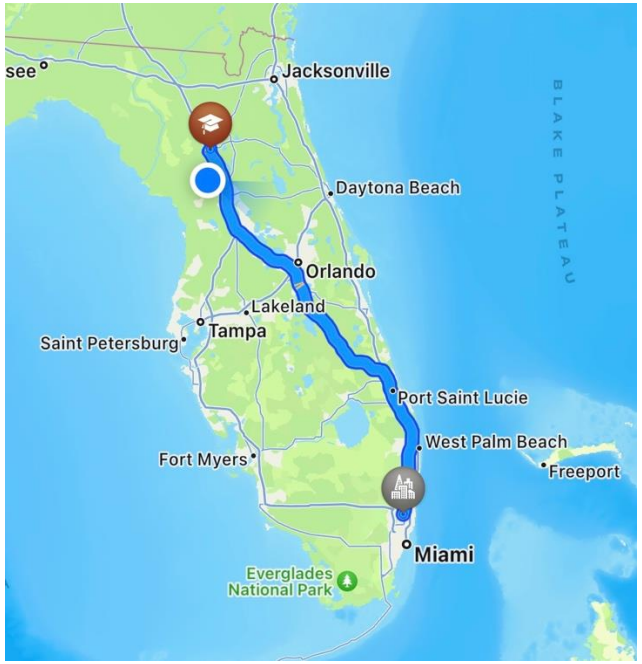
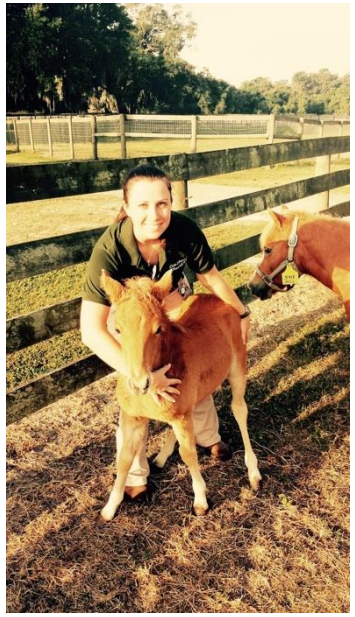
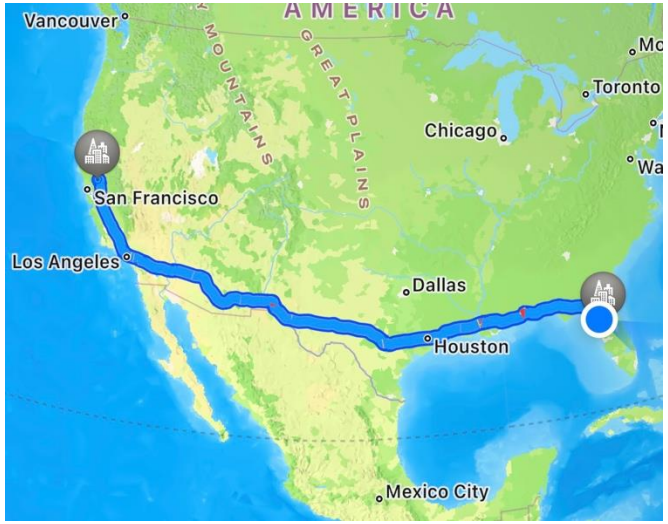
FALA Educational Seminar 2025

