

Contents

Contributor Names and Affiliations xx

About the Editors xxiii

Preface xxvii

Acknowledgments xxviii

Part I Performing the Physical Examination of Horses 1

1 Setting the Stage: Observing and Understanding Equine Behavior 3

Gayle Leith and Ryane E. Englar

- 1.1 Feeding Behaviors 4
- 1.2 Social Behaviors 5
- 1.3 Movement Patterns 5
- 1.4 Sleep 6
- 1.5 Abnormal Behaviors 6
 - 1.5.1 Weaving 9
 - 1.5.2 Stall Walking 9
 - 1.5.3 Pawing 10
 - 1.5.4 Oral Stereotypy 11
 - 1.5.5 Sleep and Rest Disturbances 13
- 1.6 Concluding Thoughts 13
- References 13

2 Safe Methods by Which to Approach and Restrain the Equine Patient 17

Gayle Leith and Ryane E. Englar

- 2.1 Assessing Fear, Anxiety, and Stress and Making Patient-Specific Determinations About Next Steps 17
- 2.2 Approaching the Horse 19
 - 2.2.1 Attending to Flight Zones 19
 - 2.2.2 The Approach 20
- 2.3 Haltering a Horse 20
 - 2.3.1 Types of Halters 20
 - 2.3.2 Approaching the Horse to Halter 23
 - 2.3.3 Fitting the Halter 25
- 2.4 Interacting with the Haltered Horse: First Impressions 26
- 2.5 Leading the Haltered Horse 27
- 2.6 Tying a Horse 28
 - 2.6.1 Tying a Quick Release Knot 28
 - 2.6.2 Using Crossties 29
- 2.7 Additional Restraint 29
 - 2.7.1 Neck Roll or Twitch 29

- 2.7.2 Twitching the Upper or Lower Lip 29
- 2.7.3 Ear Twitch 32
- 2.7.4 Rope or Chain Restraint 32
- 2.8 Picking Up the Front Legs 38
- 2.9 Picking Up the Hind Legs 38
- 2.10 Releasing the Horse 39
- 2.11 Summary of Key “Take Away” Concepts for Working with and Around Horses 41
- References 41

3 Assessing the Big Picture: The Equine Body, Skin, Coat, Coat Colors, and Markings 42

Gayle Leith and Ryane E. Englar

- 3.1 Clinical Anatomy and Practical Terminology 42
- 3.2 Body Conformation 46
- 3.3 Assessing the Equine Body Condition Score (BCS) 47
- 3.4 Weight and Height Estimations 51
- 3.4.1 Body Weight 53
- 3.4.2 Height of the Equine Patient 54
- 3.5 Introduction to Breeds of Horses 55
- 3.6 Equine Identification via Natural Markings 57
- 3.6.1 Coat Color 58
- 3.6.2 Markings 68
- 3.6.3 Chestnuts 72
- 3.7 Equine Identification via Acquired Markings 75
- 3.7.1 Pin Firing 76
- 3.7.2 Tattoos 77
- 3.7.3 Branding 78
- 3.7.4 Microchips 81
- 3.8 Assessing the Coat and Skin 82
- 3.8.1 Sun-Induced Dermatoses 83
- 3.8.2 Cutaneous Habronemiasis 83
- 3.8.3 Dermatophilosis 84
- 3.8.4 Cutaneous Papillomas and Equine Aural Plaques 85
- 3.8.5 Atopic Dermatitis 86
- 3.8.6 Anhidrosis 86
- 3.8.7 Cellulitis and Lymphangitis 87
- 3.8.8 Exuberant Granulation Tissue 88
- 3.8.9 Sarcoids 89
- 3.8.10 Squamous Cell Carcinoma (SCC) 90
- 3.8.11 Melanomas 91
- 3.8.12 Pars Pituitary Intermedia Dysfunction (PPID) 91
- 3.9 Assessing the Hooves 93
- 3.10 Concluding Thoughts 97
- References 97

