Neonatal Care of Camelids

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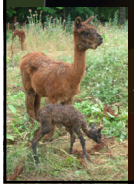
The Normal Cria

- Neonate:
  - Should stand and nurse within 2 to 4 hours
    - usually within 30 to 60 minutes
  - Should nurse colostrum
    - 5 % Body Weight within 12 hours
    - 10 % Body Weight within 24 hours
  - Should nurse 1-4 times per hour



The Normal Cria

- Routine procedures - DAY 1
  - Birth weight
    - Alpacas: > 5.5 kg
    - Llamas: > 9 kg
  - Dam exam
  - Health check
    - T,P,R
    - T 100-102^{0}F, P 60-100 bpm, R 10-30 bpm

The Normal Cria

- Routine procedures - DAY 1
  - Congenital defect check

  - Maturity check
    - 6 erupted incisors
  - Dip Navel
    - 0.5 % chlorhexidine
    - If ligation is required, no more than 1-2 hours and away from body wall

The Normal Cria

- Routine procedures - DAY 2
  - Weigh
    - Alpacas: 0.25 - 0.5 # / day
    - Llamas: 0.5 - 1 # / day
    - Should start gaining by day 3
    - Weigh daily 2-3 weeks
  - Vaccination
    - C,D,&T
  - BVD-PCR

The Normal Cria

- Routine Procedures - Day 2
  - Ig G testing
    - Serum T.P.
      - < 5.0 = FPT
      - 5.0 to 5.5 = Partial FPT
      - > 5.5 = adequate PT
    - IgG by RID or Llama S Test
      - < 600 mg/dl = FPT
      - 600 to 800 mg/dl = Partial FPT
      - > 800 mg/dl = adequate PT

The Normal Cria

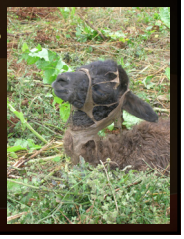
- Routine Procedures – Day > 7
  - Selenium - deficient areas
    - BoSe 0.5 cc
  - Dark Fall and Winter-born crias
    - 1500 - 2000 IU / kg Vitamin D
    - Once is usually enough
    - Never more often than q 60 days

The Abnormal Cria

- High Risk Crias
  - Low birth weight
    - llamas < 7 kg (15.4#)
    - alpacas < 6 kg (13.2#)
  - Premature / dysmature
    - <325 days gestation
  - Dystocia / C-section
  - Unobserved delivery

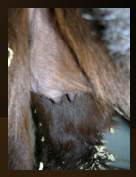
The Abnormal Cria

- High Risk Crias
  - Primiparous dam
  - Poor milk production of dam
  - Environmental extremes
  - Malnutrition of dam



Examination of Ill Crias

- Cria
  - Umbilicus and sites of sepsis
- Dam
  - Attitude
  - General health and BCS
  - Mammary gland
    - Agalactia
      - Nutrition
      - Domperidone 5mL PO q 12 h for 5-10 days
    - Mastitis



Ancillary Diagnostics

- IgG level
- CBC / Serum chemistry
- Blood gas analysis
- Blood culture
- Umbilical ultrasound
- CSF tap
- Radiographs
- Arthrocentesis

Prognostic Indicators for Ill Crias

- Hustace JL et al. Oregon State 2007
  - 65 crias < 60 days old
  - 45 survived, 20 died or were euth.
  - 83 variables recorded
  - Average age at admission
    - 15.1 +/- 18.3d for survivors
    - 17.9 +/- 19.3 days for non-survivors

Prognostic Indicators for Ill Crias

- Hustace JL et al. Oregon State 2007
  - Blood pH, BUN, N:L ratio and serum TP more sig. associated with death than presence or absence of pneumonis, recumbency or degree of mentation
  - Best predicted survival outcome model included blood pH, serum TP and N:L ratio

Treatment of Ill Crias

- Antibiotics
  - Ceftiofur sodium 2 mg/kg IV q 8 h
  - Ampicillin 6-10 mg/kg IV q 8 h
  - Amikacin 4-8 mg/kg q 12 h
  - Gentamicin 5 mg/kg q 24 h
- Antiinflammatories
  - Ketoprofen
  - Flunixin 0.25 mg/kg q 8h

Treatment of Ill Crias

- Parenteral fluids
  - Plasma
    - Give IV, IP?
    - 20-40 mL/kg
    - 5-10 g IgG
  - Synthetic colloids
    - Hetastarch, dextran
  - Crystalloids
    - 80-120 mL/kg/day
    - Bolus q 3-4 h if hypoproteinemic

