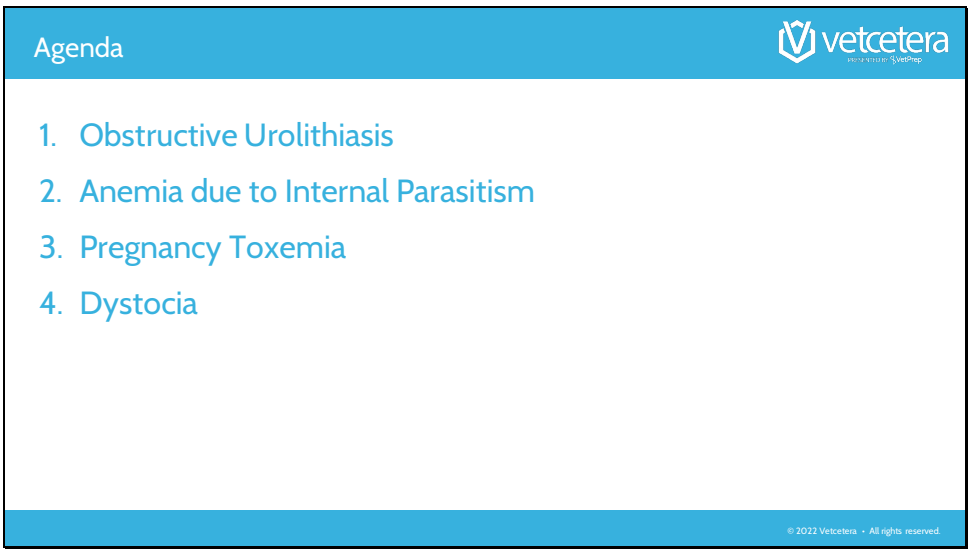
Slide 1


vetcetera
PRESENTED BY VetPrep
Common Emergencies in Small Ruminants
Misty A. Edmondson, DVM, MS, DACT

Slide 2


Agenda
vetcetera
1. Obstructive Urolithiasis
2. Anemia due to Internal Parasitism
3. Pregnancy Toxemia
4. Dystocia
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Slide 3


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Obstructive Urolithiasis

Slide 4

## Obstructive Urolithiasis: Clinical Presentation

- Often present as a "sick goat" – disease of males
- Restlessness, vocalizations, tail switching, colic
- Dribbling urine or anuria
- **Urethral pulsations without urination (male)**
- +/- urethral swelling at site of obstruction
- Crystals/blood on preputial hairs
- Preputial/rectal prolapse
- Signs of pain – stretching out bruxism, ↑ HR & RR; pain may subside if rupture

Figure 1: Dr. Dwight Wolfe, Auburn University

Slide 5

## Obstructive Urolithiasis: Diagnosis

- Most common & useful diagnostic → Ultrasound examination
  - Also examine kidneys for nephroliths, hydronephrosis, hydroureter
- Clinical Pathology
  - ↑ creatnine, PCV
  - Hyponatremia, hypochloremia, +/- hyperkalemia
  - BUN normal until late (ruminants recycle urea)
  - Possible evidence of inflammation

Slide 6

## Obstructive Urolithiasis: Management/Treatment

- **TRUE EMERGENCY!**
  - Avoid chronic distension of bladder, urethral rupture
  - Feedlot animal → immediate harvest
  - Pet/Breeding Animal → do NOT delay surgery
  - Urethral rupture → prognosis for long-term survival declines
  - Cystocentesis?

Slide 7

## Anemia & Internal Parasitism: Management/Treatment

- Fluid support
  - Administer during surgery; must have outlet if surgery delayed
  - Isotonic sodium chloride
  - Especially important if hyperkalemic

Slide 8

## Anemia & Internal Parasitism: Management/Treatment

- Non-Surgical Treatment
  - Urethral catheterization – be cautious, urethra friable
  - Walpol's solution
    - pH 4.5
    - U/S-guided cystocentesis, 30-50 mL Walpol's lavage & leave
    - Urine flow in 24-36 hours, normal voiding 3-5 days

Slide 9

## Anemia & Internal Parasitism: Management/Treatment

- Surgical Treatment
  - Amputation of urethral process – high recurrence rate
  - Salvage (Feedlot Animal) – temporary due to stricture formation (weeks to months)
    - Urethrostomy at site of obstruction
    - Penile amputation
  - Breeding or Pet Animal
    - Tube cystotomy
    - Bladder marsupialization

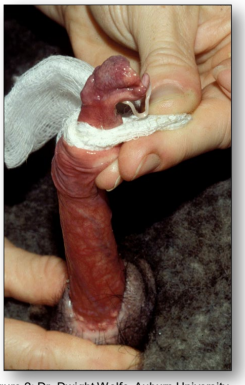


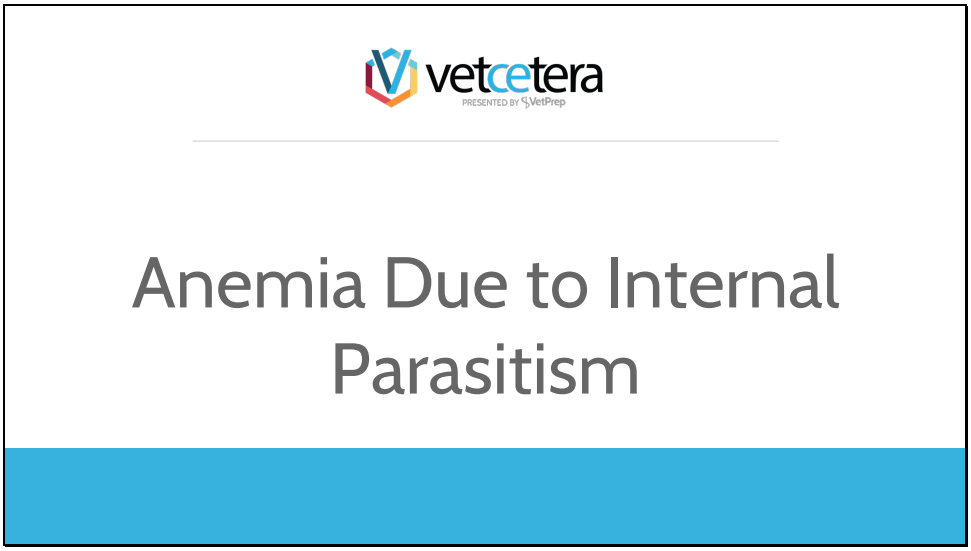
Figure 2: Dr. Dwight Wolfe, Auburn University