Lisa Edwards, DVM, DACVIM, DACVECC



EQUINE MEDICAL CENTER OF OCALA





UC DAVIS
VETERINARY MEDICINE

ACVIM
American College of Veterinary Internal Medicine

ACVECC
American College of Veterinary Emergency & Critical Care

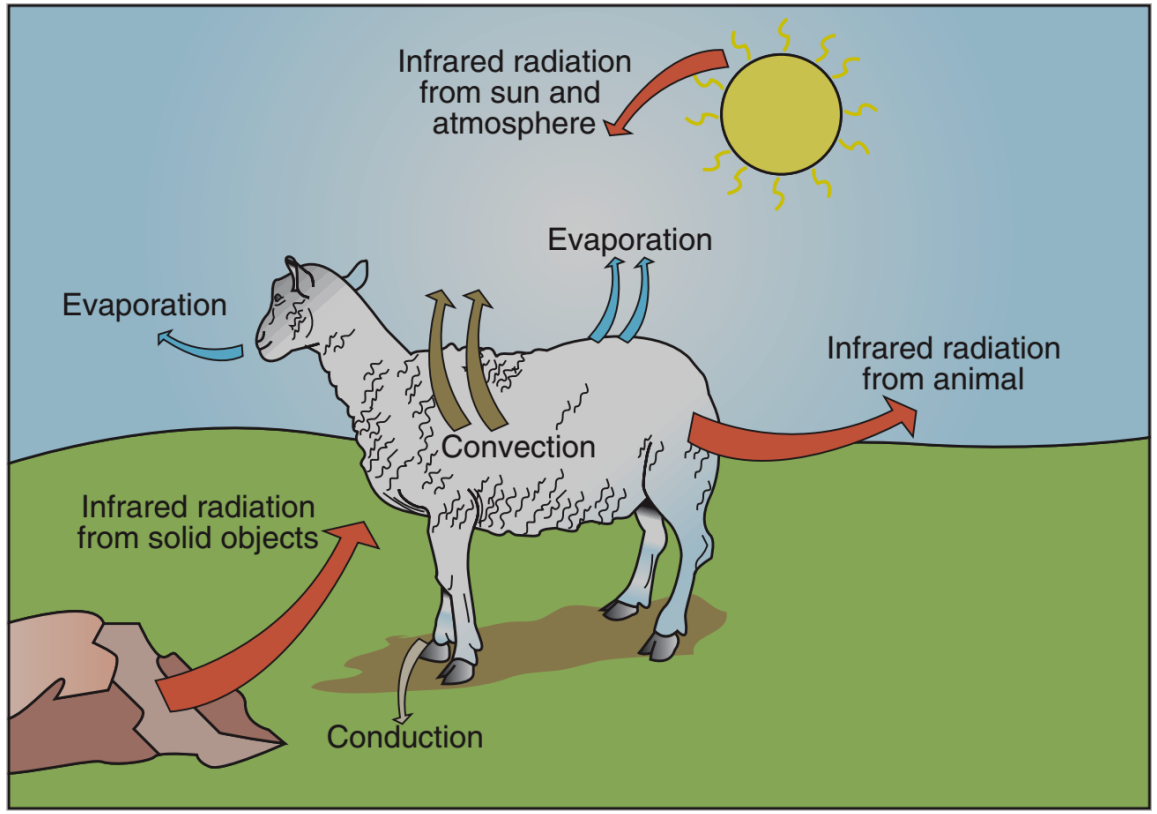
Topics

Heat stress/hyperthermia

Management of the neonatal cria

Thermoregulation

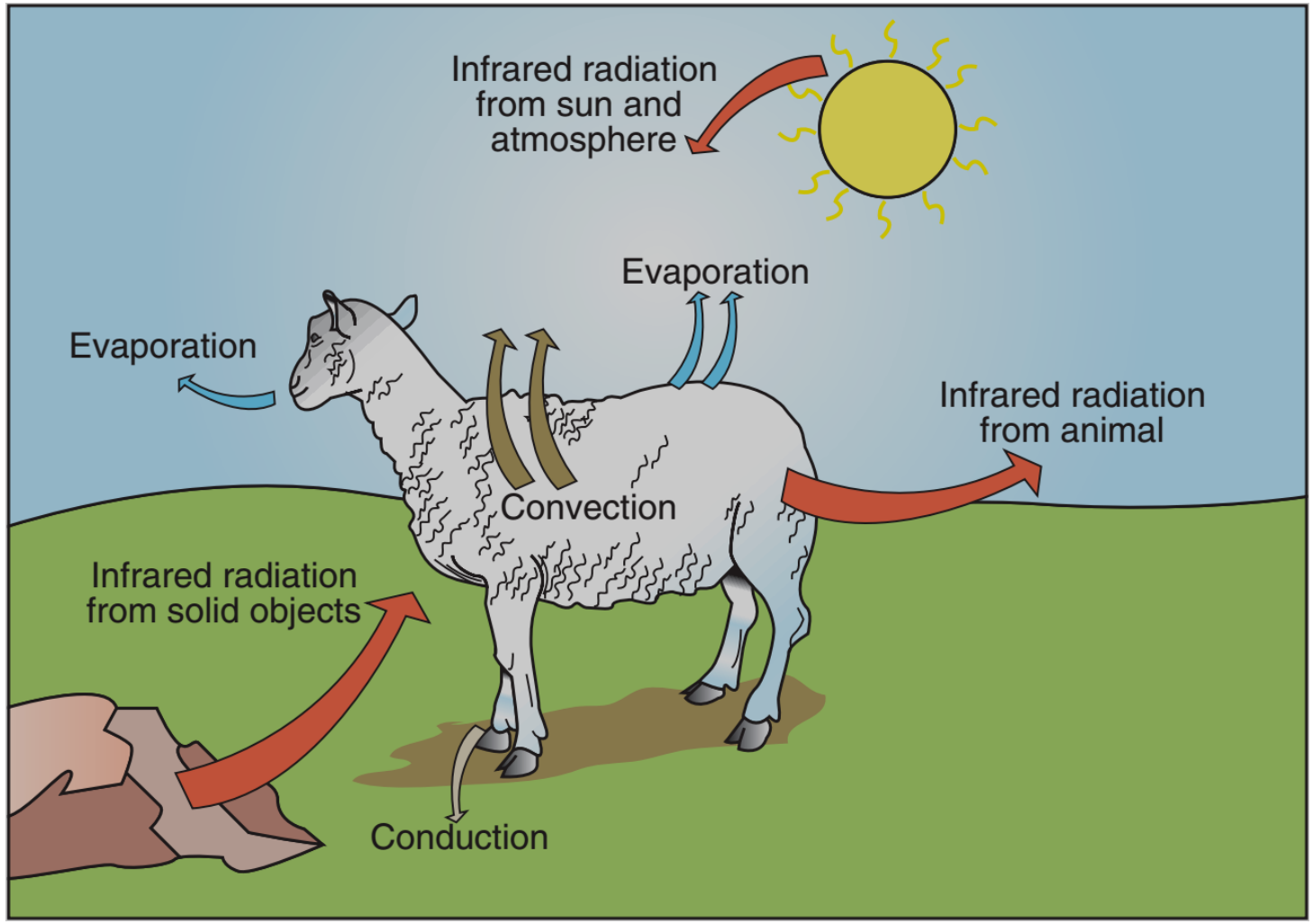
- Temperature is a major factor affecting tissue function
- Balance between heat input and output
- Food energy → heat
- Skin is the main source of heat loss



Thermoregulation

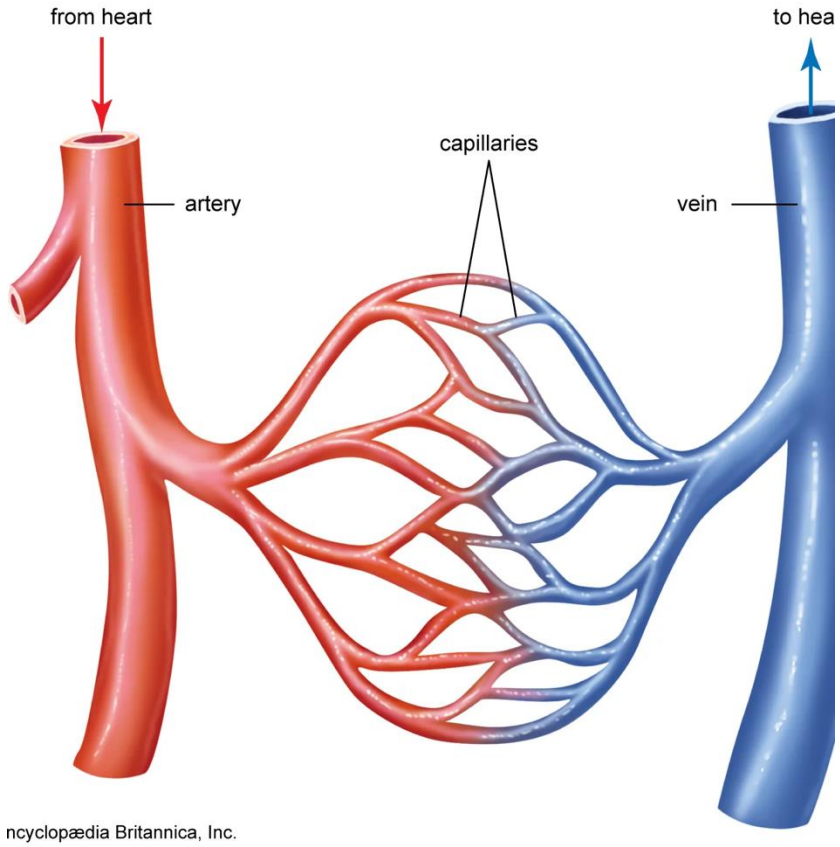
- Heat gain
  - Ambient temperature > body temperature
  - Radiant heat