Plasma Transfusions

- Gerspach C, et al. Ohio State 2007.
  - 39 crias presented for sepsis, FPT, dystocia or hypoxia
  - Pretransfusion
    - 312 +/- 275 mg/dL
  - Posttransfusion (1 unit; ~3039 mg/dL)
    - 939 +/- 746 mg/dL
  - Posttransfusion (2 units; ~6240 mg/dL)
    - 1111 +/- 746 mg/dL
  - Ill crias may need 2 or more units

Hyperosmolar syndrome

- Hyperglycemia
- Hypernatremia
- Hyperosmolarity
- Accompanies stressful event

- IV isotonic fluids, followed by PO hypotonics
- Avoid high glucose, supraphysiologic sodium
- No glucocorticoids

Treatment of Ill Crias

- Nutritional support
  - Illness increases demand for all nutritional components
  - For every 1ºC increase in body temperature, 12% increase in energy used
  - Nutritional supplementation increases wound healing, survival rates post-op and increases recovery from infectious diseases
  - Prevent catabolism

Treatment of III Crias

- Nutritional support
  - Maintenance
    - 50 kcal/kg/day energy + 3 g/kg protein + 80 mL/kg H_2O
  - Sepsis
    - Plan on 150 kcal/kg/day

Treatment of III Crias

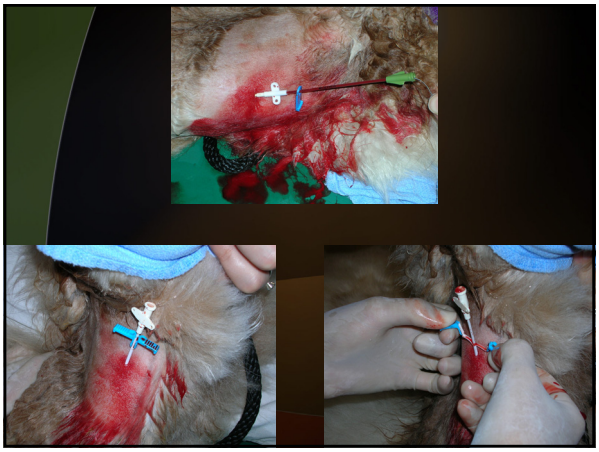
- Nutritional support
  - Enteral nutrition
    - Should be > 98^{0}F, with some evidence of GI motility
    - Colostrum
    - Dam, cow or goat milk
    - Non-medicated kid milk replacer
    - 12-14 french red rubber catheter
    - 10-12% body weight daily

Treatment of III Crias

- Nutritional support
  - Parenteral nutrition
    - PPN
      - 5 mL Vit B complex
      - 200 mL Aminosyn
      - 2.5-5% dextrose
      - 1L Norm R
    - Mix aseptically
      - Amino acid, then lipid, then dextrose, others

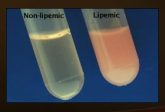
Treatment of Ill Crias

- Nutritional support - Administration
  - 16 gauge, long catheter, aseptically placed
  - Give PPN at 2.5-3% BW for 1st 24h, then increase to 5% (2.25L/day)
  - Flush well or use separate catheter for drugs
  - Add in enteral nutrition



Treatment of Ill Crias

- Nutritional support - Monitoring
  - Examine catheter 3-4x/day
  - PPN and lines changed q 24 hours
  - Evaluate BW daily
  - PCV/TP daily - lipemia?
  - QID vitals
  - U/A
  - Serum electrolytes, creatinine, liver enzymes
  - Blood glucose q 6h
    - Insulin
    - Regular 0.25 u/kg SC
    - Use if BG > 350mg/dL



Treatment of Ill Crias

- Nutritional support - Complications
  - Catheter: thrombosis, sepsis, phlebitis
  - Metabolic: hyper/hypoglycemia, osmotic diuresis, hyperlipemia, azotemia, mineral/vitamin/electrolyte imbalances, under/overhydration
  - When removing from parenteral nutrition, watch for hypoglycemia

Treatment of Ill Crias

- Respiratory support
  - Size 4 ET tube
  - Nasal oxygen - Red rubber catheter
  - Aminophylline
    - Improves respiratory efficiency
    - Stimulates surfactant production
    - 2 mg/kg SC q 4h for 24 hours, increasing time interval over next 2 days

Treatment of Ill Crias

- Respiratory support
  - Surfactant transfer
    - 14 ga needle placed intratracheally in dam
    - Perform TTW with polypropylene catheter and 120 mL saline
    - Inject supernatant intratracheally into cria