Slide 10

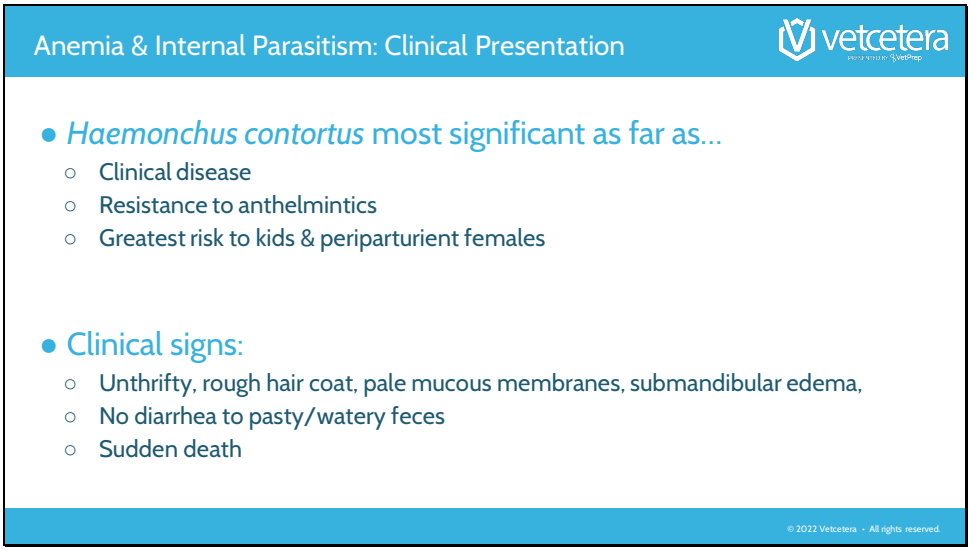
## Obstructive Urolithiasis: Prevention

- Females as pets
- Delay castration as long as possible (at least until puberty)
- Increase water intake
- Avoid excess protein (grain supplements, legume hay) in pets
- Ca:P ration of 1.5-2:1
- Urinary acidifiers – monitor pH

Slide 11


vetcetera
PRESENTED BY VetPrep
Anemia Due to Internal Parasitism

Slide 12


Anemia & Internal Parasitism: Clinical Presentation
vetcetera
*Haemonchus contortus* most significant as far as...
Clinical disease
Resistance to anthelmintics
Greatest risk to kids & periparturient females
Clinical signs:
Unthrifty, rough hair coat, pale mucous membranes, submandibular edema,
No diarrhea to pasty/watery feces
Sudden death
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Slide 13

## Anemia & Internal Parasitism: Resistance

- Resistance to one drug in a class usually means resistance to all drugs in that class
- Resistance to multiple drug classes & all classes
- Most important factor affecting rate of development of resistance
  - Untreated portion of worms, REFUGIA, provides a pool of genes that are sensitive to dewormers
  - Dilutes out the frequency of resistant genes

Slide 14

## Anemia & Internal Parasitism: Diagnosis

- Fecal Flotation
  - Qualitative (1+ to 4+)
  - Okay but not information on resistance
- Modified McMaster's Fecal Egg Count Reduction Test
  - Quantitative (EPG)
  - 2 tests performed 10-14 days apart
  - No resistance = 95-99% reduction
- DrenchRite® Larval Development Assay
  1. What parasites are in the herd/flock?
  2. Which drugs are effective on the farm?

Figure 3: https://www.wormx.info/drenchriteassay

Slide 15

## Anemia & Internal Parasitism: Management/Treatment

- FAMACHA©
  - Tool to ID anemic animals
  - Classifies animal based on level of anemia (1-5); laminated card
  - Animals needing multiple treatments = Cull

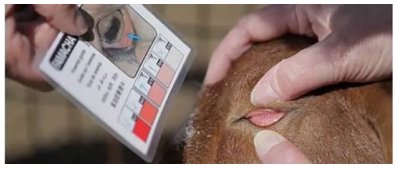


Figure 4: www.wormx.info/famacha

| Clinical Category | Eye Lid Color | Packed Cell Volume | Treat? |
|---|---|---|---|
| 1 | Red | ≥ 28 | No |
| 2 | Red-Pink | 23-27 | No |
| 3 | Pink | 18-22 | ? |
| 4 | Pink-White | 13-17 | Yes |
| 5 | White | ≤ 12 | Yes |

Slide 16

## Anemia & Internal Parasitism: Management/Treatment

- DrenchRite® Larval Development Assay
- Combination Treatment
  - Strong evidence that using **combination treatment** is best method for using anthelmintics
  1. Additive effect with each drug used → efficacy of treatment increases with each additional drug given; and
  2. Higher efficacy means fewer resistant parasites that survive treatment → greater dilution of resistant parasites by susceptible portion of the population

Slide 17

## Anemia & Internal Parasitism: Management/Treatment

**Table 1: Impact of using dewormers in combination on the efficacy of treatments.**
The increases in efficacy are due to a simple additive effect as per the equation below:
Where D1 = efficacy of dewormer 1, D2 = efficacy of dewormer 2, D3 = efficacy of dewormer 3, C2 = efficacy of D1+D2, and C3 = efficacy of D1+D2+D3
C2% = D1% + (100-D1%)*D2%
C3% = C2% + (100-C2%)*D3%