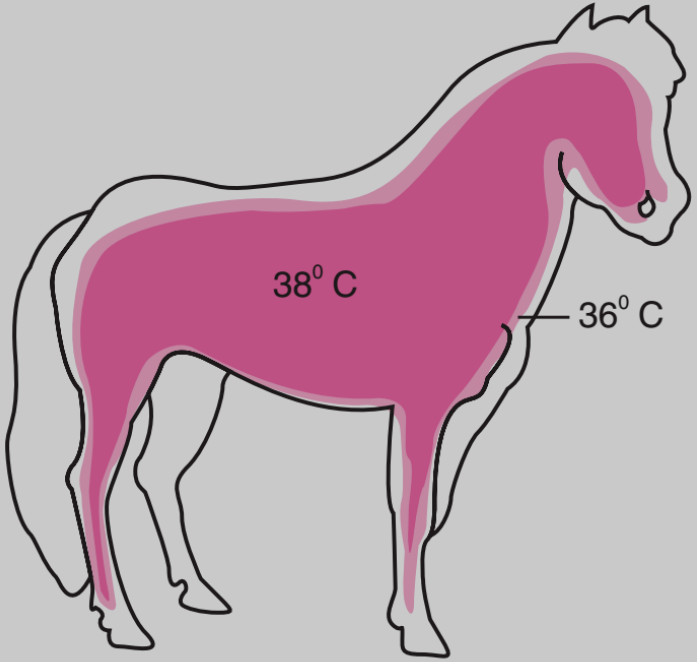
- Heat loss
  - Radiation
  - Convection
  - Evaporation
  - Conduction



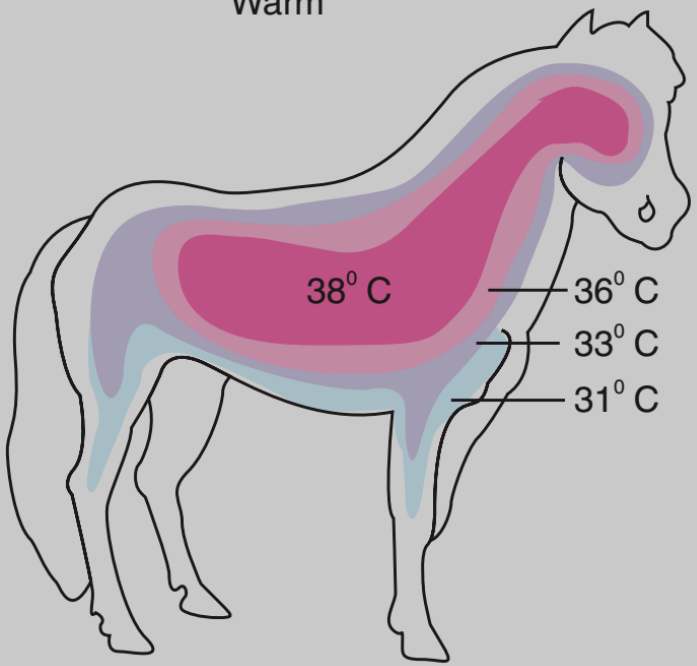
Thermoregulation

- Heat transfer within the body
- Body tissues are poor thermal conductors
- Heat is produced mainly in muscles and liver and eliminated through skin and respiratory tract
- Heat is most effectively transferred in the blood
- Blood collects heat from organs and transfers it to cooler parts of the body
    - Circulatory convection





Warm



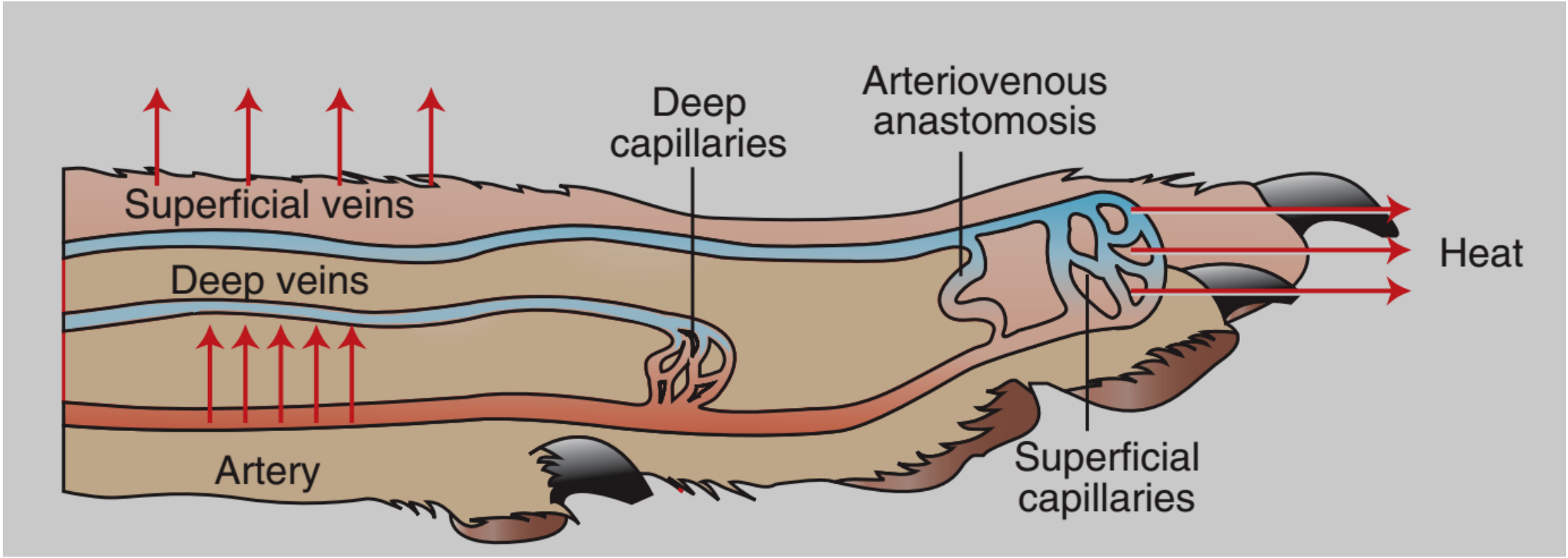
Cold

Heat Stress

- Circulatory transfer of heat to the skin is increased
- Blood vessels dilate to increase blood flow → increases heat delivery → heat loss

Heat Stress

- Countercurrent heat exchange mechanisms are used to lose heat



Heat Loss: Convection

- Body warms air
- Natural convection
  - Warmed air rises from surface of animal
- Hair or fiber traps air and impairs convection

Heat Loss: Evaporation

- Continuous evaporative heat loss through skin and respiratory tract
- Evaporative cooling can be increased by:
  - Sweating
  - Panting
- Important mechanism of heat loss when ambient temperature approaches body temperature
  - Only way to lose heat when ambient temp > body temp
- Effectiveness reduced as relative humidity increases

Response to Heat Stress

- Thermoneutral zone: range of ambient temperatures where the body can maintain core temperature solely through regulating dry heat loss (skin blood flow)
- Initial response = vasodilation
  - More heat loss by radiation and convection
- Secondary response = evaporative cooling
  - Sweating, panting, both
- Behavioral methods
  - Seeking shade, standing in water,

https://rmla.com/more-on-heat-stress-in-alpacas-and-llamas-2/

Heat Stroke

- Heat production/input > heat output → body temperature rises
- Body temperature rises → metabolic rate increases → more heat is produced
- Panting/sweating can lead to dehydration and circulatory collapse, making heat transfer to the skin difficult
- Body temperature > 107 to 109*F
  - Cellular function impaired
  - Loss of consciousness
- Exertional vs non-exertional