Failure of Passive Transfer

- Diagnosis
  - Serum T.P.
    - < 5.0 = FPT
    - 5.0 to 5.5 = Partial FPT
    - > 5.5 = adequate PT
  - IgG by RID
    - < 600 mg/dl = FPT
    - 600 to 800 mg/dl = Partial FPT
    - > 800 mg/dl = adequate PT

Failure of Passive Transfer

- Treatment
  - Colostrum
    - Gut closure begins after first protein meal
    - Must consume within 6 to 12 hours for maximal absorption
  - Plasma
    - IV
    - IP
    - Dose = 5 to 10 grams Ig (~100 to 250 ml)
    - 20-40 mL/kg

Neonatal Diarrhea

- Diarrhea in crias
  - Most common in crias on larger breeding farms
  - Especially Spring and Fall cria crops

Neonatal Diarrhea

- Important cause of morbidity in unweaned crias
- 23% morbidity in one study involving 250 crias over 5 years [Sharpe et al, unpub]
- Intensification ⇒
  ↑exposure to potential pathogens
- Inexperience of breeders to keeping livestock

Common pathogens

- E coli
- Cryptosporidiosis
- Giardiasis
- Coccidiosis
- Salmonella
- Clostridium perfringens
- Nutritional

Neonatal Diarrhea

- *E coli*
  - May be associated with diarrhea of newborns
  - May cause septicemia in FPT neonates
  - Treatment:
    - TLC, hydration
    - Monoclonal antibody ?
  - Prevention:
    - hygiene
    - colostrum ingestion

Neonatal Diarrhea

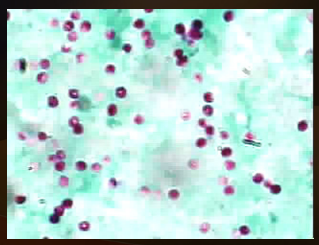
- Cryptosporidium
  - ZOONOTIC
  - 7 to 10 day old neonates
  - Protracted thin pudding
  - Dehydration, electrolyte depletion
  - Weight loss
  - Mostly larger farms
    - Recurrent problem

Neonatal Diarrhea

- Cryptosporidium
  - Test of choice
  - Membrane antigen assay

Neonatal Diarrhea

- Cryptosporidium
  - Faecal smears
  - Modified acid-fast stains



Acknowledgement: Dr Cliff Monahan, OSU

Neonatal Diarrhea

- Cryptosporidium
  - Treatment
    - Electrolyte solution
  - Prevention
    - Hygiene
    - Water filter ?
    - Very resistant in the environment
    - Resistant to disinfectants

Neonatal Diarrhea

- Giardia
  - ZOONOTIC
  - > 14 day old
  - Protracted pudding
  - Weight loss or poor weight gain
  - Diagnosis: Fecal smears, membrane Ag
  - Treatment:
    - Electrolyte solutions
  - Prevention:
    - Hygiene
    - Water filter

Neonatal Diarrhea

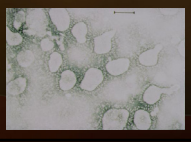
- Clostridium perfringens
  - Type A, C, D
  - Type A seemingly high significance
    - No vaccine in USA
  - Types C and D
    - Vaccinate neonate at 2 days and 2 weeks
    - Vaccinate dam when open or 60 days pre-partum
  - Profuse diarrhea
    - Can be acutely fatal

Neonatal Diarrhea

- Salmonella
  - Any age
  - Severe diarrhea, +/- blood
  - Septicemia
  - Although contagious, usually self-limiting

Neonatal Diarrhea

- Viral etiologies
  - Although Rotavirus and Coronaviruses have been identified, these do not appear to be significant pathogens
  - A Parvovirus was identified in an outbreak of diarrhea in the western USA, but the pathologic significance could not be determined



Neonatal Diarrhea

- Nutritional factors (mainly iatrogenic)
  - Overfeeding
    - >15% BW in 24hours
  - Mixing milk products
  - Rapid changes in content
- Septicemia
- Metabolic disturbances
  - Eg portosystemic shunt

General Treatment of Diarrhea

- Rehydration
  - Oral electrolytes
  - IV fluids +/- dopamine infusion (@2.5µg/kg/min)
- Plasma
  - FPT
- Specific tx as appropriate
- Antibiotics, if indicated
- NSAIDS
- Transfaunation

Additional factors to consider:

- Colostrum management
- Failure to reach a diagnosis and treat properly may result in fatal chronic renal failure
- Herd problems
- Proper diagnostics facilitate herd management
- Vaccines

Septicemia

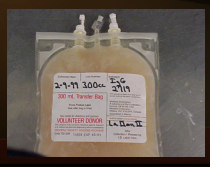
- Potential sequela to failure of passive transfer
- Omphalitis, septic arthritis, hypopyon, meningitis

