

## Contents

List of Contributors *xiii*

Preface *xiv*

Acknowledgments *xv*

### 1 Pathology of the Eye and Periocular Tissues 1

*Joseph S. Haynes*

Introduction 1

    Prefixation Preparation 1

    Fixation of Eyes for Histopathology 1

    Sectioning 2

    Processing and Staining 2

    Ocular Structure and Development 2

Cornea 3

    General Corneal Reactions to Injury 4

    Developmental and Degenerative Corneal Disease 5

        Corneal Dermoid 5

        Corneal Erosions and Ulcers 5

        Corneal Sequestration 7

        Corneal Endothelial Dystrophy and Mineralization 8

        Corneal Stromal Dystrophy and Mineralization 8

    Inflammatory Disease of the Cornea 8

        Keratitis 8

        Keratitis sicca 9

        Canine Pannus Keratitis (Chronic Superficial Keratitis) 10

        Feline Herpetic Keratitis 10

        Feline Eosinophilic Keratitis 10

        Mycotic Keratitis 11

        Equine Corneal Stromal Abscess 11

Uvea 11

    General Uveal Reactions to Injury 12

    Developmental and Degenerative Uveal Disease 13

        Goniodysgenesis and Pectinate Ligament Dysplasia 14

        Persistent Pupillary Membrane 14

        Choroidal Hypoplasia 14

        Hypertensive Vasculopathy 15

    Inflammatory Disease of the Uvea and Ocular 15

        Uveitis 15

        Lymphoplasmacytic Anterior Uveitis 16

Phacoclastic Uveitis/Endophthalmitis	19
Phacolytic Uveitis	19
Equine Recurrent Uveitis	19
Uveitis Due to FIP Coronavirus	19
Canine Uveodermatologic Syndrome (VKH-like Syndrome)	19
Pigmentary Uveitis	20
Endophthalmitis and Panophthalmitis	20
Bacterial Endophthalmitis	22
Ocular Blastomycosis	22
Ocular Cryptococcosis	22
Ocular Coccidioidomycosis	22
Ocular Histoplasmosis	24
Ocular Protothecosis	24
Lens	25
General Lens Reactions to Injury	25
Lens Luxation	25
Developmental and Degenerative Disease of the Lens	25
Microphakia and Aphakia	25
Persistent Pupillary Membrane, Persistent Primary (Hyperplastic) Vitreous, Persistent Posterior Tunica Vasculosa Lentis, and Persistent Hyaloid Artery	26
Cataract	27
Inflammatory Disease of the Lens	28
Phacitis	28
Retina	29
General Retinal Reactions to Injury	30
Developmental and Degenerative Retinal Disease	30
Retinal Dysplasia	30
Lysosomal Storage Diseases	30
Cystic Retinal Degeneration	31
Inherited Retinal Dysplasia and/or Degeneration (Progressive Retinal Atrophy)	31
Nutritionally Induced Retinopathy	32
Toxic Retinopathy	32
Ischemic and Infarctive Retinopathy	33
Glaucoma	33
Sudden Acquired Retinal Degeneration Syndrome	34
Retinal Detachment	35
Inflammatory Disease of the Retina	36
Retinitis	36
Optic Nerve	36
Developmental and Degenerative Disease of the Optic Nerve	36
Hypoplasia of the Optic Nerve and/or Optic Chiasm	36
Axonal Degeneration and Atrophy of the Optic Nerve	36
Cavitation of Optic Disk	36
Canine Ocular Gliovascular Syndrome	37
Inflammatory Disease of the Optic Nerve	37
Optic Neuritis	37
Granulomatous Meningoencephalitis	38
Sclera	38
Developmental and Degenerative Scleral Disease	39
Scleral Ectasia	39
Inflammatory Disease of the Sclera	39
Lymphoplasmacytic Scleritis	39
Nodular Granulomatous Episcleritis and Necrotizing Scleritis	40

