulomas ... 228
Epithelioid granulomas
Histiocytic Granulomas
Morphology of Granulomas ... 229
Sarcoid Granulomas
Sarcoidosis
Crohn's Disease
Tuberculous Granuloma
Pseudotuberculous Granuloma
Rheumatic Granuloma
Rheumatoid Granuloma
Foreign-Body Granuloma

14 Viral Infection

Uncoated Single-Stranded RNA Viruses 238
Picornaviridae ... 238
Poliomyelitis Virus ... 238
Hepatitis A Virus (HAV) ... 240
Rhinoviruses ... 240

Uncoated Double-Stranded RNA Viruses 240
Reoviridae ... 240
Rotavirus

Coated Single-Strand RNA Viruses 240
Togaviridae 240
Alpha virus
Rubivirus
Flaviviridae 240
Orthomyxoviridae 242
Influenza Virus
Paramyxoviridae 242
Parainfluenza Virus
Mumps Virus
Respiratory Syncytial Virus (RSV)
Measles Virus

Arenaviridae 242
Rhabdoviridae 244
Rabies Virus
Retroviridae 244
Oncornaviruses
Human Immunodeficiency Virus (HIV)

Coated Double-Stranded RNA Viruses 246
Poxviridae 246
Variola Virus
Molluscum Contagiosum Virus
Herpesviridae 246
Herpes Simplex Virus (HSV)
Varicella Zoster Virus
Cytomegalovirus (CMV)
Epstein-Barr Virus (EBV)

Coated Single-Stranded DNA Viruses . 248
Hepadnaviridae 248
Hepatitis B Virus (HBV)

Uncoated Double-Stranded DNA Viruses 250
Adenoviridae
Papovaviridae
Miopapovaviridae

Uncoated Single-Stranded DNA Viruses 250
Parvoviridae 250
Parvovirus B19

Prion Diseases 252
Disorders Associated with Prions 252
Creutzfeldt-Jakob Disease
Gerstmann's Hereditary Senile Ataxia
Kuru
Scrapie
Bovine Spongiform Encephalopathy

15 Bacterial Infection

Gram-Positive Cocci 254
Staphylococci 254
Staphylococcus epidermidis
Staphylococcus aureus

Streptococci 254
Streptococcus pyogenes

Gram-Negative Cocci 256
Neisseriaceae 256
Neisseria gonorrhoeae
Neisseria meningitidis

Gram-Positive Rods 256
Corynebacterium diphtheriae
Listeria monocytogenes
Actinomyces israelii
Bacillus anthracis
Clostridia 258
Clostridia – associated Disorders 258
Clostridial Gas Gangrene
Tetanus
Botulism
Antibiotic associated Enterocolitis

Gram-Negative Rod-shaped Bacteria 260
Enterobacteriaceae 260
Disorders Associated with Enterobacteriaceae 260
Typhoid Fever
Salmonella Enteritis

Short-Curved Gram-Negative Rod-shaped Bacteria 262
Vibrio cholerae
Campylobacter jejuni coli
Helicobacter pylori

Flexible Spiral Gram-Negative Bacteria .. 262
Borrelia burgdorferi
Treponema pallidum

Mycobacteria (Acid-Resistant Rods) 264
Tuberculosis Bacteria
Mycobacterium leprae

Obligatory Intracellular Bacteria 266
Rickettsia prowazekii
Calymmatobacterium granulomatis
Chlamydia

Bacteria Without a Cell Wall 266
Mycoplasma pneumoniae

16 Mycotic Infection

Skin Mycoses (Superficial Mycoses) 268
Dermatophytoses 268
Subcutaneous and Mucosal Mycoses 268
Organ and Systemic Mycoses 268
Yeasts 270
Candida albicans
Cryptococcus neoformans
Molds 272
Aspergillus Fungi
Mucor (Zygomycetes)
Dimorphic Fungi 272
Histoplasma capsulatum
Coccidioides immitis
Rhinosporidium seeberi

17 Protozoan Infection

Zoomastigophora 274
Trypanosoma cruzi
Leishmania
Trichomonas vaginalis
Giardia lamblia
Lobosea 276
Entamoeba histolytica
Sporozoa 276
Toxoplasma gondii
Plasmodia
Mycoid Parasites 278
Pneumocystis carinii

