

NEONATAL MEDICINE

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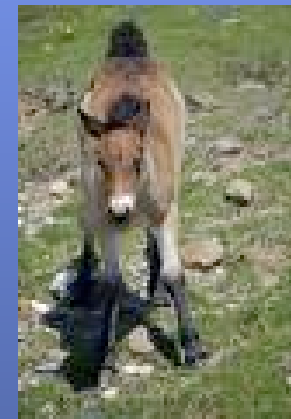
MONTANA EQUINE
MEDICAL & SURGICAL CENTER

The “1 -- 2 -- 3 Rule”

- 1st hour: From “Water” to Delivery
 - Stage 1 Labor: Delivery of the Amnion: 15 minutes
 - Stage 2 Labor: Delivery of the Foal: 15 minutes
- 2nd hour: Delivery to Standing Foal
- 3rd hour: Standing Foal Nurses
Placenta is Delivered (Stage 3)

Pre-Partum Concerns:

- Vaccinations:
 - Pneumabort K: 5, 7, 9th month of gestation
 - E/W/T, West Nile, Flu/Rhino: 10th month
 - To Achieve Best Passive Transfer
 - Maternal Blocking of Antibodies
 - (Intra-Nasal Vaccines Do Not Enter Udder)
 - Ultrasonographic Assessment:
 - 10-14 days pre-partum
 - Fetal Eye, Aortic Root, Thoracic Diameter
 - Heart-Rate SLOWS pre-partum
 - Averages 65-75 bpm
 - Increased variation with activity compared to early gestation
 - Mare Bath: Gentle Soap



Preparation/Supplies

- Mare Preparation + Exam
 - Bath
 - Udder
 - Tailhead, Perineum
 - Milk Test Kits
- Supplies:
 - Towels
 - Hemostats + Scissors
 - 1:4 Nolvasan Solution
 - Chains and Handles,
 - Betadine + J-Lube
 - ET Tube, Ambu Bag, Oxygen
 - Epinephrine, Atropine, Vasopressin, IV Fluids



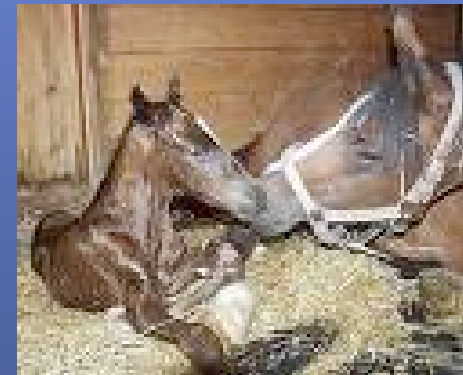
1st Hour

- Delivery of the Amnion is “Stage 1 Delivery”
 - Signals the Beginning of Labor
 - Start your watch
- Delivery of the Foal is “Stage 2 Delivery”
 - 15 minutes from first presentation to delivery
 - Less is more but...
 - Provide assistance if mare is not making progress
 - No more than 2 strong people
 - May pause once head + forelimbs have presented
 - Clean the head
 - Stimulate breathing
 - Oxygen



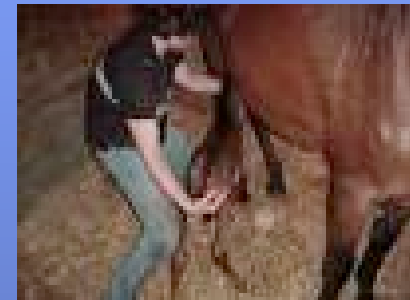
2nd Hour

- Dystocia is a TRUE medical emergency
 - Do Not Delay
- Veterinary Intervention:
 - Evaluation
 - Include determination if C-section is an option
 - Set your Watch: 15 minutes of manipulation
 - Manipulation
 - Tocolytics: Buscopan : 0.3 mg/kg
 - » Duration is 30 minutes
 - Epidural: Lidocaine 0.1 mg/kg
Morphine 0.1-0.3 mg/kg
 - Broad Spectrum Antibiotics
 - Analgesia: NSAIDs
 - Hoist for Repulsion: 15 minutes (if surgery is an option)