Eyelids, Conjunctiva and Retrobulbar Tissues	40
Developmental Disease of the Eyelids	40
Inflammatory Disease of the Eyelids	40
Granulomatous Blepharitis/Meibomian Adenitis	40
Marginal Nodular Blepharitis/Meibomian Adenitis	42
Inflammatory Disease of the Conjunctiva, Membrana Nictitans, and Retrobulbar Tissues	42
Conjunctivitis	42
Nodular Granulomatous Episcleritis/Conjunctivitis	42
Periocular/Retrobulbar Cellulitis/Abscess	42
Neoplasia of the Eye and Periocular Tissues	43
Neoplasia of the Cornea	43
Neoplasia of the Uvea	45
Intraocular Melanoma and Uveal Melanocytosis	45
Iridociliary Tumors	45
Anterior Uveal Sarcoma of Blue-Eyed Dogs	46
Intraocular Osteosarcoma	46
Intraocular Adenocarcinoma (Malignant Mixed Tumor)	48
Lymphoma	48
Neoplasia of the Lens	50
Trauma-Induced Intraocular Sarcoma of Cats	50
Neoplasia of the Retina	50
Neoplasia of the Eyelids	50
Palpebral Melanocytoma and Malignant Melanoma	50
Squamous Cell Carcinoma	50
Squamous Papilloma	50
Meibomian Gland Tumors	52
Neoplasia of the Conjunctiva and Membrana Nictitans	52
Squamous Cell Carcinoma	52
Adenocarcinoma of Gland of Third Eyelid (Membrana Nictitans)	54
Epibulbar Melanoma	54
Neoplasia of Retrobulbar Tissues	54
Retrobulbar Meningioma	54
Retrobulbar Peripheral Nerve Sheath Tumor	55
Lymphoma	55
Adenoma/Adenocarcinoma of Lacrimal Gland or Zygomatic Salivary Gland	55
Canine Orbital Lobular Adenoma	57
References and Additional Readings	57

## 2 Pathology of the Bones and Joints 59

*Joseph S. Haynes*

Introduction 59

Specimen Preparation, Fixation, and Demineralization 59

Bone Structure and Physiology 60

Development of Bone and Cartilage 61

Basic Reactions of Bone to Injury 62

    Hypoplastic/Dysplastic Bone Growth 62

    Loss of Bone 63

    Excessive Production of Bone 63

    Osteonecrosis 64

    Inflammation of Bone 65

    Neoplasia of Bone 68

Joint Structure and Physiology 68

Basic Reactions of Joints to Injury 68

Degenerative Changes in Articular Cartilage	69
Inflammation of Articular Cartilage and Chondronecrosis	70
Inflammation of the Synovial Membrane and Joint Capsule	71
Diseases of Bone	72
Developmental Disorders and Anomalies	72
Osteochondrosis	72
Physeal Dysplasia in Cats	73
Chondrodysplasia	73
Osteochondromatosis (Multiple Cartilaginous Exostoses)	73
Hyperostotic Diseases of Bone	74
Hypertrophic (Pulmonary) Osteopathy	74
Canine Hepatozoonosis	74
Hyperostoses of Nutritional Origin	74
Hyperostoses of Unknown Cause	74
Inflammatory Diseases of Bone	75
Osteomyelitis Caused by Bacterial Infection	75
Osteomyelitis Caused by Fungal Infection	76
Canine Metaphyseal Osteopathy (Canine Hypertrophic Osteodystrophy)	76
Osteonecrosis and Bone Infarction	77
Necrosis of the Femoral Head and Legg–Calvé–Perthes Disease	77
Bone Infarction	77
Neoplasia of Bone	78
Osteoma	78
Osteosarcoma	78
Chondroma	80
Chondrosarcoma	82
Multilobular Tumor of Bone	82
Osteochondroma	83
Giant Cell Tumor	83
Multiple Myeloma	83
Chordoma	84
Hemangiosarcoma	84
Ossifying Fibroma	84
Diseases of Joints	85
Osteochondrosis Dissecans	85
Infectious Arthritis due to Bacteria	86
Lyme Disease	86
Autoimmune and Immune-Mediated Arthritis	86
Chronic Osteoarthritis	86
Neoplasms of Joints	87
References and Additional Readings	89

