

TABLE OF CONTENTS

Equine Neonatal Medicine

List of Contributors

Foreword

Preface

Part I The Newborn Foal 1

Chapter 1 Postpartum Adaptation of the Newborn Foal 3

Section I Fetal Heart Rate and Fetal ECG 3

Section II Fetal Circulation and Cardiorespiratory Transition 8

Section III Maturation of the Lung and the Surfactant System 12

Section IV Onset of Breathing 26

Section V Control of Breathing 32

Section VI Renal Transition from Fetus to Newborn 37

Section VII Newborn Physical Examination 42

Chapter 2 Principles and Theory of Cardiopulmonary Resuscitation (CPR) 51

Chapter 3 The Premature and Dysmature Neonatal Foal 64

Part II Disorders of the Neonatal Foal 79

Neonatal Respiratory System 81

Chapter 4 Embryology and Anatomy of the Respiratory System 81

Chapter 5 Clinical Neonatal Respiratory Physiology 84

Chapter 6 Examination, Therapeutics, and Monitoring of the Respiratory System 90

Section I Physical Examination 90

Section II Thoracic Radiography of the Neonatal Foal	94
Section III Thoracic Ultrasonography of the Neonatal Foal	101
Section IV Advanced Imaging (ct, Mri) of the Neonatal Respiratory System	109
Section V Inhalation Therapy	117
Section VI Ventilator Therapy	126
Chapter 7 Congenital Disorders of the Respiratory System	140
Chapter 8 Respiratory Disorders	153
Section I Disorders of Breathing Pattern in the Neonatal Foal	153
Section II Lower Respiratory Tract Disorders	156
Section III Meconium Aspiration Syndrome	183
Section IV Persistent Pulmonary Hypertension of the Newborn	189
Section V Pneumothorax and Pneumomediastinum	196
Section VI Diaphragmatic Hernias	201
Section VII Miscellaneous Disorders of the Respiratory System	206
Section VIII Nonpulmonary Disease Processes Manifesting as Respiratory Disease	216
Neonatal Cardiovascular System	224
Chapter 9 Embryology and Anatomy of the Heart	224
Chapter 10 Clinical Neonatal Cardiac Physiology	232
Chapter 11 Examination, Therapeutics, and Monitoring of the Cardiovascular System	238
Section I Examination of the Cardiovascular System	238
Section II Echocardiography	244
Section III Advanced Cardiac Monitoring in Foals	259
Section IV Central Venous Pressure	268
Section V Cardiovascular Medications for the Neonatal Foal	273

Chapter 12 Congenital Heart Defects 284

Chapter 13 Cardiovascular Disorders of the Neonatal Foal 315

Section I Arrhythmias 315

Section II Pathophysiology of Shock Syndromes in the Neonatal Foal 323

Section III Catheter- Associated Thrombophlebitis 337

Neonatal Digestive System 343

Chapter 14 Embryology and Anatomy of the Digestive Tract 343

Chapter 15 Examination of the Digestive Tract 351

Section I Physical Examination of the Digestive System 351

Section II Abdominocentesis and Cytologic Evaluation of Peritoneal Fluid 354

Section III Ultrasonographic Examination of the Neonatal Foal Abdomen 357

Section IV Endoscopy of the Digestive Tract 369

Section V Radiography of the Alimentary Tract 374

Section VI Oral Lactose Tolerance Test and Oral Glucose Absorption Test 387

Section VII Liver Biopsy 389

Section VIII Diagnostic Tests and Fecal Analysis in the Neonatal Foal with Diarrhea 391