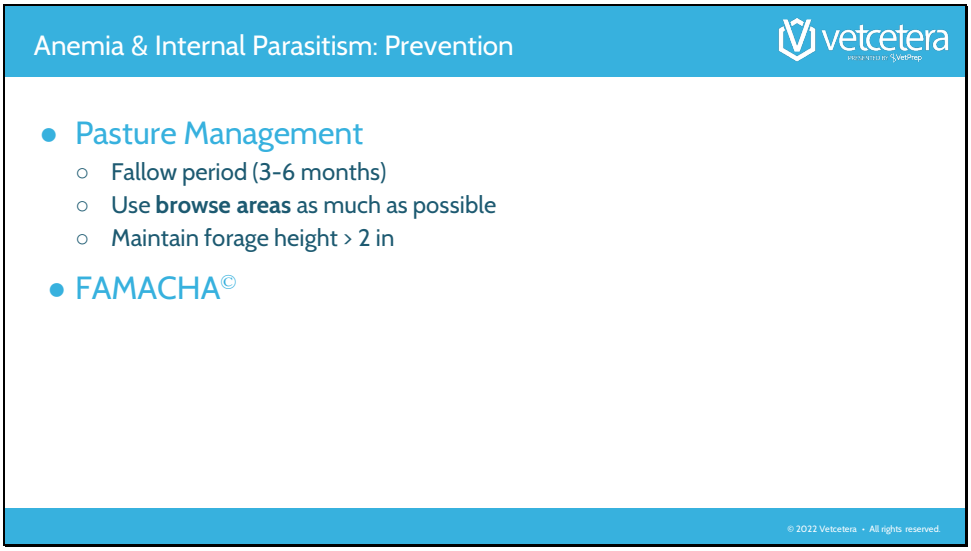
| Drug 1 (%) | Drug 2 (%) | Drug 3 (%) | Combination (%) |
|---|---|---|---|
| 80 | 80 | | 96 |
| 80 | 80 | 80 | 99.2 |
| 90 | 90 | | 99 |
| 90 | 90 | 90 | 99.9 |
| 60 | 95 | | 98 |
| 60 | 60 | 95 | 99.2 |
| 99 | 99 | | 99.99 |
| 60 | 60 | 60 | 93.6 |
| 50 | 50 | 50 | 87.5 |
| 40 | 40 | 40 | 78.4 |

**Table 2: Impact of combinations on percent of resistant worms that survive.**
Table shows the % of worms killed by a single dewormer vs a combination treatment with two dewormers both with the same efficacy, ranging from 80% to 99%. The last column shows the magnitude of the difference between % of worms killed and % surviving when one or two dewormers in combination are used. Note that the higher the efficacy of the drugs, the smaller the difference in efficacy when used in combination, but the greater the difference in the % of resistant survivors.

| Efficacy of Dewormer | | Single Dewormer | 2 Dewormers in Combination | Fold Difference |
|---|---|---|---|---|
| 99 | % Killed | 99 | 99.99 | 1.01x |
| | % Surviving | 1 | 0.01 | **100x** |
| 98 | % Killed | 98 | 99.96 | 1.02x |
| | % Surviving | 2 | 0.04 | **50x** |
| 95 | % Killed | 95 | 99.75 | 1.05x |
| | % Surviving | 5 | 0.25 | **20x** |
| 90 | % Killed | 90 | 99 | 1.1x |
| | % Surviving | 10 | 1 | **10x** |
| 80 | % Killed | 80 | 96 | 1.2x |
| | % Surviving | 20 | 4 | **5x** |

Figure 5: https://www.wormx.info/combinations; Ray Kaplan, Combination Dewormers: The Time is Now, January 2017.

Slide 18


Anemia & Internal Parasitism: Prevention
vetcetera
Pasture Management
Fallow period (3-6 months)
Use **browse areas** as much as possible
Maintain forage height > 2 in
FAMACHA©
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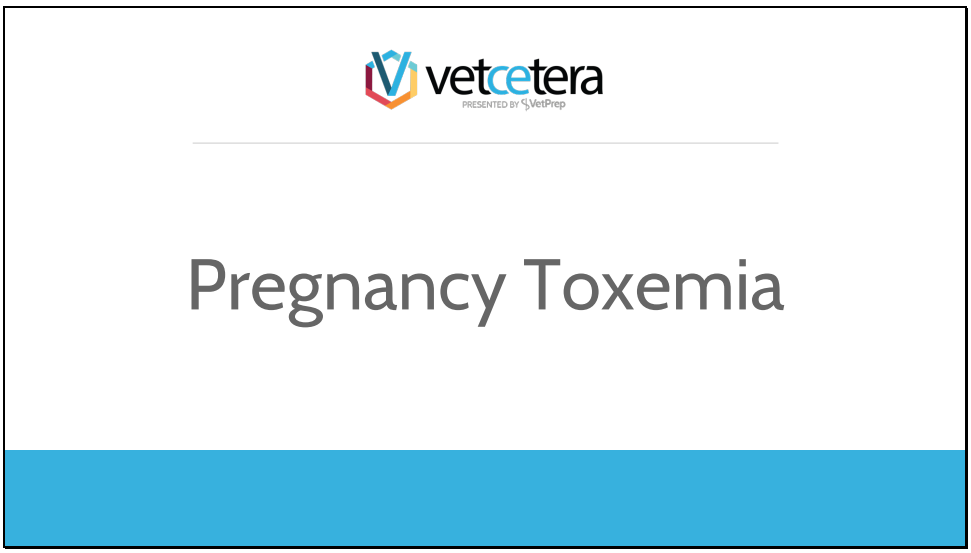
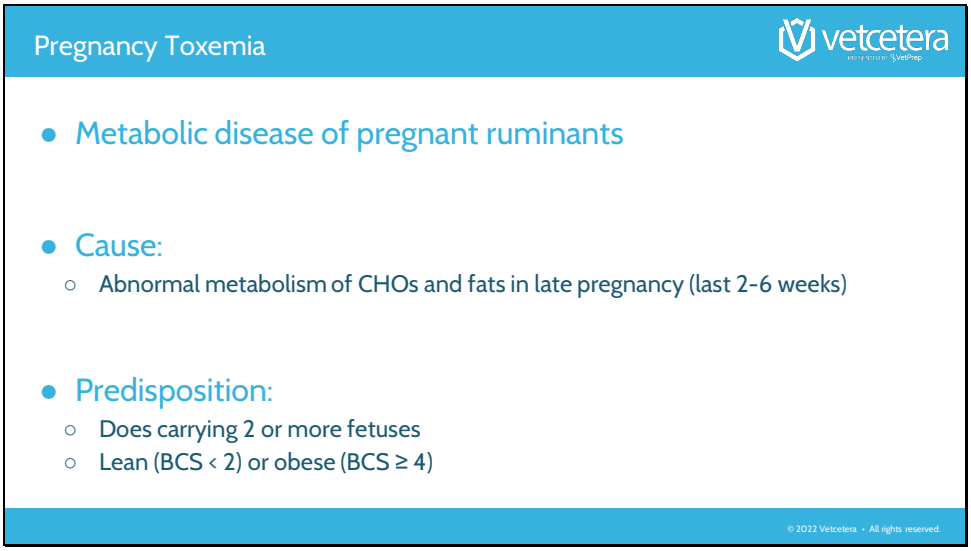
Slide 19