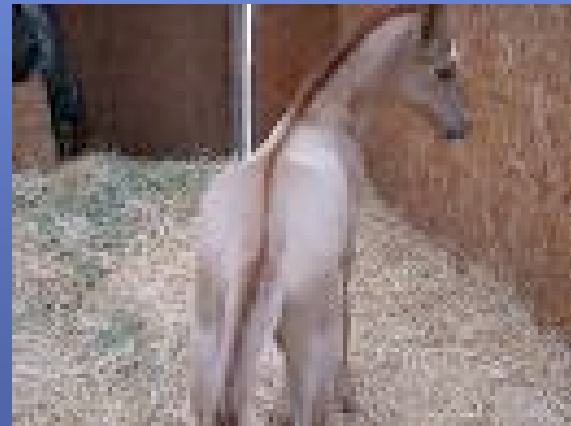
Third Hour

- Passing the Placenta
 - After 6 hours: Emergency
 - Uterine Lavage:
 - Intra-Uterine: Sterile Crystalloids
 - Sterile NG Tube
 - “T-U-R-Y” Cystoscopy Set
 - Intra-Placental: Clean Water
 - Oxytocin
 - 20-40 units IM
 - Infusion: 100-200 units in 1 L (over 30 minutes)
- Suckling: Passive transfer of antibodies
- Specialized crypt cells close in response to ANY ingesta
 - Administration of any milk-like substance will close crypt cells
 - If crypt cells carry bacteria → septicemia
 - If crypt cells close without either antibodies or bacteria → protection
 - This may be value of “powdered colostrum” products
 - Pasteurized goat’s milk decreases risk of septicemia



Routine Assessment

- Every time you enter the stall:
 - Foal should stand + stretch
 - Foal should go to udder
 - Foal should urinate 4x/hr
- Temperature?
 - Unreliable
- Monitoring:
 - Weight
 - Lameness?
 - Lethargy + Appetite
 - Feces?
 - “Foal Heat” Diarrhea
 - Serial Bloodwork
- Palpation:
 - All joints: Esp. hock + stifle joints
 - Umbilicus



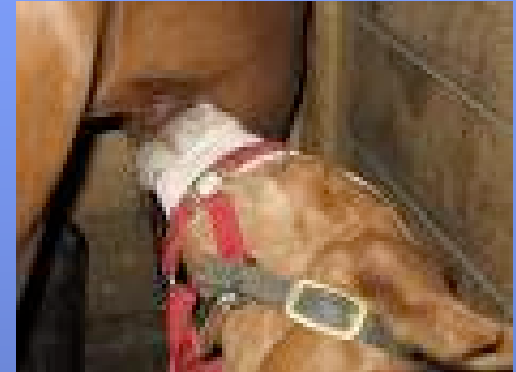
Routine Prevention

- Vitamin E/Selenium to every foal
 - 1 cc IM on Day 1
- Additional Vit E?
 - Dose is debatable
- Umbilical Care
 - 1:4 Nolvasan Solution 2-4x/day for 1 wk
- Nutrition
 - Test your hay
 - Balanced concentrate for mare
 - Junior, Growth Diets



Milk, Milk Replacer

- Bottle vs. Pan-Feeding
 - Aspiration
 - Social Issues
- Volume: 6-8 mg/kg/hr
 - ie 10% B.W. → 5L/day for a neonate
 - Up to 20% B.W. → 10L/day for a neonate
- Calories:
 - 50-100 kcal/kg/day
 - Mare's milk has 0.57 kcal/ml → 4-8L/day
 - Foals suckle 2-3x / hr → 100-150 ml/feeding
 - Tube feeding?
 - 665 ml q2 hrs BUT 1000 ml q3 hrs

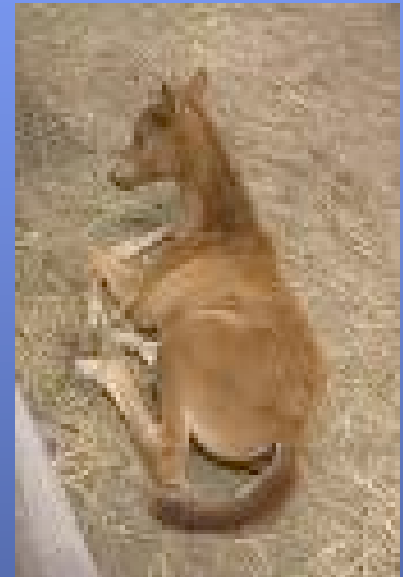


Failure of Passive Transfer

- No protection vs. opportunistic pathogens
- Foal Factors vs Maternal Factors
- Assess at 12-18 hours of age: CITE test
 - SNAP test - “foal-side” testing
 - Target: >800 mg/dL = excellent passive transfer
 - Crypt cells closed by 18 hours (sooner once exposed to ANY ingesta)
 - May still provide antibodies orally
 - Crypt cells may not all be closed
 - Donor colostrum most cost-effective when given early
- Repeat Assessment: Antibodies are consumed during septicemia
- Plasma transfusion is the ideal