4 Examining the Head, with Emphasis on the Eyes and Ears 99

Gayle Leith and Ryane E. Englar

- 4.1 Introduction to the Structures of the Equine Head 99
- 4.2 The Eyes and Ocular Adnexa 104
- 4.2.1 Systematic Approach to the Eye Exam in Horses 105
- 4.2.2 Upper and Lower Palpebrae and the Third Eyelid 107
- 4.2.3 Conjunctiva 110
- 4.2.4 Tear Film and the Nasolacrimal Drainage System 111
- 4.2.5 The Orbit and Globe Position, Globe Size, and Ocular Alignment 113

4.2.6	Sclera, Limbus, and Cornea	116
4.2.7	Anterior Chamber	118
4.2.8	Iris and Pupil	118
4.2.9	Lens	121
4.2.10	Fundoscopy	122
4.2.10.1	Direct Ophthalmoscopy	123
4.2.10.2	Indirect Ophthalmoscopy	124
4.2.11	Assessing Vision: The Neuro-ophthalmic Exam	125
4.3	Examination of the Ears	127
4.4	Nose and Nostril Examination	130
4.5	The Vibrissae	131
4.6	Introduction to the Oral Cavity	131
4.6.1	Mucous Membrane Color and Capillary Refill Time (CRT)	132
4.6.2	Examination of the Oral Cavity, with Emphasis on Dentition and the Periodontium	133
4.6.3	The Lip Commissures	134
4.6.4	The Tongue	134
4.7	Concluding Thoughts	136
	References	136

5 Examining the Cardiovascular, Respiratory, and Lymphatic Systems of the Equine Patient 138

Gayle Leith and Ryane E. Englar

5.1	Patient History	139
5.2	Observation of the Equine Patient Prior to Handling	139
5.3	Assessment of Mucous Membrane Color and Capillary Refill Time (CRT)	140
5.3.1	Mucous Membranes	140
5.3.2	Mucous Membrane Moisture	142
5.3.3	Capillary Refill Time (CRT)	142
5.4	Digital Palpation of Arterial Pulse	143
5.5	Assessment of Jugular Pulses	144
5.6	Cardiothoracic Auscultation	145
5.6.1	Recalling the Cardiac Cycle	145
5.6.2	Listening for Normal Heart Sounds: The Role of Auscultation and the Stethoscope	146
5.6.3	Abnormal Heart Sounds	149
5.6.4	Arrhythmias	150
5.6.5	In-Depth Auscultation of the Heart	150
5.7	Respiratory Assessments	151
5.7.1	History-Taking in Preparation for the Respiratory Exam	151
5.7.2	Observation of the Equine Patient Prior to the Respiratory Exam	154
5.7.3	The Upper Airway	156
5.7.3.1	Nostrils	156
5.7.3.2	Nasal Cavity	157
5.7.3.3	Paranasal Sinuses	157
5.7.3.4	Pharynx	161
5.7.3.5	Guttural Pouches	161
5.7.3.6	Larynx and Epiglottis	163
5.7.4	Lower Airway Examination	164
5.7.4.1	Percussion	166
5.7.4.2	Ultrasonography and Radiography	167
5.8	The Lymphatic System	167
5.8.1.1	Submandibular Lymph Nodes	168
5.8.1.2	Retropharyngeal Lymph Nodes	168
5.9	Concluding Thoughts	171
	References	171

6 Examining the Alimentary Tract of the Equine Patient 173

Gayle Leith and Ryane E. Englar

- 6.1 Overview of the Digestive Tract 173
- 6.2 Patient-Specific Considerations: Why Signalment and Geographical Residence Matter? 177
- 6.3 Taking a Patient History 178
- 6.4 Vital Signs 181
- 6.5 External Exam of Head and Teeth 181
- 6.6 Intraoral Dental Examination 182
 - 6.6.1 Dental Formulas 182
 - 6.6.2 Tooth Eruption Schedules 185
 - 6.6.3 Directional Terminology 185
 - 6.6.4 Dental Spacing 186
 - 6.6.5 Tooth Anatomy 187
 - 6.6.6 Types of Teeth in Greater Detail 188
 - 6.6.7 Aging Horses 190
 - 6.6.8 Normal Wear 192
 - 6.6.9 Abnormal Wear 192
- 6.7 Beyond the Oral Cavity 196
- 6.8 The Rectal Examination 198
- 6.9 Concluding Thoughts 201
- References 201