Slide 20


Pregnancy Toxemia
vetcetera
Metabolic disease of pregnant ruminants
Cause:
Abnormal metabolism of CHOs and fats in late pregnancy (last 2-6 weeks)
Predisposition:
Does carrying 2 or more fetuses
Lean (BCS < 2) or obese (BCS ≥ 4)
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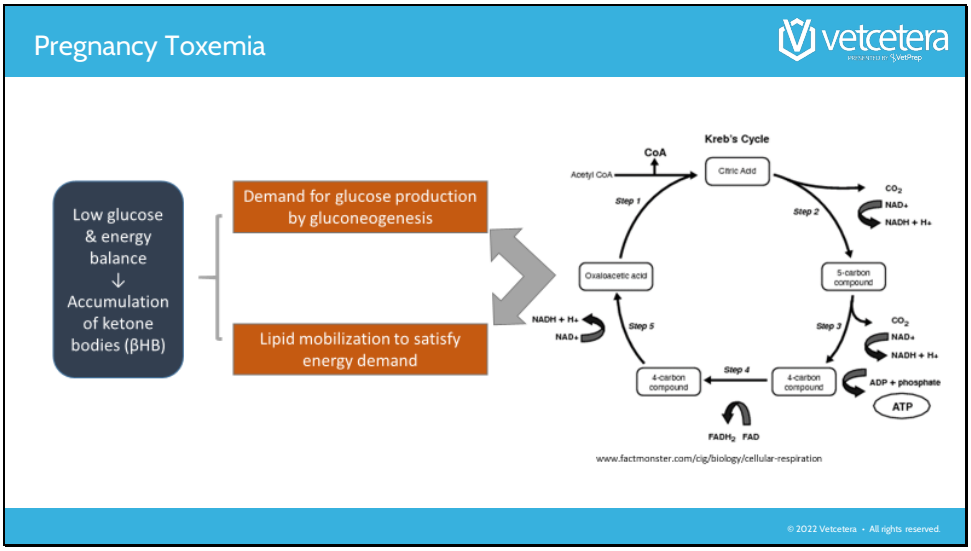
Slide 21

## Pregnancy Toxemia

### Pathophysiology of disease

- Rapid fetal development in late gestation causes rapid mobilization of fat stores to assure adequate energy
- Liver also increases gluconeogenesis to facilitate glucose availability to the fetus(es).
- Negative energy balance → increased mobilization may overwhelm capacity of liver → hepatic lipidosis
- At same time, ketone bodies produced and accumulated → leads to excessive ketone bodies in blood which increases susceptibility to pregnancy toxemia

Slide 22


Pregnancy Toxemia
vetcetera
Low glucose & energy balance ↓ Accumulation of ketone bodies (βHB)
Demand for glucose production by gluconeogenesis
Lipid mobilization to satisfy energy demand
Kreb's Cycle
CoA
Acetyl CoA
Citric Acid
Step 1
Step 2
$CO_2$
$NAD_+$
$NADH + H_+$
Oxaloacetic acid
5-carbon compound
$NADH + H_+$
$NAD_+$
Step 5
Step 3
$CO_2$
$NAD_+$
$NADH + H_+$
4-carbon compound
Step 4
4-carbon compound
ADP + phosphate
ATP
$FADH_2$ FAD
www.factmonster.com/cig/biology/cellular-respiration
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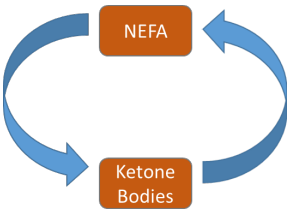
Slide 23

## Pregnancy Toxemia

### Vicious Cycle

- Hypoglycemia
- Lipolysis
- Increased NEFAs
- Ketone formation
  - Ketones further suppress gluconeogenesis
  - Ketone bodies suppress appetite
- Resulting FFA mobilization suppresses liver function