18 Helminthic Infection

Trematodes 280
Schistosomes
Cestodes 280
Taenia saginata
Taenia solium
Echinococcus granulosus
Echinococcus multilocularis
Nematodes 284
Enterobius vermicularis
Wuchereria bancrofti
Trichinella spiralis

19 Hereditary Disorders

Chromosomal Disorders 287
Autosomal Aberrations 287
Numeric Autosomal Aberrations 288
Triploidy
Trisomy 21 (Down Syndrome)
Trisomy 18 (Edwards Syndrome)
Trisomy 13 (Patau Syndrome)
Structural Autosomal Aberrations 288
Deletion Syndrome
Microdeletion Syndromes
Sex Chromosome Aberrations 290
Klinefelter's Syndrome
XYY Syndrome
Turner's Syndrome
Chromosome Breakage Syndromes 290
Single-Gene Disorders 292
Autosomal Dominant Inheritance 292
Autosomal Recessive Inheritance 292
X-Linked Dominant Inheritance 292
X-Linked Recessive Inheritance 292
Multifactorial Hereditary Disorders .. 293
Mitochondrial Hereditary Disorders .. 293

20 Congenital Malformations

Basic Teratologic Terminology 294
Malformation
Anomalies
Dysplasia

General Etiology 295
Genetic causes
Exogenous causes

General Causal Pathogenesis 295
Cell Proliferation 295
Cell Contact Mechanisms
Proliferation Stimulators
Proliferation Inhibitors
Proliferation Modulators
Cell Determination and Differentiation 296
Cell Determination
Cell Differentiation
Cell Migration 296
Apoptosis (Cell Death) 296

Blastopathies 298

Conjoined Twins-Malformations 298
Complete Symmetrical Double Malformations
Incomplete Symmetrical Double Malformations
„Parasitic" Asymmetrical Double Malformations

Feto-fetal Transfusion Syndrome 298

Embryopathies 300

Morphogenetic Forms of Embryopathy .. 300
Isolated (Single) Malformations 300
Supernumerary Malformations
Fusion Malformations
Failures of dorsal Fusion (Dysraphia)
Failures of ventral Fusion
Agenesis
Aplasia
Hypoplasia
Atresia
Stenosis
Vestige
Hamartia
Chorista
Cysts
Atavism
Multiple Malformations 302
Field Defects
Sequence
Syndrome
Congenital disorder

Etiologic Forms of Embryopathy 302
Radiation Embryopathy
Diabetic Embryopathy
Thalidomide Embryopathy
Congenital Rubella Syndrome
Embryofetal Alcohol Syndrome
Amniotic Band Syndrome
Teratogenesis and Tumorigenesis
Multifactorial Malformations

Fetopathies 306
Diabetic Fetopathy
Cytomegalovirus Fetopathy
Listerial Fetopathy
Fetal Toxoplasmosis
Congenital Syphilis

21 Tissue Repair

Tissue Repair 308
Regulatory Mechanisms 309

Physiologic Regeneration 309
Solitary regeneration
Cyclical regeneration
Permanent regeneration 309

Pathologic Regeneration 310

Complete Regeneration 310

Incomplete Regeneration 310

Wound Healing 310
Healing of a Skin Wound 310
Types of Wound Healing
Phases of Wound Healing
Fracture Healing 314
Healing by First Intention
Healing by Second Intention
Wound Healing in Internal Organs 314
Reversibly Postmitotic Cells
Irreversibly Postmitotic Cells
Wound Healing in the Central Nervous System 316
Open Brain Injuries
Closed Brain Injuries
Wound Healing in Peripheral Nerves

Metaplasia 318
Epithelial Metaplasia 318
Squamous Metaplasia
Intestinal Metaplasia
Urothelial Metaplasia
Mesenchymal Metaplasia 318

Heteroplasia 318
Heterotopia 318
Tissue Displacement 318

22 Tumor Pathology

General Definition of „Tumor“ 320
Benign Tumors 320
Malignant Tumors 320
Tumors of Limited Malignancy 320
Tumor-like Lesions 320

Causal Tumorigenesis 321
Disturbed DNA repair 321
Disturbed Cellular Communication 321
Proliferation Disinhibition 321
Growth Factors
Proto-oncogenes
Tumor Suppressor Genes

Tumor Immunology 326
Tumor Antigens 326
Oncofetal Antigens
Differentiation Antigens
Tumor Immunity 326