7 Equine Musculoskeletal and Lameness Exams 203

Lara Shreve

- 7.1 Introduction 203
- 7.2 Pertinent Medical History 203
- 7.3 Observation from Afar 204
- 7.4 Palpation for Symmetry, Swellings, and Pain Responses 205
- 7.5 Gait Analysis and Grading Lameness 208
- 7.6 Incorporating Hoof Testers into the Exam and Checking for a Digital Pulse 210
- 7.7 Distal Limb Palpation 213
- 7.8 Flexion Tests 216
 - 7.8.1 Forelimb Flexion Tests 218
 - 7.8.2 Hindlimb Flexion Tests 218
- 7.9 Perineural Anesthesia 219
 - 7.9.1 Forelimb Blocks 220
 - 7.9.2 Hindlimb Blocks 223
- 7.10 Intravenous Anesthesia 224
- 7.11 Diagnostic Imaging 224
- References 224

8 Examining the Nervous System of the Horse 226

Gayle Leith and Ryane E. Englar

- 8.1 Geographic Location Provides Foundational Knowledge and Prioritizes Differentials 226
- 8.2 The Role of Patient Signalment, Patient History, and Client Observations 227
- 8.3 First Impressions: The Neurologic Horse 228
- 8.4 Key Considerations When Examining the Neurologic Horse 229
- 8.5 Localizing the Lesion 230
- 8.6 The Neurologic Exam 232
 - 8.6.1 The Static Component of the Neurologic Exam 232
 - 8.6.2 The Dynamic Component of the Neurologic Exam 247
- 8.7 Pelvic Limb Movement Disorders Unrelated to Musculoskeletal Lameness or Proprioceptive Ataxia 250

8.8	Concluding Thoughts	250
	References	250
9	The Reproductive Exam in the Mare	252
	<i>Sarah Eaton</i>	
9.1	Reasons for Reproductive Tract Evaluation in the Mare	252
9.2	Practitioner Safety	252
9.3	Patient Preparation and Safety	253
9.4	Equipment Preparation	254
9.5	Anatomy of the Mare	257
9.6	Evaluation of the Nonpregnant Mare	258
9.6.1	Ovaries	259
9.6.2	Ovarian Tube/Oviduct	259
9.6.3	Uterus	259
9.6.4	Cervix	260
9.6.5	Vestibule and Vagina	261
9.6.6	Broad Ligament	261
9.7	Transrectal Ultrasonography	261
9.7.1	Ovaries	262
9.7.2	Oviduct	262
9.7.3	Uterus	262
9.7.4	Cervix	265
9.7.5	Vagina and Vestibule	265
9.8	Evaluation of the Pregnant Mare	265
9.8.1	Transrectal Palpation	265
9.8.2	Transrectal Ultrasonography	266
9.8.3	Transabdominal Ultrasonography	266
9.9	Vaginal Examination	267
9.10	The Mammary Glands	269
9.11	Conclusion	271
	References	271
10	The Reproductive Exam in the Gelding and Stallion	272
	<i>Sarah Eaton</i>	
10.1	Reasons for Performing a Reproductive Examination	272
10.2	Practitioner Safety	272
10.3	Patient Preparation and Safety	275
10.4	Equipment Preparation	276
10.5	Anatomy of the Male Reproductive Tract	277
10.6	External Examination of the Male Reproductive Tract	279
10.7	Internal Examination of the Male Reproductive Tract	281
10.8	Ultrasonography of the Male Reproductive Tract	281
10.9	Semen Evaluation	283
10.10	Conclusion	283
	References	283
11	Examination of the Neonate	284
	<i>Sarah Eaton</i>	
11.1	Reasons for Performing a Neonatal Examination	284
11.2	Practitioner and Patient Safety	284
11.3	Equipment Preparation	286
11.4	Examination Basics	286