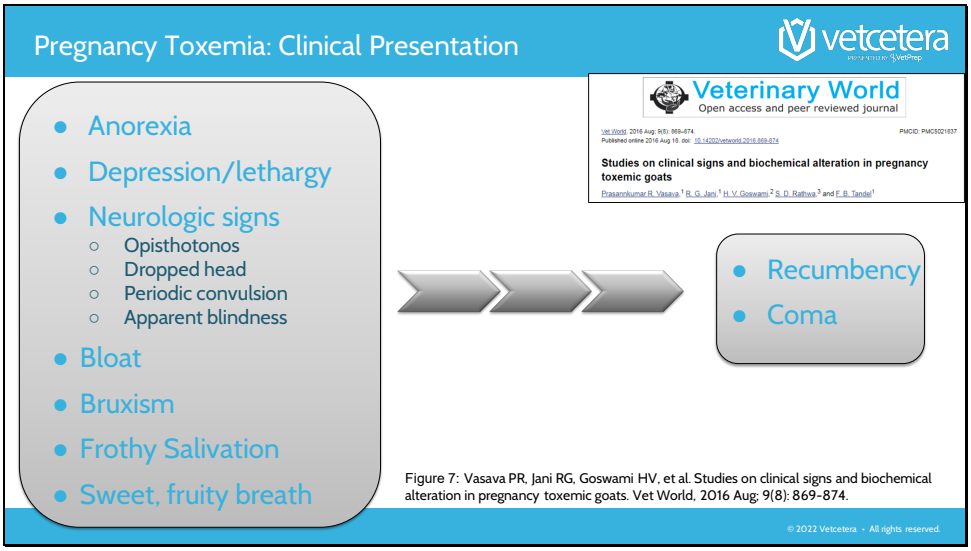
Slide 24

## Pregnancy Toxemia: Clinical Presentation

- May be vague initially
  - Weakness, lethargy
  - May separate from herd
  - Mild ataxia

Figure 6: Dr. Thomas Passler, Auburn University

Slide 25


Pregnancy Toxemia: Clinical Presentation
vetcetera
Anorexia
Depression/lethargy
Neurologic signs
Opisthotonos
Dropped head
Periodic convulsion
Apparent blindness
Bloat
Bruxism
Frothy Salivation
Sweet, fruity breath
Recumbency
Coma
Veterinary World
Open access and peer reviewed journal
Studies on clinical signs and biochemical alteration in pregnancy toxemic goats
Figure 7: Vasava PR, Jani RG, Goswami HV, et al. Studies on clinical signs and biochemical alteration in pregnancy toxemic goats. Vet World, 2016 Aug; 9(8): 869-874.
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Slide 26

## Pregnancy Toxemia: Clinical Presentation


| Clinical Signs: | Pathophysiology of CS: |
|---|---|
| Anorexia → | Ketone bodies |
| Depression/lethargy → | Low glucose |
| Neurologic signs → | Cerebral hypoglycemia |
| Bloat → | Hypocalcemia |
| Bruxism → | Cerebral hypoglycemia |
| Frothy salivation → | Frothy salivation |
| Sweet, fruity odor to breath → | Ketone bodies |
| Recumbency/Coma → | Low energy, hypocalcemia |

Figure 8: Vasava PR, Jani RG, Goswami HV, et al. Studies on clinical signs and biochemical alteration in pregnancy toxemic goats. Vet World. 2016 Aug; 9(8): 869–874.

Slide 27

## Pregnancy Toxemia: Clinical Presentation

Figure 9: Dr. Thomas Passler, Auburn University

Slide 28

## Pregnancy Toxemia: Diagnosis

- Dehydration
- Stress leukogram
- Metabolic acidosis
- Increased ketone bodies in urine
- Blood ketones


Figure 10: www.abbottdiabetescare.com

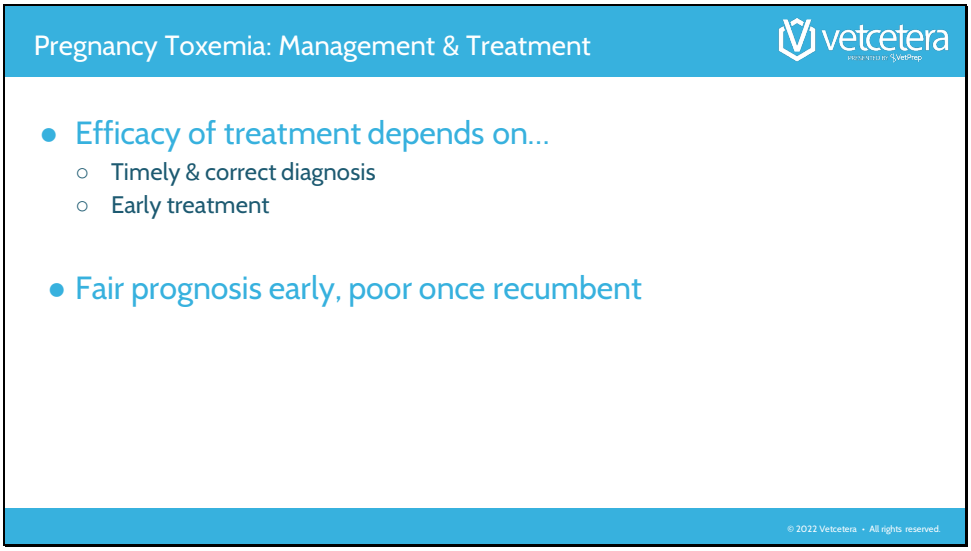
Slide 29

## Pregnancy Toxemia: Diagnosis – Clinical Pathology

- **Decreased**
  - Glucose
    - 20-40 mg/dL
  - Calcium
- **Increased**
  - SGPT
  - SGOT
  - BUN
  - Creatnine
  - BHBA
    - >3 mmol/L (x10.3 = 30.9 mg/dL)
  - NEFA


Figure 11: Vasava PR, Jani RG, Goswami HV, et al. Studies on clinical signs and biochemical alteration in pregnancy toxemic goats. Vet World, 2016 Aug; 9(8): 869-874.