### 3 Pathology of the Skin 90

*Joseph S. Haynes*

Introduction	90
Specimen Preparation and Fixation	90
Basic Reactions of Skin to Injury	90
Inflammation of the Skin: Dermatitis	90
Microscopic Patterns of Cutaneous Inflammation	91
Acute Dermatitis	91
Chronic Dermatitis	94
Abnormal Keratinization	95

Alopecia	96
Abnormal Pigmentation	96
Diseases of the Skin	96
Developmental Disorders and Anomalies of the Skin	96
Ichthyosis	96
Primary Seborrhea	96
Hyperplastic Dermatoses of the West Highland White Terriers	97
Zinc Responsive Dermatoses	97
Black-Hair Follicular Dysplasia and Color Mutant Alopecia	98
Collagen Dysplasia	98
Degenerative, Atrophic, and Necrotizing Diseases of the Skin	99
Endocrine-Related Disease	99
Superficial Necrolytic Dermatitis	100
Toxic Epidermal Necrolysis	101
Cutaneous Infarction	101
Inflammatory Diseases of the Skin	101
Allergic Skin Diseases	101
Feline Miliary Dermatitis	103
Autoimmune Skin Diseases	107
Bacterial Skin Disease	111
Pyoderma	112
Nocardiosis and Actinomycosis	112
Fungal Skin Disease	112
Dermatophytosis	112
Additional Fungal Skin Disease	112
Parasitic Skin Disease	113
Demodectic Mange	113
Sarcoptic and Notoedric Mange (Scabies)	115
Cutaneous Habronemiasis	116
Miscellaneous Inflammatory Skin Diseases	116
Acral Lick Dermatitis	116
Chronic Otitis Externa	117
Pyogranulomatous Panniculitis	117
Sebaceous Adenitis	117
Neoplasms and Cystic Lesions of the Skin	117
Epithelial Neoplasms	117
Squamous Papilloma	117
Inverted Viral Squamous Papilloma	119
Cutaneous Horn	119
Canine and Feline Viral Plaque	119
Actinic Keratosis	119
Squamous Cell Carcinoma	120
Squamous Cell Carcinoma	121
Basosquamous Carcinoma	124
Infundibular Keratinizing Acanthoma (Intracutaneous Cornifying Epithelioma)	124
Subungual Keratoacanthoma	125
Trichoblastoma (Basal Cell Tumor)	125
Trichoblastoma	125
Trichoepithelioma	125
Pilomatricoma	129
Apocrine Gland Tumors	131
Anal Sac Apocrine Adenocarcinoma	132

Ceruminous Gland Tumors	133
Sebaceous Gland Tumors	133
Hepatoid/Perianal Gland Tumors	135
Eccrine Gland Tumors	135
Melanotic Tumors	137
Mesenchymal Neoplasms	138
Canine Soft Tissue Sarcomas	138
Equine Sarcoid	140
Feline Sarcoid	141
Canine Keloidal Fibroma	141
Feline Giant Cell Sarcoma	141
Feline Vaccination Site Sarcoma	141
Cutaneous Hemangioma and Hemangiosarcoma	141
Round Cell Neoplasms and Reactive Proliferations	143
Cutaneous Lymphoma	143
Cutaneous Histiocytic Diseases	143
Canine Persistent and Recurrent Cutaneous Histiocytomas	144
Cutaneous Plasmacytoma	148
Canine Cutaneous Mast Cell Tumors	148
Canine Subcutaneous Mast Cell Tumors	151
Feline Cutaneous Mast Cell Tumors	151
Equine Cutaneous Mast Cell Tumors	151
Other Masses, Cysts, and Cyst-like Structures	153
Follicular Cyst	153
Infundibular Cyst	153
Isthmus Cyst	154
Matrical Cyst	154
Hybrid Cyst	154
Dermoid Cyst	155
Apocrine Gland Cyst	155
Canine Apocrine Cystomatosis	156
Feline Ceruminous Cystomatosis	156
Calcinosis Circumscripta	156
Follicular Hamartoma	156
Fibroadnexal Hamartoma	156
Collagenous Hamartoma	158
Acrochordon (Skin Tag)	158
References and Additional Readings	159