Section IX Nutritional Support 396

Section X Prokinetic Therapy in Foals 402

Section XI Endotoxemia in the Neonatal Foal 407

Chapter 16 Congenital Disorders of the Equine Gastrointestinal Tract 421

Chapter 17 Gastrointestinal Disorders 436

Section I Causes of Dysphagia in the Neonatal Foal 436

Section II Gastroduodenal Ulcer Syndrome and Ileus in the Foal 442

Section III Enteritis, Colitis, and Diarrhea 451

Section IV Peritonitis 471

Section V Meconium Impaction 482

Section VI Hernias 487

Section VII Intestinal Hyperammonemia 491

Chapter 18 The Acute Abdomen in the Neonatal Foal 495

Chapter 19 Hepatobiliary Diseases 525

Neonatal Endocrine System 543

Chapter 20 Endocrine Physiology in the Neonatal Foal 543

Section I The Hypothalamic- Pituitary- Adrenal Axis and Steroid Hormones 545

Section II Energy and Growth Hormones 556

Section III Thyroid Hormones 563

Section IV Hormones Involved in Blood Pressure and Blood Volume Regulation 567

Section V Hormones Involved in Calcium, Phosphorus, and Magnesium Regulation
573

Chapter 21 Endocrine Disorders in Foals 580

Section I Disorders of the Hypothalamic Pituitary Adrenal Axis and Neurosteroids 582

Section II Disorders of Energy and Growth Hormones 589

Section III Disorders of Thyroid Hormones 594

Section IV Disorders of Hormones Involved in Blood Pressure and Volume
Regulation 599

Section V Disorders of Calcium, Phosphorus, and Magnesium Homeostasis 603

Section VI Diagnosis and Treatment of Endocrine Disorders 611

Neonatal Urinary System 629

Chapter 22 Embryology and Anatomy of the Urogenital System 629

Chapter 23 Clinical Neonatal Renal Physiology 638

**Chapter 24 Examination, Therapeutics, and Monitoring of the Urinary System
644**

Section I Examination of the Urinary System 644

Section II Medications Acting on the Urinary System 654

Section III Renal Replacement Therapies 662

Chapter 25 Congenital Urogenital Disorders 670

Chapter 26 Renal Disorders in Neonatal Foals 676

Chapter 27 Urinary Tract Disorders 684

Neonatal Nervous System 705

Chapter 28 Embryology and Anatomy of the Neonatal Nervous System 705

Chapter 29 Physiology of the Neonatal Nervous System 712

Chapter 30 Examination, Therapeutics, and Monitoring of the Nervous System 724

Section I Neurologic Examination of the Neonatal Foal 724

Section II Cerebrospinal Fluid Collection and Analysis 730

Section III Electrodiagnostics in the Neonatal Foal 734

Section IV Intracranial Pressure Monitoring 739

Section V Medications Acting on the Neonatal Nervous System 741

Chapter 31 Congenital Nervous System Disorders 759

Section I Juvenile Idiopathic Epilepsy 759

Section II Lavender Foal Syndrome 763

Section III Cerebellar Abiotrophy 765

Section IV Deafness in Foals 768

Section V Occipitoatlantoaxial Malformation (oaam) in Foals 770

Section VI Miscellaneous Congenital Disorders of the Nervous System 773

Chapter 32 Nervous System Disorders 784

Section I Infectious and Inflammatory – Bacterial Meningoencephalomyelitis 784

Section II Infectious and Inflammatory – Sarcocystis and Neospora in the Mare and Foal 787

Section III Infectious and Inflammatory – Tetanus in the Neonatal Foal 795

Section IV Toxicities – Neurotoxicities 806

Section V Pathophysiology and Treatment of Central Nervous System Trauma in the Foal 831

Section VI Traumatic Brain and Spinal Cord Injury in the Foal 858

Section VII Metabolic Causes of Neurologic Dysfunction 886

Section VIII Idiopathic – Neonatal Encephalopathy 895

Section IX Idiopathic – Neonatal Epileptic Seizures 915

Section X Idiopathic – Narcolepsy in Foals 919

Section XI Autoimmune – Kernicterus 921

Section XII Nervous System Neoplasia 925

Section XIII Peripheral Nerve Disorders – Nerve Injury Secondary to Dystocia 927

Section XIV Peripheral Nerve Disorders – Botulism 931

Neonatal Musculoskeletal System 940

Chapter 33 Embryology and Anatomy of the Neonatal Musculoskeletal System 940

Chapter 34 Clinical Neonatal Musculoskeletal Physiology 950

Chapter 35 Examination, Therapeutics, and Monitoring of the Neonatal Musculoskeletal System 953

Section I Diagnostic Tests 953

Section II Medications for Intra- Articular and Musculoskeletal Use in the Neonatal Foal 961

