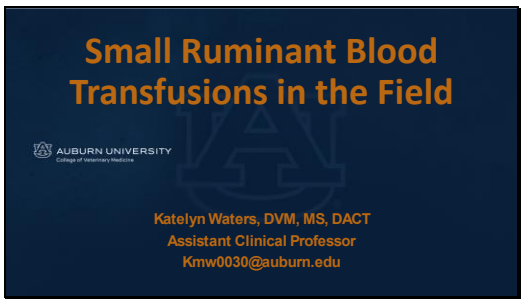
Slide 1



Slide 2

Outline

- Identification of anemia
- Causes of anemia
- Transfusion Indications
- Transfusion Necessities
- Donor selection
- Transfusion protocol
- Case example

Slide 3

Identifying Anemia

- FAMACHA
- PCV/TP
- Hemogram

Slide 4

FAMACHA

- Access level of anemia
- Compares conjunctival color
- Inexpensive
- Instant results
- Owner education

Photo: smallruminants.ces.ncsu.edu/2019/09/the-famacha-history/

Slide 5

Hemogram: Anemia

- Acute blood loss
  - Normal parameters immediately after insult
  - Anemia and hypoproteinemia several hours later
  - Regeneration evident within 1-2 days
    - Macrocytosis
    - Reticulocytosis
    - Nucleated red blood cells

Slide 6

Causes of anemia

- Parasites
- Parasites
- Parasites

Slide 7

Causes of anemia

- Parasites
  - Internal and ectoparasites
- Trauma
- Hemolysis
  - Infectious
  - Toxins

Slide 8

Intestinal Parasites

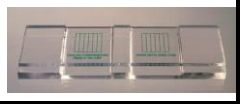
- HOTC
  - *Haemonchus contortus*
  - *Ostertagia spp.*
  - *Trichostrongylus spp.*
  - *Cooperia spp.*
- Coccidia
  - *Eimeria spp.*
- *Trichuris spp.*

Photo: Sheep, goat, and cervid medicine

Slide 9

McMaster's Fecal Egg Count

- In general:
  - 1,000 epg in small ruminants
  - Utilize the EPG in conjunction with FAMACHA and clinical signs of animal
    - Diarrhea
    - Poor FAMACHA
- Fecal floatation
  - Coccidia



Slide 10

Deworming

- Triple Dewormer
  - Fenbendazole: 20 mg/kg PO
  - Oral Ivermectin Sheep Drench: 0.4 mg/kg PO
  - Levamisole:
    - Goats: 15 mg/kg PO
    - Sheep: 8 mg/kg PO
- Vitamin B Complex
- Flunixin Meglumine
  - 1.1 mg/kg IV

Slide 11

Deworming protocol: Coccidiosis

- Sulfadimethoxine
  - 55 mg/kg PO Day 1
  - 27.5 mg/kg PO Q24 Day 2-5
- Amprolium
  - 25-40 mg/kg PO Q24 hours, 5-day duration
  - Thiamine antagonist
  - +/- Thiamine supplementation

Slide 12

Trauma

- Dog bites
- Fighting
- Surgical complications
  - Castration
  - Dehorn
  - Disbudding

Slide 13

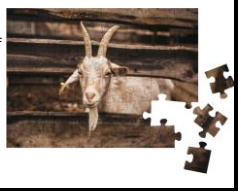
Hemolysis

- Toxic plants
- Copper
- Sulfur
- Nitrates and nitrites
- Blood borne parasites

Slide 14

Step by Step Workup: Transfusion Indications

- Approach for each case
- "Don't miss the forest for the trees"
  - Trust your physical exam and yourself
- What will each diagnostic tell you
  - How will it change your treatment plan
    - OR WILL IT?!
- Manage client expectations



Slide 15

Transfusion indications

- PCV: ≤10-12 %
- Plasma transfusion also needed?
  - Total protein
    - Albumin?
- Ongoing severe hemorrhage
  - Trama, procedure complication

Slide 16

Transfusion necessities

- Healthy donor animal
- Blood administration set
- Blood collection

Photo: Jbrvet

Slide 17

Transfusion necessities

- Clippers and scrub
- Catheter or large needle
- Low-cost short-term catheter
  - "Taco" suture
  - Sedation if donor fractious

Slide 18

Combating the anemia

- Referral to hospital
  - Financial constraints?
  - Ability to haul in?
- Discussion with owner
  - Risks with being on farm
    - Reactions
  - Risks with a blood transfusion
    - Donor and Recipient
  - Accurate PCV?
  - Centrifuge available?