Heat stress and hyperthermia in SAC

- Dromedary camel adapted to hot arid climate
  - Adapted to deal with hyperthermia and dehydration
- South American camelids evolved later and in a cool climate
  - Adapted to deal with cold, not excessive heat/humidity

Causes of Hyperthermia

High environmental temperature and humidity

Muscular exertion

Fever (pyrogenic hyperthermia)

Dehydration

Drugs/toxins that inhibit thermoregulation

Production of Body Heat

- Packing
- Racing
- Breeding
- Fighting
- Transport
- Prolonged restraint
- Chased by carnivore

Normal body temperature

Adult	99.5 – 102*F
Cria	100 – 102*F

The Thermal Window

- Evaporative cooling via the thermal window
- Relatively fiberless area on the ventral abdomen, axillary region and inside of the thighs
- Skin is thinner with many blood vessels
- Sweat glands are more productive

Evaporative Cooling

- Skin temperature
- Ambient temperature
- Ambient humidity
- Air movement
  - Convection
- Insulation
- Radiant heat
  - Sun, heated surfaces

Fiber Coat

- Efficient insulating layer against cold
- Inhibits radiant heat from reaching skin
- Can aid or hinder evaporative cooling
- Heat dissipation is inhibited if fiber is:
  - Excessively long
  - Dirty
  - Matted
  - Wet

Signs of Heat Stress

- Flared nostrils
- Open mouth breathing
- Increased respiratory rate (>40 rpm)
- Increased heart rate (>90 bpm)
- Lethargy
- Collapse, unable to rise
- Weakness, trembling, shaking, incoordination, stiffness
- Drooping lower lip, foaming, drooling
- Rectal temperature > 104*F
- Scrotal swelling
- Decreased feed and water intake

Hyperthermia: Effects on Organs

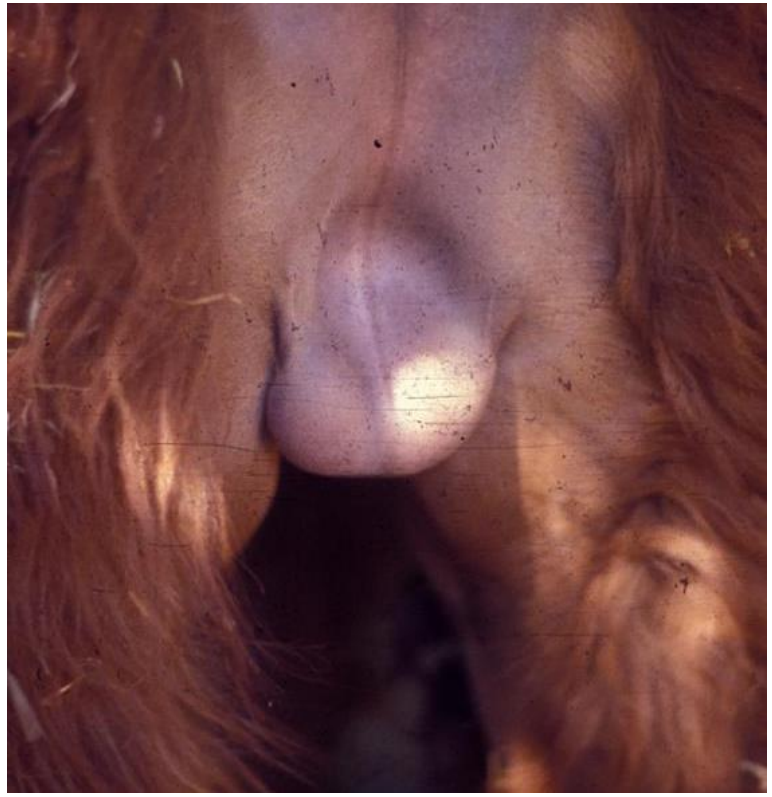
- Hyperthermia of short duration and mild/moderate intensity may not have lasting adverse effects on organ function once the animal is cooled
- If severe or prolonged, animal may die due to multi-organ failure even if core body temperature returns to normal

Central Nervous System Effects

- Very sensitive to hyperthermia!
- Direct heat damage to neurons
- Secondary injury
  - Reduced oxygen to the brain
  - Electrolyte abnormalities
  - Blood clots
- Decreased mental function, weakness/inability to stans, convulsions, seizures
- Pregnant females → fetal brain damage and congenital anomalies

Reproductive System Effects

- Females
  - Abortion
  - Decreased birth weight of cria
  - Congenital defects
- Males
  - Decreased sperm count, infertility
  - Scrotal edema



Merck Manual *Courtesy of Dr. LaRue Johnson*

Respiratory System Effects

- 1.8*F increase in body temperature requires 10% more oxygen for proper function of body systems
- Temperature reaches 105.8*F → respiratory system cannot supply enough oxygen by normal respiration alone
  - Respiratory rate increase
  - Open mouth breathing

Fowler VCNA

Digestive Tract Effects

- Signs of colic are common
- Blood shifted from gut to skin
  - Decreased blood flow → decreased function
  - Disrupted mucosal barrier
- Rumination and intestinal motility decreased
- Diarrhea

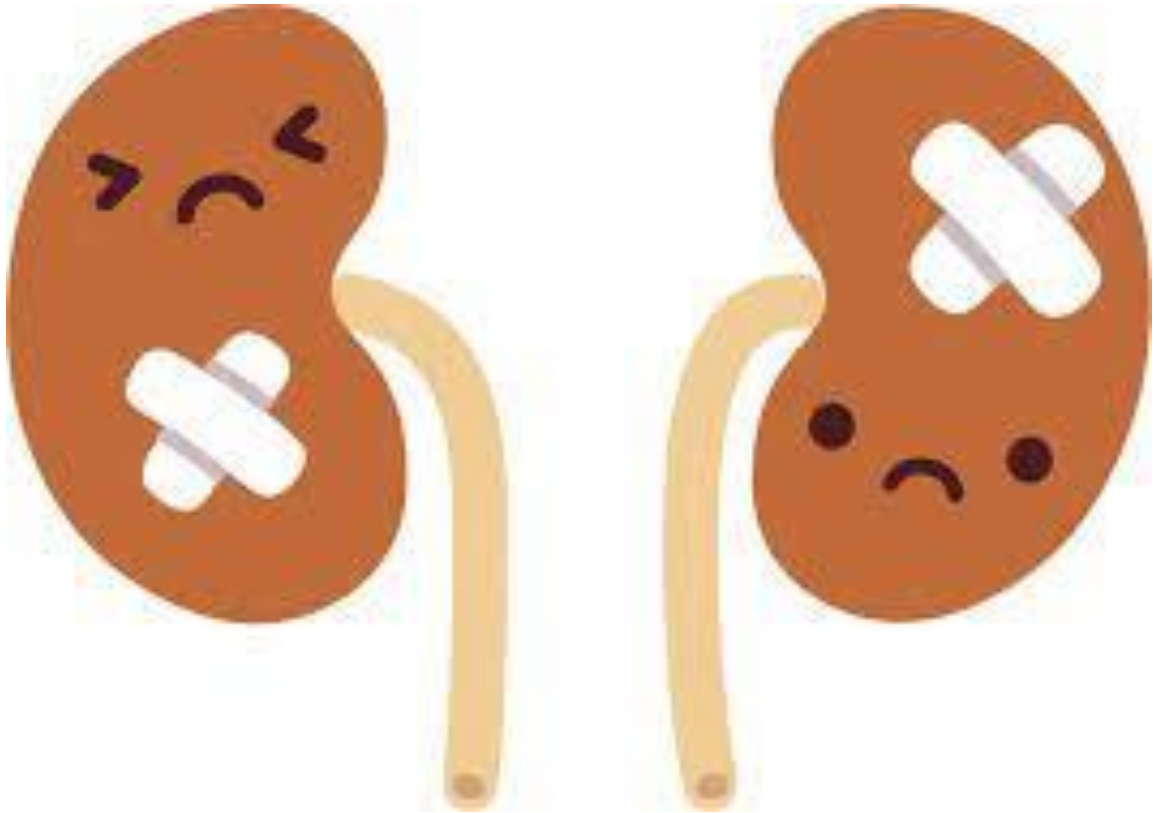
http://www.shagbarkridge.com/info/bloat.html