Chapter 36 Congenital and Acquired Musculoskeletal Disorders in the Neonatal Foal 976

Chapter 37 Musculoskeletal Disorders 992

Section I Infectious Neonatal Musculoskeletal Disorders 992

Section II Noninfectious Neonatal Musculoskeletal Disorders 1007

Neonatal Integumentary System 1024

Chapter 38 Embryology and Anatomy of the Integument 1024

Chapter 39 Diagnostics, Therapeutics, and Monitoring of Skin Diseases in the Foal 1026

Chapter 40 Congenital and Inherited Skin Disorders 1031

Chapter 41 Skin Disorders in the Neonatal Foal 1043

Neonatal Hematology and Clinical Chemistry 1049

Chapter 42 Development of Hemopoiesis in the Foal 1049

Chapter 43 Evaluation of the Hematopoietic System – Flow Cytometry 1055

Chapter 44 Clinical Chemistry in the Foal 1060

Chapter 45 Hematologic Disorders 1073

Neonatal Immunology & Infection 1089

Chapter 46 Innate Immunity in the Foal 1089

Chapter 47 Humoral Immunity & Transfer of Maternal Immunity 1099

Chapter 48 Cellular Immunity in the Neonatal Foal 1109

Chapter 49 Congenital Disorders of Immunity 1113

Chapter 50 Neonatal Infection 1126

Section I Bacterial Sepsis 1126

Section II Viral Infections 1156

Neonatal Ophthalmology 1178

Chapter 51 Embryology and Anatomy of the Equine Eye 1178

Chapter 52 Ocular Physiology and Vision in the Equine Neonate 1185

Chapter 53 Examination, Diagnostics and Therapeutics of the Neonatal Equine Eye 1197

Chapter 54 Congenital Ocular Abnormalities in the Foal 1214

Chapter 55 Inherited Ocular Disorders 1222

Chapter 56 Acquired Ocular Diseases in Neonatal Foals 1234

General Treatment Principles for the Equine Neonate 1245

Chapter 57 Neonatal Care at the Farm 1245

Chapter 58 Feeding the Neonatal Foal 1259

Chapter 59 Critical Care Techniques in the Neonatal Foal 1268

Section I Foal Restraint and Handling 1268

Section II Sedation of the Neonatal Foal 1272

Section III Nasotracheal and Orotracheal Intubation 1273

Section IV Placement of Nasal Insufflation Tube 1275

Section V Nasogastric Tube Placement 1277

Section VI Intravenous Catheter Selection, Placement, Maintenance, and Monitoring
1280

Section VII Intraosseous Infusion Technique 1287

Section VIII Treatment of Hypothermia 1290

Section IX Direct and Indirect Blood Pressure Measurement 1294

Section X Urinary Catheter Placement 1296

Section XI Arterial and Venous Blood Gas Collection 1300

Section XII Capnography 1302

Section XIII Neonatal Transfusion Therapy 1305

Section XIV Umbilical Care 1312

Section xv Point- of- Care Monitors in Neonatal Medicine 1314

Chapter 60 Special Considerations in Pharmacology of the Neonatal Foal 1320

Chapter 61 Antimicrobial Therapy in the Neonatal Foal 1328

Chapter 62 Fluid Therapy in the Neonatal Foal 1344

**Chapter 63 Nonsteroidal Anti- inflammatory Drugs and Analgesics in the
Neonatal Foal 1358**

Chapter 64 Anesthesia of the Neonatal Foal 1366

Chapter 65 Necropsy Examination and Sample Submission of the Fetus, Fetal Membranes, and Foal 1395

Chapter 66 Special Considerations for the Neonatal Donkey and Mule Foal 1399

Part III The Periparturient Mare 1419

Chapter 67 Colic in the Periparturient Mare 1421

Chapter 68 Cesarean Section 1436

Chapter 69 The High- Risk Pregnancy 1439

Chapter 70 Poor Maternal Behavior, Induction of Lactation, and Foal Grafting 1448

Chapter 71 Maternal Complications Associated with Parturition 1453

Chapter 72 Anesthesia of the Late- Term Mare 1467

Appendix Formulary for Equine Neonatal Medications 1478

Index 1505.