Slide 30


Pregnancy Toxemia: Management & Treatment
vetcetera
Efficacy of treatment depends on…
Timely & correct diagnosis
Early treatment
Fair prognosis early, poor once recumbent
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Slide 31

## Pregnancy Toxemia: Management & Treatment

- Treatment based on…
  1. Eliminate negative energy source
     - Good quality hay & grain
       - Starch ferments to proprionate in rumen
       - Proprionate "Glucogenic" VFA
     - Oral propylene glycol: 2-3 oz PO BID
       - 3-carbon energy source
       - Glucose precursor
     - Parasite issues, etc.?

Slide 32

## Pregnancy Toxemia: Management & Treatment

- Treatment based on…
  1. Eliminate negative energy source
     - Good quality hay & grain
       - Starch ferments to proprionate in rumen
       - Proprionate "Glucogenic" VFA
     - Oral propylene glycol: 2-3 oz PO BID
       - 3-carbon energy source
       - Glucose precursor
     - Parasite issues, etc.?

Slide 33

## Pregnancy Toxemia: Management & Treatment

- Treatment based on…
  1. Eliminate negative energy source
     - Good quality hay & grain
       - Starch ferments to proprionate in rumen
       - Proprionate "Glucogenic" VFA
     - Oral propylene glycol: 2-3 oz PO BID
       - 3-carbon energy source
       - Glucose precursor
     - Parasite issues, etc.?
  2. Removal of factors that affect energy requirements (3 Options)
     1) Prolonged medical support of dam
     2) Induction of parturition
     3) Immediate Cesarean section

Slide 34

## Pregnancy Toxemia: Management & Treatment

### Prolonged Medical Support

- Possible to save dam and fetuses
- Poor prognosis for both dam and kids
- Provide dextrose, fluids, calcium
  - IV dextrose infusions
    - 5-7 g q 3-4 hours, preferably CRI
    - 5% dextrose, 10-20 mEq/L of potassium, 25 mL of calcium borogluconate/L
  - Insulin +/-
  - Blocks hormone sensitive lipase
  - Dose to effect, monitor glucose
  - Approximately 4X/day or CRI

Slide 35

## Pregnancy Toxemia: Management & Treatment

### Induction of Parturition

- 10 mg of Lutalyse® in goats
- 15 mg dexamethasone in sheep
- Dam may not survive until parturition (36-48 hours)
- Fetuses may be premature

## Pregnancy Toxemia: Management & Treatment

### Immediate C-Section

- Best prognosis for dam
- Most common reported reason for C-section in small ruminants
- Recovery of dam often dramatic (within 24-48 hours)
  - Warn owners & be prepared to euthanize kids if premature

Slide 37

## Pregnancy Toxemia: Prevention

- Increase nutritional plane in last 6 weeks of pregnancy
- Groups dams according to…
  - Number of fetuses (ultrasound)
  - Age
  - Body condition
- Prevent stress during pregnancy

Slide 38

## Pregnancy Toxemia: Prevention

### Breeding Management

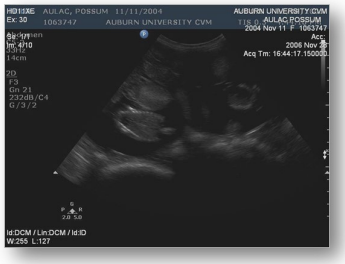
- High fecundity associated with increased incidence
- Breed at appropriate age – often delayed in show does
- Show does are over-conditioned
- Cull older does
  - Increased incidence with age/parity
  - Most first parity cases are show/pets → over-conditioned

Slide 39

## Pregnancy Toxemia: Prevention

### Nutritional Management

- Begin with good quality forage
- BCS and feed accordingly
- Ultrasound
  - Pregnancy status
  - Singletons/twins/triplets
- Establish feeding groups
- Increase feed as needed for weather conditions



Slide 40

Slide 41

## Dystocia: Clinical Presentation

- Eutocia
  - Normally uneventful - only 3-5% require assistance
  - Lateral recumbency may be preferred
  - Older does/ewes may remain standing
  - Amnion protrudes through vulva → forefeet & head
  - Most cranial, longitudinal presentation
    - Some in posterior presentation (3-9%)
    - Normal if both legs extended
    - Dystocia if flexed hind limb

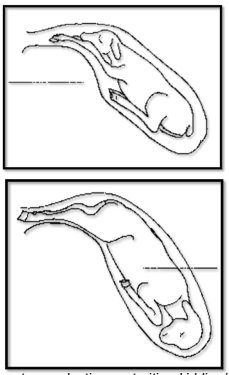


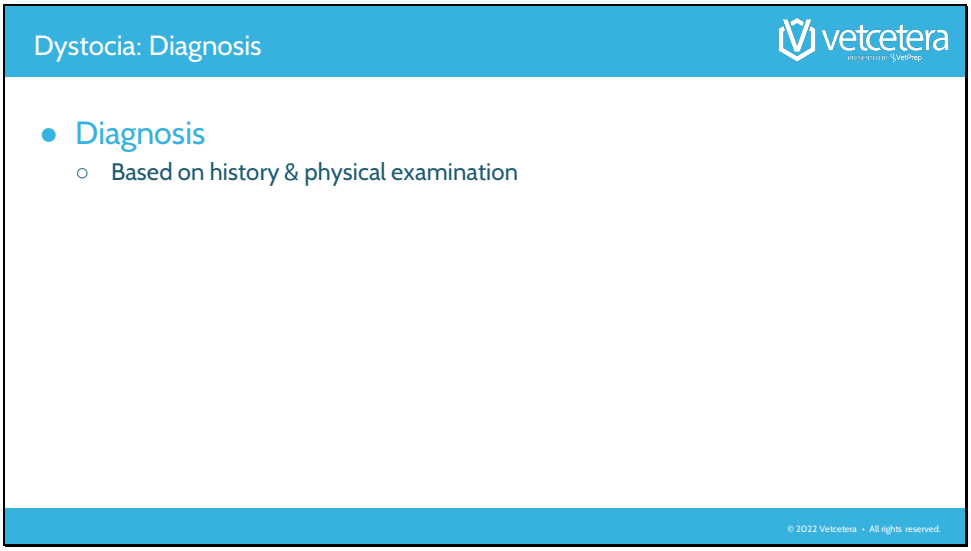
Figure 12: https://goats.extension.org/goat-reproduction-parturition-kidding/