Cardiovascular and Clotting System Effects

- Increased heart rate
- Decreased blood pressure
- Shock
- Animals with pre-existing cardiac disease may have increased risk of the death
- Decrease platelet count
- Alterations in clotting times

Urinary and Muscular System

- Kidney injury
  - Muscle break down
  - Red blood cell breakdown
  - Dehydration
  - Caution giving Banamine
- Rapid muscle breakdown



Hyperthermia: Sequence of Events

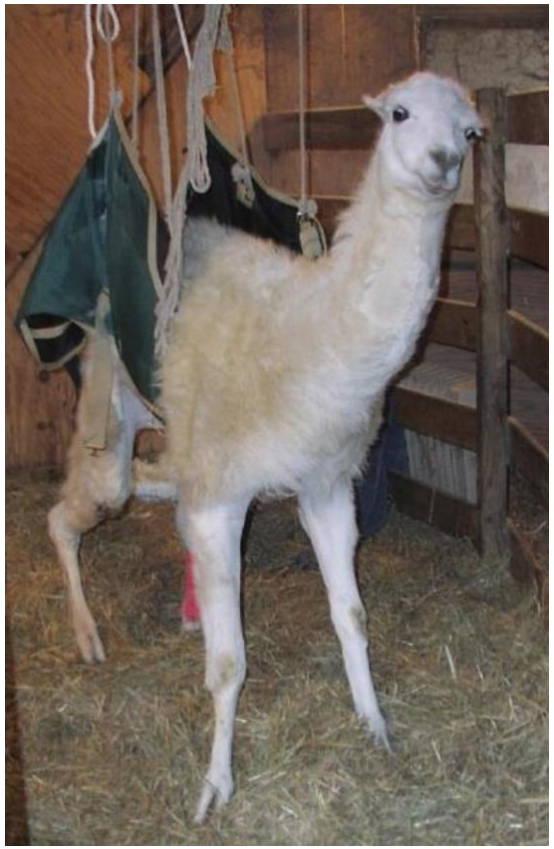
Increased body temperature
Increased heart and respiratory rates
Redness of skin
Sweating
Hemoconcentration
Body fluids shift from gut/liver to muscle/skin
Decreased kidney function
Decreased blood pressure
Central nervous system damage
Coagulation defects
Death

Treatment of Hyperthermia: Cooling

- Apply cool water to the thermal window and directing a fan at the animal
  - Cool packs in axillary and inguinal regions
- Do not immerse in ice baths
  - Constriction of blood vessels in the skin prevents heat dissipation
- Other methods of cooling not associated with improved outcome:
  - Cold water enemas, stomach lavage
- Monitor temperature
- Discontinue cooling measures before temperature is normal

Veterinary Intervention

- Blood work
  - Organ function – liver, kidney, muscle
  - Electrolytes
  - Lactate
  - White blood cell count
  - Clotting times
- IV fluid therapy
- Recumbency and sling care
  - Prognosis poor if unable to stand
- Antibiotic therapy
- Management of multiple organ dysfunction syndrome
- 50% survival reported in one case review