IV Fluids

- Neonates require huge volumes of fluids!!
- 75% of BW is water (65% for adults)
- ECF is 38-44% (vs. 22-28% for adults)
- Increased Metabolic Rate
- Decreased Renal Concentrating Ability
 - Kidney Output = 6 ml/kg/hr (ie 65% of total input)
- Total Requirement: 10 ml/kg/hr
- Plus Dehydration
 - % dehydration x B.W.
 - e.g. 5% x 50 kg = 2.5 L
- Plus ongoing losses:
 - Increased if high ambient temperature
 - Increased if reflux, diarrhea
 - Increased if “third space” losses (eg into gut in ileus, into abdomen)



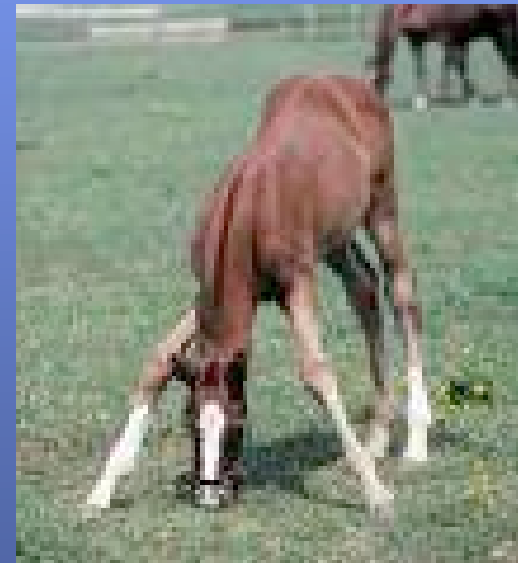
Crystalloids

- Isotonic Crystalloids:
 - LRS, Plasmalyte 148, Norm R
 - Replacement Fluids
 - Osmolarity = Plasma
 - Fluids go equally into plasma, ICF, ECF
 - 1L fluids → 750 ml goes to extravascular space
 - I.e. Just like plasma, without protein
- Hypotonic Fluids:
 - Plasmalyte 56, Norm M
 - Maintenance Fluids
 - Preferentially rehydrate → ICF, ECF
 - Due to osmotic drive



Colloids

- Plasma
 - 1 L raises total protein 0.75 g/dL (if no losses)
 - Balanced colloid:
 - Minimizes coagulopathy
 - Provides Antibodies
 - Duration in circulation?
 - 5-7 days minimum
- Hetastarch
 - Expands plasma volume
 - Synthetic Starch
 - High variability in particle size
 - Dose 2-5 ml/kg
 - Hypocoagulability @ 10 mg/kg
 - Duration in circulation?
 - 3-5 days



Septicemia - treatment

- Risk Factors
 - Placentitis
 - Pre-maturity
 - **Failure of Passive Transfer**
- Diagnostics?
 - CBC/Chemistry may not reveal inflammation
 - Blood Culture
- Treatment
 - Broad Spectrum Antimicrobials
 - Continued Plasma Transfusions
 - Supportive Care

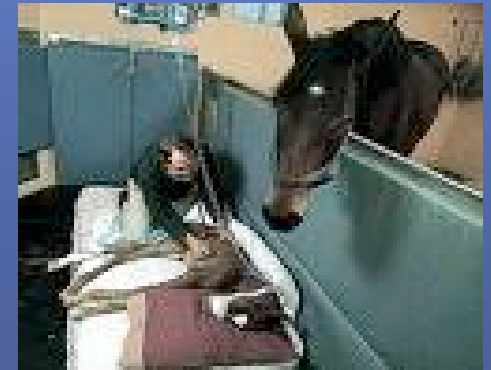


Antibiotics: Routine

- Eg partial failure of passive transfer:
Prophylaxis
- SMZ: 30 mg/kg PO BID
- Doxycycline: 10 mg/kg PO BID
- Chloramphenicol? 50 mg/kg PO TID