Slide 42

## Dystocia: Clinical Presentation

- Dystocia
  - When does a normal delivery become a dystocia?
    - Doe in active labor ≥ 30 minutes & no progress
    - Abrupt cessation of parturition
    - Delivery of placenta without kid/lamb
  - Most common cause = ***fetal postural abnormalities***
  - Other causes…
    - Incomplete cervical dilation
    - Simultaneous presentation of lambs or kids
    - Cervicovaginal prolapse
    - Uterine inertia
    - Fetal-maternal disproportion - singleton birth, over-weight ewe or doe

Slide 43


Dystocia: Diagnosis
vetcetera
Diagnosis
Based on history & physical examination
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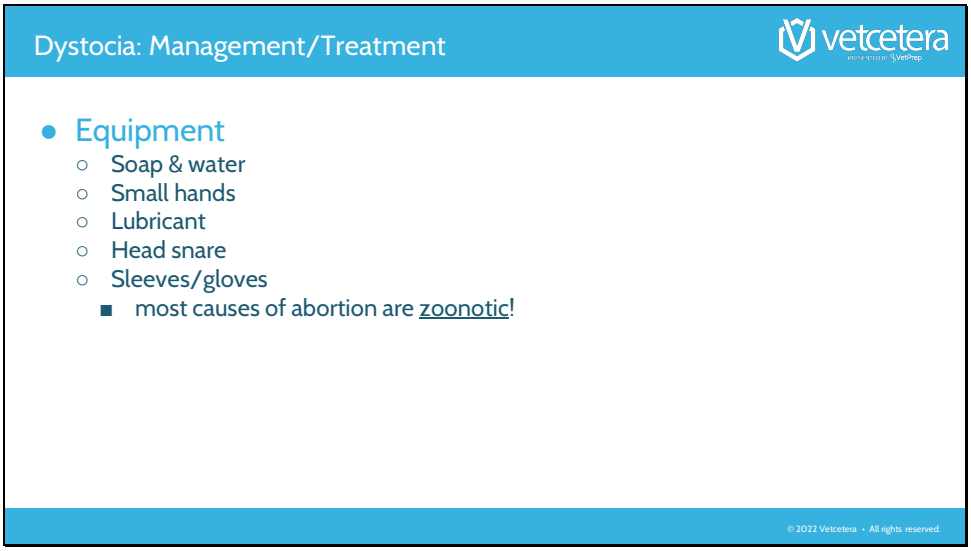
Slide 44

## Dystocia: Management/Treatment

- **Dystocia Management**
  - Assess overall condition & rule out concurrent disease
  - Caudal epidural +/-
    - Correct abnormalities of fetal posture
    - Decrease straining & pain

- **Rules of Dystocia**
  1. Small hands are an advantage
  2. Cleanliness
  3. Lubrication
  4. Gentleness - use extreme care, can rupture vagina & uterus, injury to kid

Slide 45


Dystocia: Management/Treatment
vetcetera
Equipment
Soap & water
Small hands
Lubricant
Head snare
Sleeves/gloves
most causes of abortion are zoonotic!
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Slide 46

## Dystocia: Management/Treatment

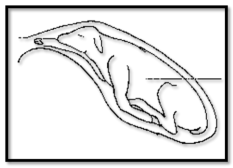
- "Race to the Finish"
  - More than on fetus attempting to exit the vagina at same time
  - Figure out which legs belong to which fetus & untangle
  - ID 1st kid, repel 2nd kid, deliver 1st kid
- Head Malposition
  - NEVER deliver if the head is retained
    - may cause rupture of the uterus!
  - Push fetus back to gain room to pull head around

Figure 13: https://goats.extension.org/goat-reproduction-parturition-kidding/

Slide 47

## Dystocia: Management/Treatment

- Front Leg Malposition
  - One or both front limbs retained
  - Some does may kid normally with one leg retained
  - If both, only head may be protruding from vulva
    - Swollen tongue
  - Elbow lock
    - Elbows are locked in flexion against pelvis
    - Repel fetus & digitally straighten one leg at a time



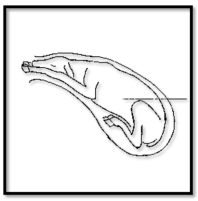


Figure 14: https://goats.extension.org/goat-reproduction-parturition-kidding/

Slide 48

## Dystocia: Management/Treatment

- Breech Presentation
  - Caudal longitudinal presentation, dorsosacral position, both rear limbs retained beneath fetus
  - Requires straightening both rear limbs
  - Push fetus cranially & to one side
  - Requires pulling & rotating the hock while the foot is pulled ventrally & medially
  - Careful with fetal hooves

Figure 15: http://www.ansci.wisc.edu/jjp1/ansci_repro/lab/lab13_09/calving/abnormal_positions.html