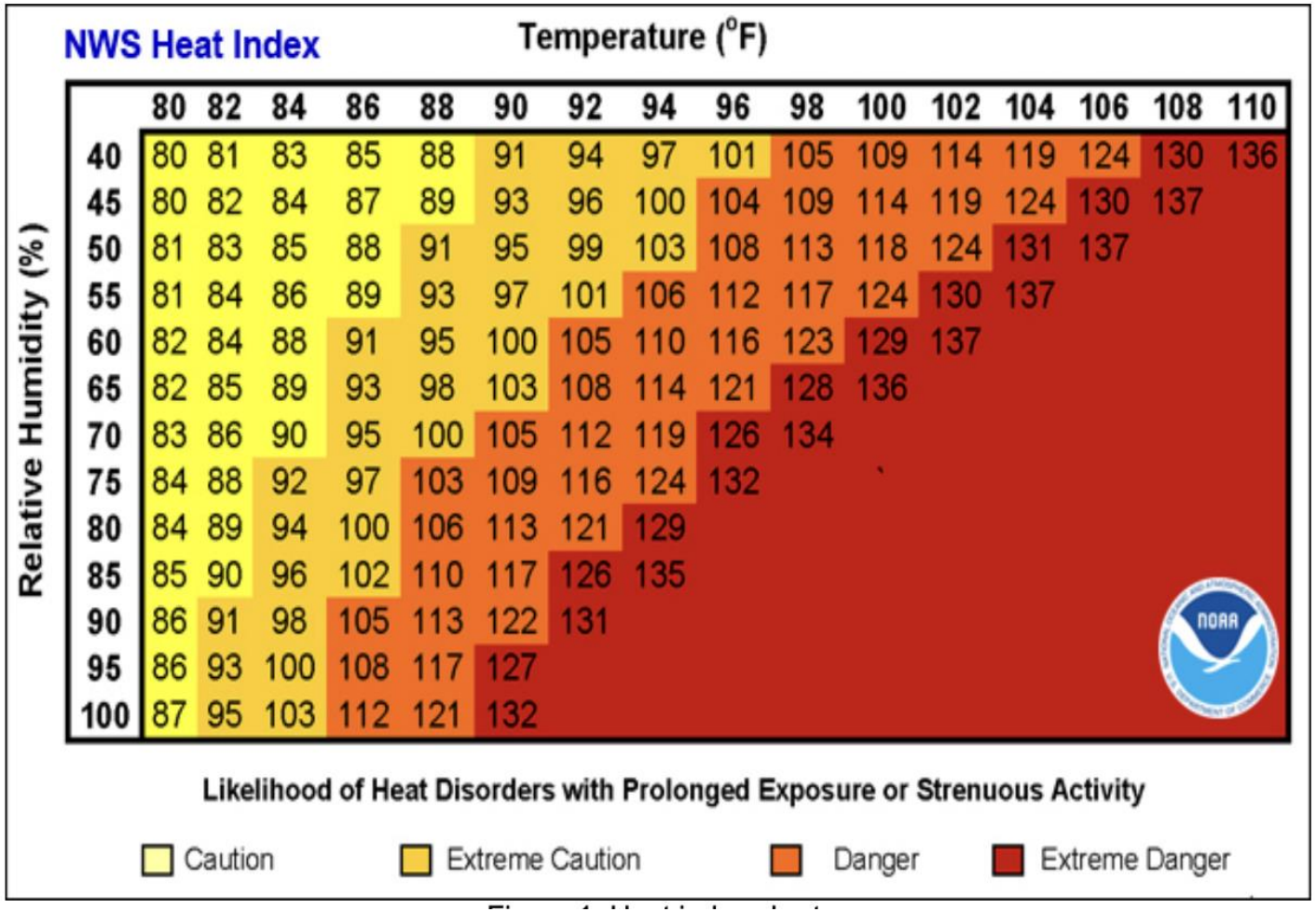


Hyperthermia Prevention

- Access to shade
- Fans in stall
- Pond or pool for self cooling
- Shady, sandy spot that can be moistened
- Maintain normal body condition
- Shear prior to onset of high heat and humidity
- Avoid work, stress, shearing, transport, capture, etc during the peak heat of the day

Hyperthermia Prevention

- Heat Index = apparent temperature
  - Relative humidity + air temperature
- Avoid non-essential handling when HI is 120 – 150
- Clinical signs seen at HI of 150 in one study



Questions?




California Wildfire Patients

Management of the Neonatal Cria

Parturition Events

Gestation is variably, average ~11.5 months (343 days)

As early as 320 days and as late as 375 days

Longer gestation if birthing in spring vs autumn

Parturition Events: Stage 1 Labor

Preparatory phase

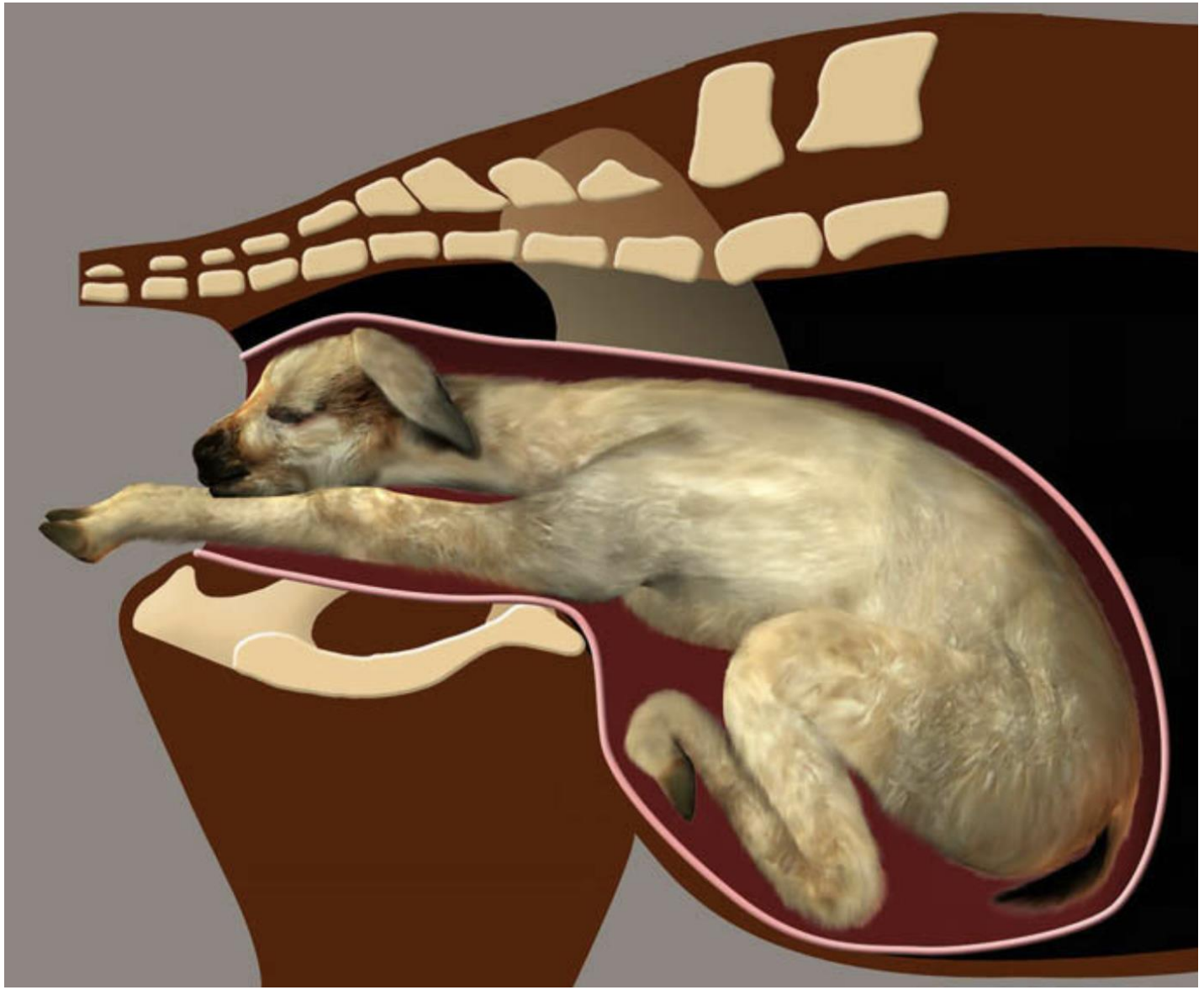
1 – 6 hours

Signs

- Separation from herd
- Lack of interest in feed/grazing
- Humming
- Restlessness
- Frequent trips to communal defecation area
- Cushed with hind limbs out to one side