Antibiotics: Big Guns

- Beta-Lactams and Cefalosporin
 - K Pen: 22,000 units/kg QID
 - Ampicillin: 10 mg/kg TID-QID
 - Timentin: 50-60 mg/kg QID
 - **Naxcel: 10mg/kg BID**
 - Ceftazidime: 50 mg/kg QID
 - **Imipenem: 10 mg/kg QID**
- Aminoglycosides
 - After rehydration
 - Gentocin: 6.6 - 10 mg/kg
 - **Amikacin: 21-27 mg/kg**
 - Therapeutic Monitoring



Hypoxic/Ischemic Diseases

- “Dummy” foals = Peripartum Asphyxia Syndrome
- Medications
 - Allopurinol – Downregulates Xanthine Oxidase
 - During first 3 days of life (human)
 - 10 m/kg PO BID
 - Vit E -- Free Radical Scavenger
 - 1000 units PO SID
 - Low-dose NSAIDs
 - Ketoprofen: 0.5 -1.1 mg/kg IV BID
 - Mannitol
 - Preferentially recruits fluids from cerebral edema
 - DMSO?
 - Causes severe hypertonicity for 5-7 days
- Any organ system can be affected
 - Gastrointestinal
 - Renal, esp. including bladder
 - Hepatic
 - ****Neurologic****



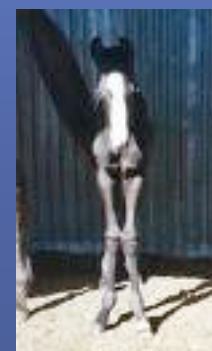
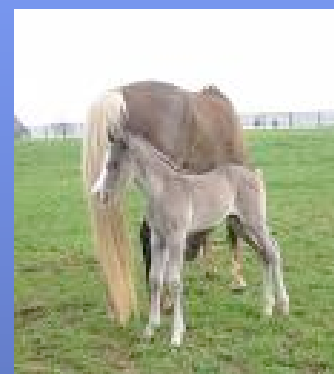
Dysmaturity + Prematurity

- 335-345 days is only an average
- Dysmaturity = term but signs consistent with incomplete maturation in utero
- Clinical Signs, P.E.
 - Domed Forehead
 - Silky Haircoat
 - Tendon Laxity
 - Entropion
 - Epinechium
- Treatment:
 - Supportive Care
 - Broad-Spectrum Antimicrobials
- Radiographic
 - Incomplete ossification



Orthopedic abnormalities

- Flexural Deformities
- Incomplete Ossification
 - Crushing of cartilage model
 - Juvenile arthritis
 - Strict Confinement
 - Time
 - Tildren?
- Contractural Deformities
 - Rest
 - Robert Jones: Reverse Myotactic Response
 - NSAIDs
 - Oxytetracycline: 5 mg/kg once
 - Repeat only as necessary



Ruptured Bladder

- “Dummy” bladder syndrome
- Monitor urine production
 - 6 ml/kg/hr → 300 ml/hr
- Diagnostics:
 - Abdominal U/S
 - Identify Rent
 - Free fluid (mixed echogenicity)
 - Abdominocentesis
 - Total K⁺ concentration
 - Azotemia

Colic Signs

- Gastric Ulceration
 - Ranitidine:
 - Omeprazole: 2.2 mg/kg PO SID
 - Sucralfate: 10 mg/kg PO QID
- Obstructive Diseases
 - Lethal White
 - All white QH may NOT be lethal white
 - Atresia
 - Segmental smooth muscle abnormalities
 - Meconium impactions
 - Acetylcysteine: dose
 - Soapy water enema Gastric ulceration

Clostridial Diseases

- Metronidazole:
 - 10-15 mg/kg PO QID
 - IV if refluxing
 - ?Anti-inflammatory effect
- *C. perfringens*
 - Severe, static distension
 - Flocculent Reflux
 - Septicemia + Septic Shock
- *C. difficile*
 - Antigen: Normally present in Neonates
 - Toxin: Never Normal

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