11.4.1	The Head and Mouth	287
11.4.2	Ophthalmic Examination	288
11.4.3	The Axial Skeleton	289
11.4.4	The Cardiovascular System	289
11.4.5	The Respiratory System	291
11.4.6	The Gastrointestinal Tract	291
11.4.7	The Umbilicus	292
11.4.8	The Urogenital Tract	293
11.4.9	The Appendicular Skeleton and Musculoskeletal System	294
11.4.10	The Neurological System	295
11.4.11	The Integument	296
11.5	Examination of the Placenta	297
11.6	Conclusion	299
	Resources Consulted	300

12 Basic Clinical Procedures in Equine Practice 301

Gayle Leith, Sarah Eaton, and Ryane E. Englar

12.1	Blood Collection	301
12.2	Administration of Medications	305
12.2.1	Oral Medication Administration	306
12.2.2	Injectable Medication	307
12.2.3	Intravenous (IV) Injection	308
12.2.4	Intramuscular (IM) Injection	311
12.3	Intravenous Catheter – Placement and Maintenance	313
12.4	Nasogastric Intubation	319
12.5	Abdominocentesis	323
12.6	Tracheostomy	325
12.7	Dental Exam and Odontoplasty (Floating)	329
12.8	Diagnostic Anesthesia as a Key Component of the Lameness Exam	331
12.9	Microchip Insertion	336
12.10	Nasopharyngeal Sampling	340
12.11	Transtracheal Wash (TTW)	341
12.12	Ophthalmic Procedures	343
12.13	Placement of the Subpalpebral Lavage System	347
12.14	Sheath Cleaning	347
12.15	Equine Euthanasia	350
12.16	Concluding Thoughts	354
	Resources Consulted	355

13 Indications for Referral in Equine Practice 357

Gayle Leith and Ryane E. Englar

13.1	Basic Considerations Surrounding Referrals	357
13.1.1	Reasons to Refer and Expectations of rDVMs	357
13.1.2	Expectations of Receiving Veterinarians	360
13.1.3	Barriers to Referral Care	361
13.2	Referral Scenarios	362
13.3	Case-Specific Instances in Which Referral Is Indicated	363
13.3.1	Acute Abdomen	363
13.3.2	Rectal Tear	364
13.3.3	Fractures	364
13.3.4	Dystocia	365
13.3.5	Septic Foals	366

- 13.3.6 Airway Management Following Respiratory Distress 366
- 13.3.7 Complex Neurologic Dysfunction 366
- 13.3.8 Ocular Emergencies 367
- Resources Consulted 367

Part II Performing the Physical Examination of Ruminants 369

14 Setting the Stage: Observing and Understanding Ruminant Behavior 371

Skyler Bentley and Shaun Huser

- 14.1 Insight into Behaviors of Prey Species 371
 - 14.1.1 Group Mentality and Bonds 371
 - 14.1.2 Separation 373
 - 14.1.3 Common Stressors 374
 - 14.1.3.1 Human Stressors 374
 - 14.1.3.2 Predator Stressors 375
 - 14.1.3.3 Environmental Stress 376
 - 14.1.3.4 Confrontation 377
 - 14.2 Behavior and the Exam from a Distance 377
 - 14.2.1 Environment 377
 - 14.2.2 Resources 377
 - 14.2.3 Herd Dynamics 378
 - 14.2.4 Mentation and Gait 378
 - 14.2.5 Body Condition Score (BCS) 379
 - 14.2.6 Grazing Activity 379
 - 14.2.7 Fecal Scoring 379
 - 14.2.8 Presence of Discharge/Respiratory Abnormalities 379
 - 14.2.9 General Signs of Pain or Distress 379
 - 14.2.10 Musculoskeletal Concerns 380
 - 14.2.11 Hair Coat Quality 380
 - 14.3 Behavioral Details that are Species Specific 381
 - 14.3.1 Cattle (*Bos taurus*, *Bos indicus*) 381
 - 14.3.1.1 Industry Overview 381
 - 14.3.1.2 At a Distance 381
 - 14.3.1.3 Close Up 381
 - 14.3.1.4 Social Preferences/Behavior 381
 - 14.3.1.5 Maternal Characteristics 383
 - 14.3.1.6 Reproductive Characteristics 383
 - 14.3.1.7 Aggression 383
 - 14.3.1.8 Stress Signals 384
 - 14.3.1.9 Environmental Preferences 384
 - 14.3.2 Sheep (*Ovis aries*) 384
 - 14.3.2.1 Industry 384
 - 14.3.2.2 At a Distance 385
 - 14.3.2.3 Close Up 386
 - 14.3.2.4 Maternal Characteristics 386
 - 14.3.2.5 Reproductive Characteristics 386
 - 14.3.2.6 Aggression 387
 - 14.3.2.7 Stress Signals 387
 - 14.3.2.8 Environmental Preferences 387
 - 14.3.3 Goats (*Capra aegagrus hircus*) 387
 - 14.3.3.1 Industry 387