Parturition Events: Stage 2 Labor

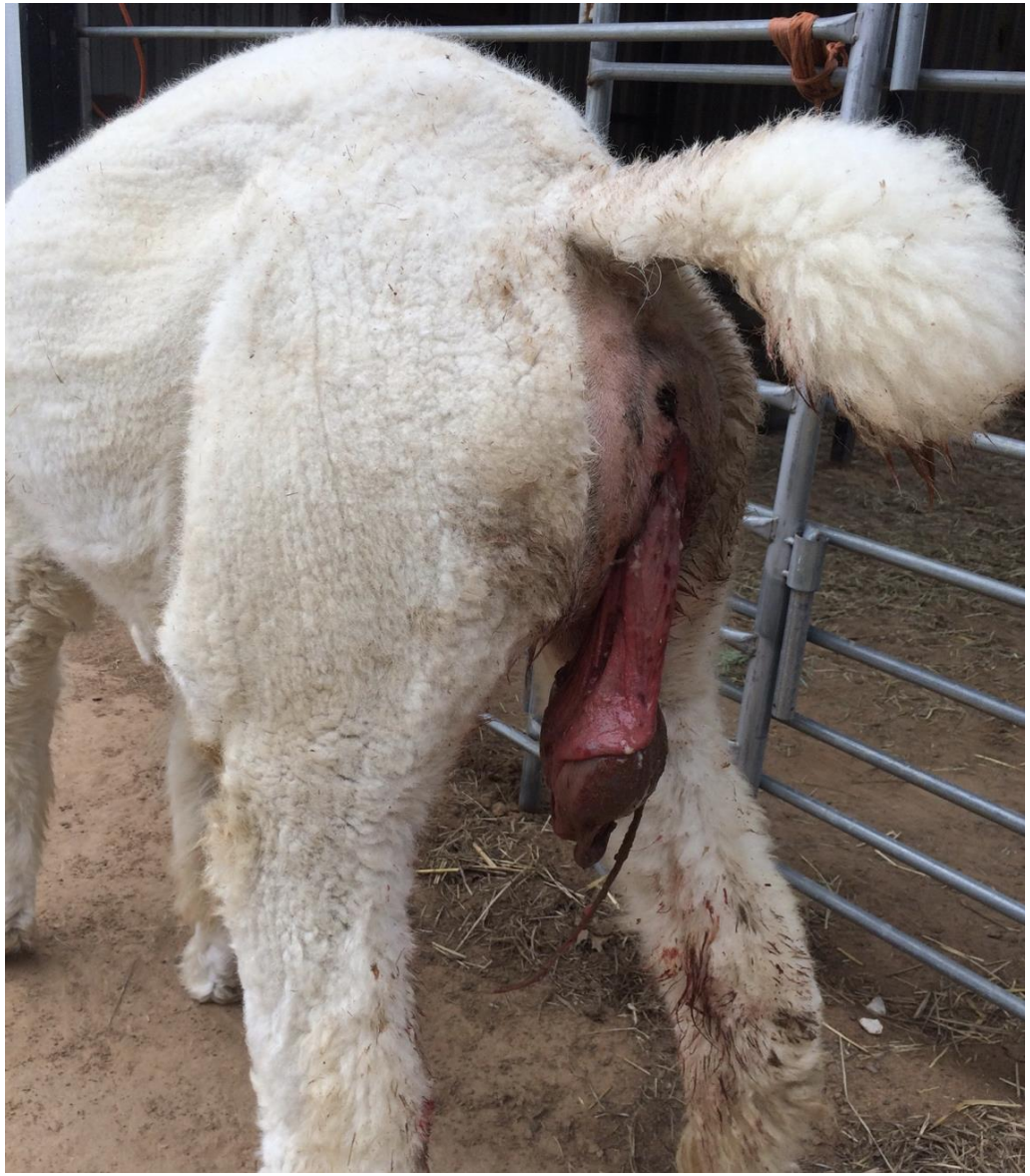
- Expulsion of the cria
- Usually lasts 20 to 30 minutes, can take up to 1 hour
- If active straining without progression for 15 minutes → evaluate for malpresentation
- Cria should be in anterior dorsosacral position



Whitehead VCNA

Parturition Events: Stage 3 Labor

- Expulsion of the placenta
- Usually passed within 1 hour of delivery of the cria
  - Maximum 4 to 6 hours
  - Rarely retain placenta → oxytocin, prostaglandin
- Camelids do not consume the placenta



https://aubreyoaksalpacas.com/learn-about-raising-alpacas-introduction/postpartum-care/

Neonatal Cria Milestones

- Standing in 30 to 60 minutes
- Nursing in 2 to 4 hours
- Meconium should be passed by 18 to 20
  - Warm, soapy water enema if meconium retention
- Birth weights
  - Alpaca cria: 5.5 – 7 kg
  - Llama cria: 7 – 9 kg
  - May lose 0.25 kg in the first day, especially if weighed wet
  - Gain 0.25 to 0.5 kg per day

Cria Nursing

- Nurse frequently in the neonatal period
  - 2 to 3 times per hour, often less than 1 minute
- Spend short amount of time at each teat then move to the next
- Nursing excessively or for long periods → dam may have insufficient milk

Management of the Neonate

- Allow bonding to occur first
- Weigh cria
- Dip umbilical stump in antiseptic solution
  - 0.5% chlorhexidine
  - 2 – 3 % iodine tincture
- External umbilical stump is usually ~ 2 to 3 inches
  - Hold off/apply pressure for 10 to 15 minutes if hemorrhage
  - Ligature may predispose to abscess formation

Management of the Neonate

- If cold or wet, move inside with dam to reduce risk of hypothermia
  - Freshly bedded stall with straw
  - Heat lamp (fire hazard), blankets, warm bottles
- Cria jackets