Chemical Tumorigenesis 328
Stages of Carcinogenesis 328
Initiation
Promotion
Latency
Progression
Metastasis
Metabolic Carcinogen Activation 330
Organ and Species Specificity 330

Viral Tumorigenesis 332
DNA Tumor Viruses 332
Human papilloma viruses
Adenoviruses
Epstein-Barr Virus
Hepatitis B Virus
RNA Tumor Viruses

Physical Tumorigenesis 334
Ionizing Radiation
Ultraviolet Radiation
Foreign Bodies

Human Tumorigenesis 336
Predisposition 336
Hormonal Factors 336
Age 336
Senile tumors
Childhood tumors
Nutritional Factors and Drug Use 336
Nutritional Fats
High Nutritional Fiber Intake
Alcohol Abuse
Cigarette Smoke
Environmental Factors 336
Genetic Changes 338
Susceptibility Genes
Tumor Promotion
Oncogene Activation
Defective Apoptosis
Defects in Differentiation Genes
Defects in Metastasis-Suppressor Genes
Defective Immune Surveillance
Resistance to Therapy

Formal Tumorigenesis 340

Precursors and Early Stages 340
Precancerous Conditions 340
Intra epithelial Neoplasia
Leukoplakia
Carcinoma in Situ 340
Early Invasive Carcinoma 340

Cellular and Nuclear Changes 342
Cellular Changes 342
Anaplasia
Biochemical Convergence
Nuclear Changes 342
DNA Content of Tumor Cells
Chromosome Aberrations

Tumor Angiogenesis 344

Tumor Dissemination 344
Metastasis 346
Lymphatic Metastasis
Hematogenous Metastasis
Cavitary Metastasis
Canalicular Metastasis
Inoculated Metastases

Tumor Regression 350
Sequelae of Tumor Regression 350
Remission
Complete remission
Spontaneous remission
Recurrence

Tumor Complications 352
Local Complications 352
Stenosis
Circulatory Disruption
Tumor Necrosis
Disruption of Organ Function
Systemic Complications 352
Tumor Metastases
Cancer Cachexia
Tumor Anemia
Paraneoplastic Syndromes

Tumor Classification 355

Nonepithelial Tumors 355
General Definitions 355
Benign Nonepithelial Tumors
Malignant Nonepithelial Tumors
Fibrous Tumors 356
Fibroma
Fibrosarcoma
Muscle Tumors 356
Leiomyomas
Leiomyosarcoma
Rhabdomyoma
Rhabdomyosarcoma
Tumors of Fatty Tissue 356
Lipoma
Liposarcoma
Cartilage Tumors 358
Chondroma

Chondrosarcoma
Bone Tumors 358
Osteoma
Osteosarcoma
Leukemias 358
Acute Myelogenous Leukemia
Chronic Myelogenous Leukemia (CML)
Acute Lymphoblastic Leukemia
Chronic Lymphocytic Leukemia (CLL)
Malignant Lymphoma 362
Hodgkin's Lymphomas
Non-Hodgkin's Lymphomas
Melanocytic Tumors 366
Melanocytic Nevi
Malignant Melanoma
Brain Tumors 366
Gliomas
Nerve Sheath Tumors
Meningioma

Benign Epithelial Tumors 370
Papillomas 370
Basal Cell Papilloma
Mucosal Papilloma
Papilloma of Glandular Excretory Ducts
Urothelial Papilloma
Adenomas 370
Solid Adenoma
Tubular Adenoma
Villous Adenoma
Cystadenoma
Fibroadenoma

Malignant Epithelial Tumors 372
Squamous Cell Carcinoma 372
Highly Differentiated Forms
Undifferentiated Forms
Adenocarcinoma 372
Highly Differentiated Forms
Moderately Differentiated Forms
Mucigenous Carcinomas
Urothelial Carcinoma 372
Papillary Urothelial Carcinomas
Solid Urothelial Carcinomas

Carcinomas of Specific Organs 374
Prostatic Carcinomas
Carcinoma of the Breast
Lung Carcinoma
Colorectal Carcinoma

Dysontogenetic Tumors 382
Teratoma 382
Mature Teratoma
Immature Teratoma
Embryonal Tumors (Blastomas) 382
Neuroblastoma
Medulloblastoma
Retinoblastoma
Nephroblastoma
Embryonal Tumors Arising from Vestigial Tissue 382
Ameloblastoma
Craniopharyngioma
Chordoma
Mesodermal Mixed Tumor