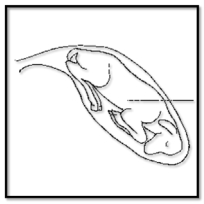


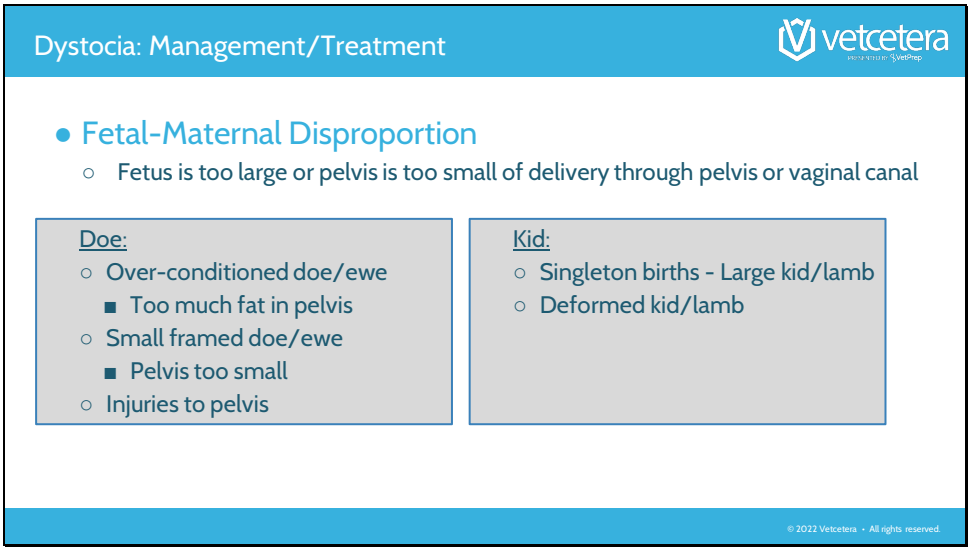
Figure 16: https://goats.extension.org/goat-reproduction-parturition-kidding/

Slide 49

## Dystocia: Management/Treatment

- Ringwomb
  - Failure of cervix to dilate completely
  - Relatively common (~23%)
  - Active labor with no kids delivered
  - Manual dilation unrewarding - may tear cervix
  - Predisposing factors
    - Hypocalcemia, hormone imbalances, mineral imbalance, prolonged dystocia
  - Treatment = Cesarean Section

Slide 50


Dystocia: Management/Treatment
vetcetera
Fetal-Maternal Disproportion
Fetus is too large or pelvis is too small of delivery through pelvis or vaginal canal
Doe:
Over-conditioned doe/ewe
Too much fat in pelvis
Small framed doe/ewe
Pelvis too small
Injuries to pelvis
Kid:
Singleton births - Large kid/lamb
Deformed kid/lamb
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Slide 51

## Dystocia: Management/Treatment

- Uterine Inertia
  - Inability of uterus to contract
    - May be cause or result of dystocia
  - Primary uterine inertia
    - May be due to hypocalcemia, hormone imbalance
  - Secondary uterine inertia
    - Due to fatigue
    - May be caused by ringwomb, fetal malposition

Slide 52

## Dystocia: Management/Treatment

- Cesarean Section
  - May be required in prolonged labor
    - Cervix starts to close within 2-3 hours
  - Relatively simple surgical procedure
  - Often best option for both doe and kids
- Fetotomy
  - Dead fetus
    - Removing extremities to relieve dystocia
    - Head, forelimb, rearlimb

Slide 53

## Dystocia: Management/Treatment

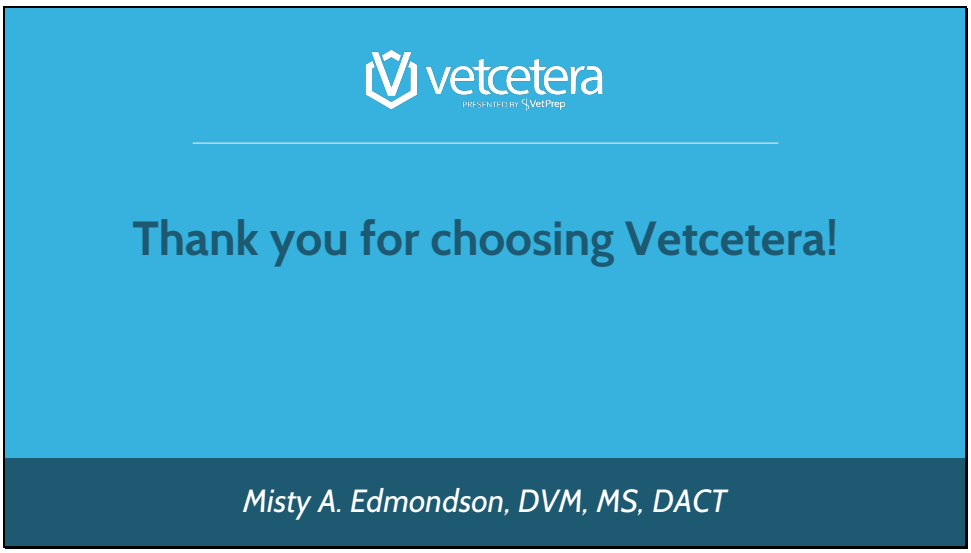
- Aftercare for Doe/Ewe
  - Carefully check for additional fetuses
  - +/- antibiotics
  - +/- tetanus antitoxin
  - Anti-inflammatories
  - Good nutrition
  - Check for sufficient colostrum/milk
- Aftercare for Kids/Lambs
  - Remove fetal membranes
  - Manual stimulation
  - +/- oxygen
    - Meconium staining
  - Keep warm
  - Dip navel – 7% iodine
  - COLOSTRUM!!!

Slide 54

## Dystocia: Prevention

- Good breeding management
- Good nutrition – not too fat, not too think
- Careful observation
- Client education – what's normal, when to call DVM

Slide 55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Thank you for choosing Vetcetera!
Misty A. Edmondson, DVM, MS, DACT