Normal Vital Parameters

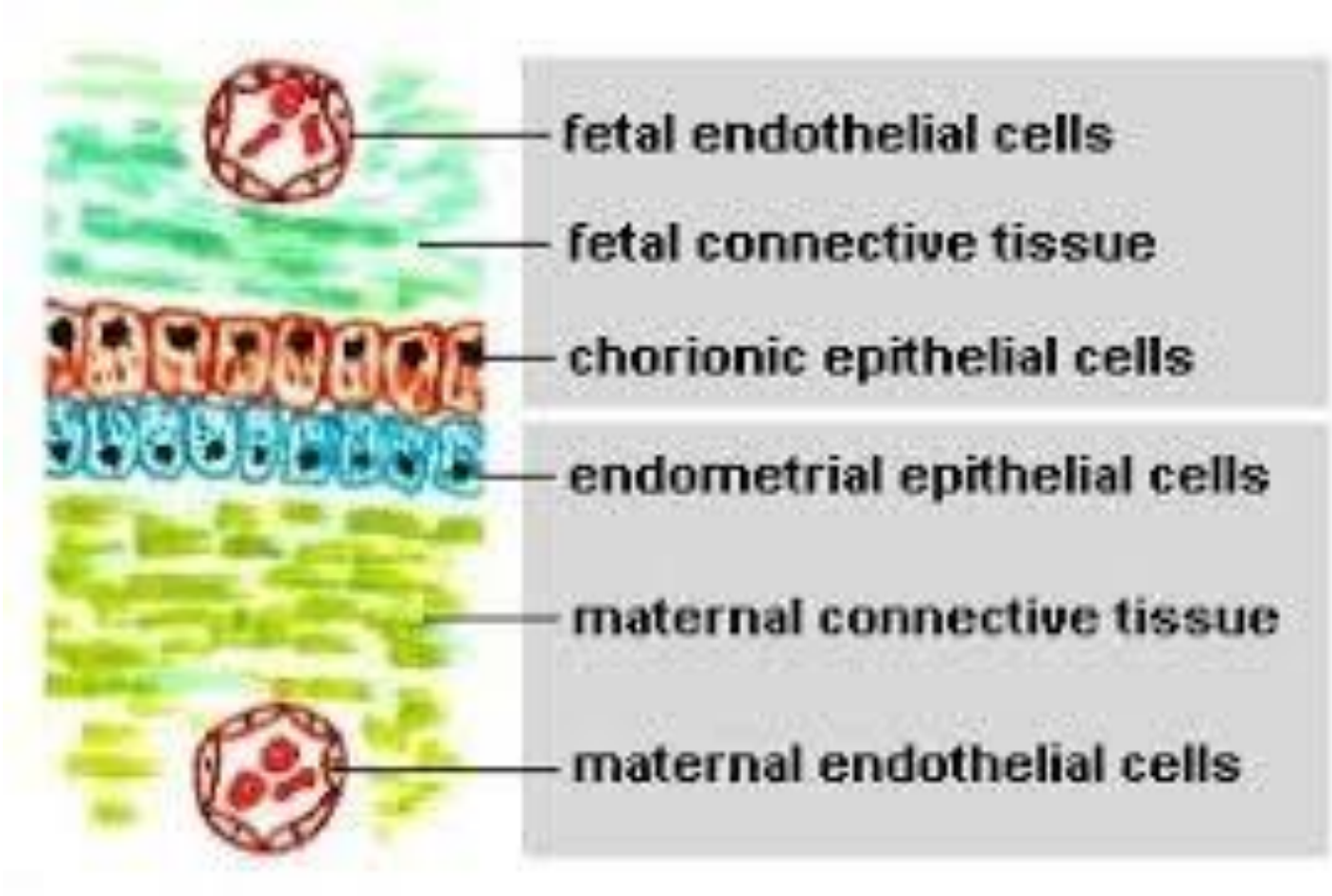
Heart rate: 70 to 100 bpm

Respiratory rate: 20 to 30 rpm

Temperature: 100 – 102*F

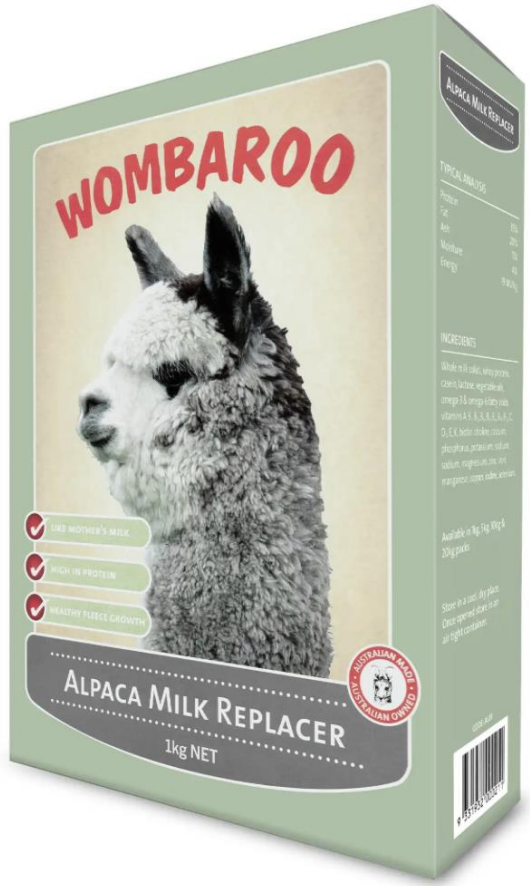
Colostrum

- Born with very low globulins due to type of placentation
  - Diffuse epitheliochorial
- Ensure colostrum consumption!
  - 10 -20 % body weight in 24 hours



Colostrum and Milk

- Failure of transfer of passive immunity is a major cause of mortality in crias
- Frozen camelid colostrum if available
  - Goat, sheep, cow as alternative
- Camelid milk
  - Higher sugar, less fat compared to domestic ruminants
  - Fresh or frozen cow or goat milk alternative
- Bottle feeding
  - 10 -15% of BW over 24 hours
  - Start with every 2 hour feedings



Assessment of Immunoglobulins

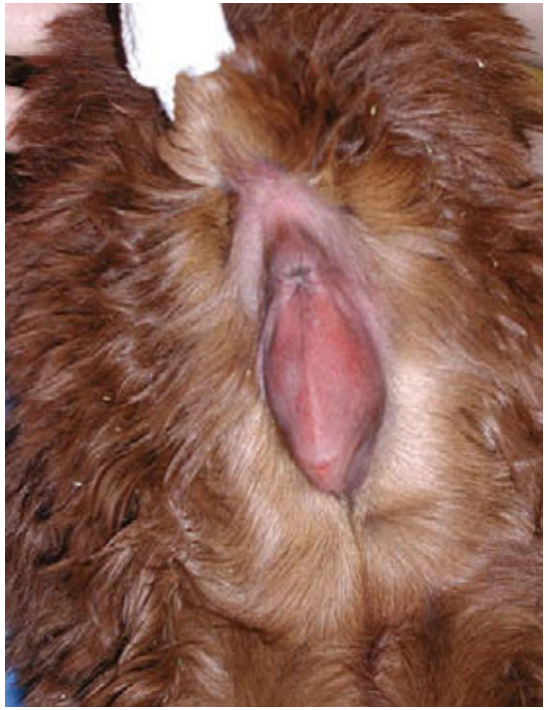
- When to check…always a good idea
- Cria factors
  - Low birth weight, unwitnessed intake, premature, congenital defects that may prevent adequate nursing
- Dam factors:
  - Mastitis, poor udder development, poor colostrum quality, dystocia, maiden dam
- IgG peaks at 24 to 48 hours

Assessment of Immunoglobulins

- Radial immunodiffusion is the most accurate
  - Not stall side (need 24 hours)
- IgG > 800 mg/dl to insure cria
- Most normal crias are 1,700 – 2,300 mg/dl
- 36 hours of age likely the ideal time to check
- Total protein > 5.5 g/dl
  - <4.5 g/dl = failure of passive transfer
- Globulin 2.3 g/dl = IgG 1,000 mg/dl
- Sodium sulfate turbidity test

Congenital Defects

- Choanal atresia
- Cleft palate
- Atresia ani or coli
- Vulvar hypoplasia
- Cardiac defects
- Musculoskeletal
  - Angular limb, luxating patelling, etc



Questions?

- **Lisa A. Edwards, DVM, DACVIM (LAIM), DACVECC**
- ledwards46@ufl.edu

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