Semimalignant Tumors 384
Basal Cell Carcinoma
Carcinoid Appendix
Ameloblastoma
Chordoma
Craniopharyngioma

23 Generalized Circulatory Disorders

Arterial Hypertension 386
Essential Hypertension 386
Renal Hypertension 386
Renovascular Hypertension
Renoparenchymal Hypertension
Endocrinal Hypertension 388
Cardiovascular Hypertension 388
Neurologic Hypertension 388
Sequelae of Arterial Hypertension 388
Hypertensive Cardiac Hypertrophy
Hypertensive Arteriopathy

Pulmonary Hypertension 390
Primary Pulmonary Hypertension
Secondary Pulmonary Hypertension
Sequelae of Pulmonary Hypertension 390
Chronic Cor Pulmonale
Hypertensive Pulmonary Vascular Disease

Portal Hypertension 392
Sequelae of Portal Hypertension 392
Development of Collateral Circulation
Congenitive Splenomegaly
Ascites

Shock 394

Pathogenetic Forms of Shock 394
Cardiogenic Shock
Hypovolemic Shock
Septic Shock
Anaphylactic Shock
Endocrine Shock
Neurogenic Shock

Hemodynamic Forms of Shock 394
Hyperdynamic Shock Syndrome
Hypodynamic Shock Syndrome

Sequelae of Shock 396
Shock Lung
Shock Kidney
Shock Hepatopathy
Shock Pancreatopathy
Shock Endocarditis
Shock Enteropathy
Shock Encephalopathy
Shock Endocrinopathy

Hemorrhage 398
Bleeding Through Ruptures 398
Weakening of the Vessel Wall
Over-Stretching of Vascular Structures
Diapedesis Bleeding 398
Hemorrhagic Diathesis 400
Osler-Weber-Rendu Disease
Thrombocytopenic Forms
Thrombasthenic Forms
Coagulopathic Forms

24 Localized Circulatory Disorders

Thrombosis 404
Causal Pathogenesis 404
Endothelial Lesion („wall factor“)
Hemodynamic Abnormality („flow factor“)
Hypercoagulability („blood factor“)
Forms of Thrombi 406
Laminated Thrombus (depository Thrombus)
Red Thrombus (stagnation thrombus)
Mixed Thrombus
Hyaline Thrombus
Forms of Thrombosis 408
Venous Thrombosis
Arterial Thrombosis
Cardiac Thrombosis
Sequelae of Thrombosis 408
Recurrent Thrombus
Obliteration of the Vessel
Post-thrombotic Syndrome
Puriform Thrombolysis
Thrombus Calcification
Thromboembolism

Embolism 410
Thromboembolism 410
Venous Thromboembolism
Arterial Thromboembolism
Fat Embolism 412
Traumatic Fat Embolism
Fat Emboli Syndrome
Air Embolism 412
Cholesterol Embolism 412
Amniotic Fluid Embolism 412
Parasite Embolism 412

Arterial Circulatory Disorders 414

Absolute Persistent Ischemia 414
Anemic Infarct
Hemorrhagic Infarct
Absolute Temporary Ischemia 416
Relative Ischemia 416
Acute Temporary Relative Ischemia
Chronic Relative Ischemia

Disorders Associated with Absolute Persistent Ischemia 418
Myocardial Infarction
Anemic Splenic Infarct
Anemic Cerebral Infarction
Anemic Renal Infarct

Venous Hemodynamic Disorders 422

Venous Stasis 422
Associated Disorders 422
Hepatic Congestion
Hemorrhagic Infarct 422
Associated Disorders 422
Hemorrhagic Cerebral Infarction
Mesenteric Infarction

25 Edema

Hydrostatic Edema 424
Cardiac Edema
Portal Edema
Venous Edema
Osmotic Edema

Oncotic Edema 426
Vascular Edema 426
Lymphedema 426
Seguclae of Edema 426
Sclerosis
Dermatopathy
Recurrent Erysipelas
Nodal Vascular Sinus Transformation
Stewart-Treves Syndrome
Cerebral Edema 428
Vasogenic Cerebral Edema
Cytotoxic Cerebral Edema
Interstitial Cerebral Edema
Hyposmotic Cerebral Edema

Index 431