Septicemia

- Diagnosis
  - Blood culture
  - Hematology: leukopenia with bands
  - Chemistry:
    - Azotemia
    - Acidosis
    - Hypernatremia

Septicemia

- Treatment
  - Broad-spectrum antibiotics
    - Penicillin / gentamicin combination
    - Ceftiofur
  - IV Fluid therapy
    - 0.45% NaCl + 2.5% dextrose
    - Bicarbonate
    - B complex
    - +/- K
  - Plasma transfusion



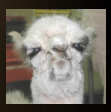
Congenital Diseases

- Relatively common among camelids
  - Genetic bottle neck in SA in 1500's
- Commonly occur in:
  - Musculoskeletal system
  - Reproductive tract
  - Face

Congenital Diseases

- Three proved to be heritable
  - Wry-tail (Jane Vaughan - Australia)
  - Choanal atresia (Brad Smith - Oregon State)
  - Tipped ears (New Zealand)

Congenital Diseases



- Face
  - Maxillofacial dysgenesis
    - Wry-face
    - Concerns for heritability (LaRue Johnson)
  - Choanal atresia
    - Congenital defect proved to be heritable
    - Probably passed by both parents
    - Lethal if not treated
  - Nasolacrimal duct atresia

Congenital Diseases

- Musculoskeletal System
  - Angular limb deformity
  - Vertebral body malformation
    - Hemivertebra, block vertebra, wedge vertebra
  - Appendicular skeleton
    - Tarsocrural dysgenesis
    - Horizontal talus
  - Syndactly
  - Polydactly

Angular Limb Deformity

- Risk factors
  - Prematurity
  - Rickets, macro- and trace minerals
  - Trauma, genetics, poor conformation
  - Monitor closely for angular changes
  - Surgical decision ~ 3-4 months
    - Periosteal stripping
    - Transphyseal bridging
    - Corrective osteotomy

Congenital Diseases

- Reproductive tract
  - Ovarian hypoplasia
  - Segmental aplasia
  - Persistent hymen
  - Double cervix
  - These defects are not obvious and are why we recommend a pre-purchase veterinary examination be done for breeding animals.

Portosystemic Shunt

- Rare
- Chronic ill-thrift + recurrent diarrhea
- Often > 4 months at time of dx
- Liver enzymes normal
- ↑ BA / NH_3
  - Reference range for bile acids
    - >1 yo: 1.1-22.9 umol/L
    - <1 yo: 1.8-49.8 umol/L

Portosystemic Shunt

- Ultrasonography
- Contrast studies
  - Colonic scintigraphy
  - Splenic portography
  - Mesenteric vein portography ***
- Surgical correction may be possible

Umbilical Hernia

- Determine reducibility
- If 2-3 fingers in diameter and reducible, place belly wrap
  - Elastikon and gauze
  - Leave on 2 weeks per treatment
- If complicated or large, surgical intervention

An Epidemiologic Investigation of Morbidity and Mortality in Llama and Alpaca Crias in Ohio

Melanie Sharpe
Thomas Wittum, Ph.D.
David Anderson, D.V.M., M.S.

Primary Health Events

Disease/Problem	Frequency	%
Diarrhea	24	22.9
Umbilical hernia	17	16.2
Unspecified infectious disease	16	15.2
Abscess	10	9.5
Musculoskeletal problem	8	7.7
Parturient hypoxia	7	6.7
Poor growth/not thriving	4	3.8
Respiratory disease	4	3.8
Ophthalmic problems	4	3.8
Listless/lethargy	2	1.9
Dermatologic problem	2	1.9
Severe malformation	2	1.9

Secondary Health Events

Disease/Problem	Frequency	%
Diarrhea	14	31
Respiratory disease	5	11
Abscess	5	11
Umbilical hernia	3	6.7
Dermatologic problem	3	6.7
Ophthalmic problem	3	6.7
Unspecified infectious disease	2	4.4

Difficult Birth

- Those crias who had a difficult birth were 4 times more likely to have morbidity than crias born without a difficult birth (OR=4.0, 95% CI=1.4-14.3)

Season of Birth

- Those crias who were born in the fall were more likely to have morbidity than those crias born in the spring, summer or winter.
- Lowest risk of morbidity was observed among crias born in the spring.
  - (OR=.35, 95% CI=.15-.77)

Conclusions

- Crias born with difficulty may be at higher risk of disease.
- Management to minimize difficult births may result in reduced cria morbidity.
- Crias born in the spring had a lower risk of morbidity.