- 14.3.3.2 At a Distance 387
- 14.3.3.3 Close Up 388
- 14.3.3.4 Social Preferences and Affiliative Behavior 388
- 14.3.3.5 Maternal Characteristics 389
- 14.3.3.6 Reproductive Characteristics 389
- 14.3.3.7 Aggression 389
- 14.3.3.8 Stress Signals 389
- 14.3.3.9 Environmental Preferences 390
- Resources Consulted 390

15 Safe Methods by Which to Approach and Restrain Ruminants 392

Skyler Bentley and Shaun Huser

- 15.1 Broad Considerations Surrounding Handling 393
 - 15.1.1 Visual Parameters 393
 - 15.1.2 Flight Zone 393
 - 15.1.3 Point of Balance 393
 - 15.1.4 Other Vital Cues from the Handler 394
- 15.2 Broad Environmental Considerations 394
- 15.3 Broad Considerations About On-Site Equipment 395
- 15.4 Broad Considerations Surrounding Biosecurity 395
- 15.5 Species-Specific Considerations 395
 - 15.5.1 Cattle (*Bos taurus*, *Bos indicus*) 395
 - 15.5.1.1 General Considerations and Safety 395
 - 15.5.1.2 Group Movement 396
 - 15.5.1.3 Individual Movement and Restraint 398
 - 15.5.1.4 Considerations for Handling Bulls 401
 - 15.5.1.5 Considerations for Handling Calves 401
 - 15.5.2 Sheep (*Ovis aries*) 402
 - 15.5.2.1 General Considerations and Safety 402
 - 15.5.2.2 Group Movement 402
 - 15.5.2.3 Individual Movement and Restraint 404
 - 15.5.2.4 Considerations for Handling Rams 407
 - 15.5.2.5 Considerations for Handling Lambs 407
 - 15.5.3 Goats (*Capra aegagrus hircus*) 407
 - 15.5.3.1 General Considerations and Safety 407
 - 15.5.3.2 Group Movement 408
 - 15.5.3.3 Individual Movement 408
 - 15.5.3.4 Considerations for Handling Bucks 410
 - 15.5.3.5 Considerations for Handling Kids 410
- Resources Consulted 410

16 Assessing the Big Picture: the Body; the Coat, and the Skin of the Cow, Sheep, Goat, and South American Camelid 412

Bryan Weaver and Leslie Weaver

- 16.1 Cattle 412
 - 16.1.1 Body Condition Scoring in Cattle 413
 - 16.1.1.1 BCS in Beef Cattle 414
 - 16.1.1.2 BCS in Dairy Cattle 415
 - 16.1.2 Examination of the Coat and Skin in Cattle 415
- 16.2 Sheep and Goats 416
 - 16.2.1 Assessing BCS in Sheep and Goats 416