#### **4 Pathology of the Male Reproductive System** 160

*Michael J. Yaeger*

Prostate	160
Introduction	160
Developmental and Degenerative Diseases	160
Prostatic Hypoplasia/Atrophy	160
Prostatic Hyperplasia/Hypertrophy	160
Prostatic Cysts	162
Prostatic Squamous Metaplasia	162
Prostatic Inflammatory Diseases	162
Acute and Chronic Bacterial Prostatitis	162
Prostatic Abscessation	163
Prostatic Neoplasia	163

Prostatic Adenocarcinoma	164
Prostatic Transitional Cell Carcinoma	164
Testes and Epididymis	164
Developmental and Degenerative Diseases	166
Testicular Hypoplasia	166
Testicular Atrophy/Degeneration	166
Testicular and Epididymal Inflammatory Disease	166
Infectious Orchitis and Epididymitis	166
Spermatocele and Sperm Granulomas	167
Testicular Neoplasia	167
Sertoli Cell Tumors	169
Seminoma	169
Interstitial Cell (Leydig) Tumor	169
Biologic Behavior of Canine Testicular Tumors	171
Feline Testicular Tumors	171
Equine Testicular Tumors	171
Penis and Prepuce	171
Introduction	171
Developmental and Degenerative Diseases	172
Inflammatory Diseases	172
Balanitis, Posthitis and Balanoposthitis	172
Neoplastic Diseases	172
Equine Penile Neoplasia	172
Equine Penile Squamous Cell Carcinoma	173
Equine Penile Sarcoid	173
Equine Penile Melanoma	173
Bovine Penile Fibropapilloma	174
Canine Penile Papilloma	174
Canine Transmissible Venereal Tumor	174
References and Additional Readings	176

## 5 Pathology of the Female Reproductive System 178

*Michael J. Yaeger*

Ovaries	178
Introduction	178
Developmental and Degenerative Diseases	178
Ovarian Cysts	178
Ovarian Inflammation	179
Oophoritis and Salpingitis	179
Ovarian Neoplasia	179
Germ Cell Tumors/Dysgerminoma and Teratoma	180
Dysgerminoma	180
Teratoma	181
Sex Cord-Stromal Tumors	181
Epithelial Tumors	182
Uterus and Vagina	183
Introduction	183
Developmental and Degenerative Diseases	184
Endometrial Hyperplasia/Cysts	184
Serosal Inclusion Cysts	184
Cystic Endometrial Hyperplasia	184
Pseudoplacental Endometrial Hyperplasia	184

Adenomyosis	185
Subinvolution of Placental Sites	185
Uterine Inflammation	186
Endometritis, Metritis, Perimetritis, and Pyometra	186
Endometrial Biopsies	186
Uterine and Vaginal Neoplasia	189
Endometrial Polyps	189
Uterine Tumors	189
Vaginal and Vulvar Tumors	190
Mammary Gland	191
Introduction	191
Developmental and Degenerative Diseases	191
Feline Mammary Fibroadenomatous Hyperplasia	191
Mammary Duct Ectasia and Hyperplasia	191
Inflammatory Disease	192
Mastitis	192
Mammary Neoplasia	192
Rat Mammary Neoplasia	192
Fibroadenoma	192
Canine Mammary Neoplasia	193
Mammary Adenoma and Complex Mammary Adenoma (Mixed Tumor)	193
Malignant Mammary Neoplasia	194
Mammary Adenocarcinoma, Sarcoma, and Carcinosarcoma	194
Feline Mammary Neoplasia	196
Feline Mammary Carcinoma/Adenocarcinoma	197
References and Additional Readings	197
<b>Index</b>	<b>199</b>