16.3	South American Camelids	417
16.3.1	Body Condition Scoring in South American Camelids	418
17	Examining the Head of the Ruminant, with Emphasis on the Eyes, Ears, Nose, Mouth, and Throat	419
	<i>Brian M. Shoemaker and Dusty W. Nagy</i>	
17.1	The Distance Exam: Lessons in Observation	419
17.2	Personal Protective Equipment (PPE)	421
17.3	Patient Restraint in Preparation for Examining the Head and Neck	421
17.4	Evaluating for Symmetry of the Head and Neck	423
17.5	Assessing the Skin of the Head and Neck	424
17.6	Assessing the Eyes	424
17.7	Assessing the Ears	430
17.8	Assessing the Upper Respiratory Tract	430
17.9	Examining the Oral Cavity	433
17.10	Evaluating the Throat	441
	References	444
18	Examining the Cardiovascular and Respiratory Systems of the Ruminant	445
	<i>Leslie Weaver and Bryan Weaver</i>	
18.1	Introduction	445
18.2	Assessing the Cardiovascular and Respiratory Systems from a Distance	445
18.3	Mentation	446
18.4	Posture	446
18.5	Respiration from a Distance	446
18.5.1	Respiratory Rate	446
18.5.2	Respiratory Rhythm	447
18.5.3	Respiratory Effort	447
18.5.4	Airflow Through the Nares	447
18.5.5	Audible Respiratory Changes	447
18.6	Edema	448
18.7	Assessing Circulation	448
18.7.1	Mucous Membrane Color and Capillary Refill Time (CRT)	448
18.7.2	Circulation to Extremities	449
18.7.3	Assessing Pulses	449
18.8	Auscultation of the Cardiovascular System	450
18.8.1	Heart Sounds and Points of Maximum Intensity (PMI)	450
18.8.2	Heart Rate, Intensity, and Rhythm	450
18.8.3	Murmurs and Other Abnormal Sounds	451
18.8.4	Arrhythmias	451
18.9	Auscultation of the Airway	451
18.9.1	Upper Airway Sounds	452
18.9.2	Lower Airway Sounds	452
18.10	Palpation of the Thorax	454
	Reference	454
19	Examining the Lymphatic System of the Ruminant	455
	<i>Leslie Weaver and Bryan Weaver</i>	
19.1	General Overview of the Ruminant Lymphatic System	455
19.2	Lymph Nodes of the Head	455
19.3	Prescapular Lymph Nodes	457
19.4	Prefemoral Lymph Nodes	458

- 19.5 Supramammary Lymph Nodes 458
- 19.6 Internal Pelvic Lymph Nodes 458
- 19.7 Hemal Lymph Nodes 459
- 19.8 Non-palpable Lymph Nodes 459
- 19.9 Ancillary Assessment of the Lymph Nodes 460
- Resources Consulted 460

20 Examination of the Ruminant Digestive System 461

Stephen Foulke and Wagdy R. ElAshmawy

- 20.1 Digestive System of Ruminants 461
- 20.2 History and Initial Examination 462
- 20.3 Physical Examination 462
 - 20.3.1 Abdominal Silhouette 462
 - 20.3.2 Stance and Body Posture 463
 - 20.3.3 Body Condition Score (BCS) 464
- 20.4 Systematic Examination of the Ruminant's Digestive System 465
 - 20.4.1 Examination of the Head and Neck 465
 - 20.4.2 External Examination of the Abdomen 470
 - 20.4.3 Rectal Examination of the Ruminant 475
- 20.5 Conclusion 479
- Resources Consulted 481

21 Examining the Musculoskeletal System of Ruminants 483

Brian M. Shoemaker and Dusty W. Nagy

- 21.1 General Observations 483
- 21.2 Appropriate Restraint 487
- 21.3 Comprehensive Musculoskeletal Exam 490
- 21.4 Hoof Testers 500
- 21.5 Additional Diagnostics 502
- References 502

22 Examining the Nervous System of the Ruminant 503

Dusty W. Nagy and Brian M. Shoemaker

- 22.1 Signalment and History 503
- 22.2 The Neurologic Examination 504
 - 22.2.1 Mentation 504
 - 22.2.2 Posture 505
 - 22.2.3 Gait 506
 - 22.2.4 Postural Reactions 507
 - 22.2.5 Cranial Nerve Examination 508
 - 22.2.5.1 Eye Position and Movement 510
 - 22.2.5.2 Vision 511
 - 22.2.5.3 Menace Response 511
 - 22.2.5.4 Pupillary Light Reflex (PLR) 511
 - 22.2.5.5 Palpebral Reflex 512
 - 22.2.5.6 Trigeminal Nerve (CN V) 512
 - 22.2.5.7 Facial Nerve (CN VII) 512
 - 22.2.5.8 Vestibulocochlear Nerve (CN VIII) 512
 - 22.2.5.9 Glossopharyngeal (CN IX), Vagus (CN X), and Accessory (CN XI) 513
 - 22.2.5.10 Hypoglossal Nerve (XII) Function 513
 - 22.2.5.11 Corneal Reflex 513
 - 22.2.6 Other Ancillary Neurologic Testing 513
 - 22.2.6.1 Obstacle Test 513

22.2.6.2	Ophthalmoscopic Examination	513
22.2.6.3	Otoscope Examination	513
22.2.7	Spinal Column and Spinal Reflexes	514
22.2.7.1	Panniculus Reflex	514
22.2.7.2	Perineal Reflex	515
22.2.7.3	Withdrawal Test	515
22.2.7.4	Patellar Tendon Reflex	515
22.2.8	Peripheral Nerves	515
22.2.8.1	Brachial Plexus	515
22.2.8.2	Radial Nerve	515
22.2.8.3	Suprascapular Nerve	516
22.2.8.4	Femoral Nerve	516
22.2.8.5	Obturator Nerve	516
22.2.8.6	Sciatic nerve	516
22.2.8.7	Peroneal Nerve	516
22.2.8.8	Tibial Nerve	516
	Resources Consulted	516

23 The Reproductive Exam in the Cow, Ewe, Doe, and Female South American Camelid 518

Jennifer H. Koziol DVM, MS, DACT

23.1	Introduction	518
23.2	Signalment of the Patient	518
23.3	History of the Herd	518
23.4	History of the Individual Female	518
23.5	Observation of the Patient	519
23.6	Examination of the Female Genital System	519
23.7	External Examination of the Female Genital System	519
23.7.1	Perineal Conformation	519
23.7.2	Vulva	519
23.7.3	Vulval and/or Vaginal Discharge	520
23.8	Internal Examination of the Female Genital System	521
23.8.1	Preparing for the Transrectal Examination of the Cow	521
23.8.2	Transrectal Palpation of the Female	522
23.8.3	Transrectal Ultrasound of the Female	523
23.8.4	Findings on Transrectal Examination	523
23.8.5	Cervix by Transrectal Palpation	524
23.8.6	Uterus	524
23.8.6.1	Pregnancy Diagnosis by Transrectal Palpation and Ultrasound	524
23.8.6.2	Pregnancy Diagnosis by Transabdominal Ultrasound	524
23.8.6.3	Uterine Involution	525
23.8.7	Ovaries	525
23.8.7.1	Pathology of the Ovary	525
23.8.7.2	Oviducts	525
23.8.8	Vaginal Examination of the Female	525
23.8.8.1	Vestibule	525
23.8.8.2	Vagina and Cervix	525
23.9	Clinical Signs and Diagnosis of Some Conditions Affecting the Female Genital System in Cattle	526
23.9.1	Freemartin	526
23.9.2	Hydrops Allantois and Amnion	526
23.9.3	Macerated Fetus	526
23.9.4	Mummified Fetus	526
23.9.5	Pyometra	526
23.9.6	Hydrometra	527

- 23.9.7 Metritis 527
- 23.9.8 Endometritis 527
- 23.10 Examination of the Udder 527
- Resources Consulted 528

24 The Reproductive Exam in the Bull, Ram, Buck, and South American Camelid Stud 529

Jennifer H. Koziol DVM, MS, DACT

- 24.1 Introduction 529
- 24.2 Applied Anatomy 529
- 24.3 Signalment of Case 529
- 24.4 History of the Case 529
- 24.5 Clinical Examination of the Male Genital System 530
 - 24.5.1 Full Clinical Examination Including Rectal Examination 530
 - 24.5.1.1 Sheath 530
 - 24.5.1.2 Scrotum 531
 - 24.5.1.3 Spermatic Cords 532
 - 24.5.1.4 Testicles and Epididymis 532
 - 24.5.1.5 Accessory Sex Glands 533
 - 24.5.1.6 Inguinal Rings 534
 - 24.5.1.7 Prepuce 534
 - 24.5.1.8 Penis 534
 - 24.6 Collection of Semen 534
 - 24.7 Evaluation of Semen 535
 - 24.8 Evaluation of Libido and Ability to Perform Intromission 536
 - 24.9 Further Diagnostics 536
 - Resources Consulted 536

25 Examination of the Neonate 537

Dusty W. Nagy and Brian M. Shoemaker

- 25.1 Introduction to Chapter 537
- 25.2 Signalment and History Gathering for the Neonatal Patient 537
- 25.3 Observation of the Neonate at a Distance 538
- 25.4 Approaching the Hands-On Examination of the Neonatal Patient 539
 - 25.4.1 Vital Signs 539
 - 25.4.2 The Head and Associated Vital Structures 539
 - 25.4.3 The Neck and Associated Vital Structures 542
 - 25.4.4 Evaluating the Heart and Assessing for Perfusion 542
 - 25.4.5 The Thoracic Cage: Evaluating Respiration, Rate, and Effort 544
 - 25.4.6 Examining the Abdomen: Auscultation, Percussion, and Palpation 545
 - 25.4.7 Assessing External Genitalia 546
 - 25.4.8 Evaluating the Musculoskeletal System 547
 - 25.4.9 Assessing the Nervous System 547
 - 25.4.10 Examining the Skin and Coat 548
 - Resources Consulted 548

26 Clinical Diagnostic Procedures in Ruminants 550

Philippa (Pippa) Gibbons

- 26.1 Introduction 550
- 26.2 Blood Collection 550
- 26.3 Rumen Fluid Collection 551
- 26.4 Liver Biopsy 553
- 26.5 Urine Collection 558
- 26.6 Urinalysis 559

26.7	Transtracheal Wash and Sampling of the Bronchoalveolar Fluid (BALF)	559
26.8	Deep Nasal Swab	559
26.9	Thoracic Ultrasound	562
26.10	Abdominal Ultrasound	563
26.11	Broad Considerations with Respect to Radiography in Ruminants	564
26.12	Fine Needle Aspiration (FNA)	564
26.13	Necropsy	565
26.14	Fecal Collection	568
26.15	Tissue Collection	569
26.16	Milk Collection	570
26.17	Abdominocentesis	570
26.18	Cerebrospinal Fluid (CSF) Aspiration	571
26.19	Abomasal Aspiration	573
	Resources Consulted	574

27 Indications for Referral 575

Bryan Weaver and Leslie Weaver

27.1	Why Refer?	575
27.1.1	Time	575
27.1.2	Personnel	575
27.1.3	Skillset	575
27.1.4	Facilities	575
27.1.5	Special Equipment	576
27.1.6	Availability of Resources	576
27.1.7	Increased Economic or Sentimental Value	576
27.1.8	Challenging Client	576
27.1.9	Emergency	576
27.2	How to Refer	577
27.2.1	Report the History	577
27.2.2	Describe the Initial Physical Exam	577
27.2.3	Report Basic Laboratory Data	577
27.2.4	Assessment	578
27.2.5	Plan	578
27.3	Typical Referral Cases in Clinical Practice	578
27.3.1	Reproductive – Emergent	578
27.3.1.1	Dystocia	578
27.3.1.2	Pregnancy Toxemia	578
27.3.2	Urinary – Emergent	578
27.3.2.1	Obstructive Urolithiasis	578
27.3.3	Gastrointestinal – Emergent	579
27.3.3.1	Abdominal Distension and Colic (Vagal Indigestion)	579
27.3.3.2	Neonatal Diarrhea	579
27.3.3.3	Small Ruminant Parasitism	579
27.3.4	Reproductive – Non-emergent	579
27.3.4.1	Scrotal Enlargement	579
27.3.4.2	Umbilical Remnant/Hernia	580
27.3.5	Musculoskeletal – Emergent	580
27.3.5.1	Fractures	580
27.3.6	Musculoskeletal – Non-emergent	580
27.3.6.1	Lameness	580

Index 581