Slide 19

On farm donor selection

- Systemically healthy
  - Non-pregnant
  - Disease status
    - Herd free from?
  - Non-new additions
- PCV: > 25-28 %
  - FAMACHA of 1-2
- "Largest Pinkest Healthy goat"

Slide 20

Combating the anemia

- Donor animal:
  - Biggest, pinkest animal
- Pink goat (1/5) → Pale goat (5/5)
- 20 ml/kg
  - Safe for healthy donor and recipient
  - Donor→ 20 ml/kg based on donor weight

Slide 21

Combating the anemia

- Monitor vital signs
  - Heart and respiratory rate
    - Lung sounds
    - Crackles
      - Furosemide 0.5-1 mg/kg IV q12-24 hours
  - Temperature
- Look for signs of reaction
  - Change in TPR
  - Swelling of face
  - Itching
  - Licking

Slide 22

Combating the anemia

- Can give over several hours
- Perform transfusion over ~20-30 minutes
  - Start at slow drip then increase while monitoring patient
  - 1 drop/second for 5 minutes
  - 3 drop/second for 5 minutes
  - Continuous drip for duration
- Stop/slow rate if any reaction

Slide 23

Phone rings: Ambulatory call, ADR male goat

Slide 24

Phone rings: Ambulatory call, ADR male goat

- Common things happen commonly
- Thoughts before/while talking to owner
  - Potential problem list
    - Intestinal parasitism
    - Urolithiasis
    - Poor nutrition plane
    - Neurologic conditions
  - BUT! Don't assume before you examine patient
  - BUT! Ensure you have items you need on truck
    - i.e. ultrasound, blood transfusion equipment

Slide 25

ADR thoughts:

- Common things happen commonly
- Thoughts before/while talking to owner
  - Potential problem list
    - Urolithiasis
    - Intestinal parasitism/anemia
    - Poor nutrition plane
    - Neurologic conditions

Slide 26

Ambulatory Case: November

- Adult Boer Buck
- TPR: WNL
- Approximate weight: 115 lb.
- **FAMACHA: 5/5**
  - **WHITE!**
- BCS: 3/5
- Mentation
  - QAR, Cranial nerves: WNL
- Ambulation
  - Slow to rise but ambulatory
  - Proprioception: WNL
- Mild diarrhea
- No other animals affected

Slide 27

Problem list

- Anemia
- Weight loss
- Decreased appetite

Differentials

- Parasitism
- Other causes of anemia
  - Kidney Disease
  - Autoimmune
  - Toxin
    - *was a large concern of this owner

Slide 28

Do we have multiple problems?!

- Rule-out urolithiasis
- Focal ultrasound: Urinary bladder normal in size/wall thickness
  - Normal urination observed during ultrasound
    - Can urinate sometimes with partial obstructions
  - Look for crystals
    - Snow globe

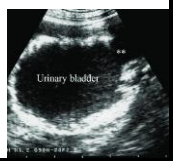


Photo: Tharwat, 2021

Slide 29

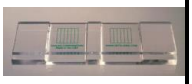
Treatment Plan

- Blood transfusion
  - 20 mg/kg
- Triple Dewormer
  - Fenbendazole: 20 mg/kg
  - Oral Ivermectin sheep drench: 0.4 mg/kg
  - Levamisole: 15 mg/kg
- Flunixin Meglumine
  - 1.1 mg/kg IV
- Vitamin B Complex
  - 5 ml SQ
- Supportive care at home

Slide 30

McMaster's Fecal Egg Count

- Patient EPG
  - ➢300 epg
    - No coccidia observed
    - Diarrhea present



Slide 31

Complete blood count: Post transfusion

- Severe anemia
  - Hematocrit: 15
  - Non-regenerative
    - Acute: < 5-7 days--> pre-regenerative anemia
    - > 5-7 days in duration--> true non-regenerative anemia
- No chemistry or other diagnostics performed at this time

Slide 32

Post-transfusion at home care

- Free access to hay and water
  - Can proved dilute Gatorade water
- Add some grain/alfalfa to entice him to eat
- Keep in small pen
- Recheck Mcmaster's in 10 days

Slide 33

Update from a few weeks later

- 2-weeks post transfusion (phone)
  - Doing better at home
  - Up out of pen more
  - Eating, drinking, overall better
- Herd check 1 month later
  - Buck FAMACHA 5/5
    - Anemia most likely still non-regenerative
    - Discussed Hospitalization
    - Further diagnostics to identify cause of anemia

Slide 34

CBC/Chem results: December

RBC	6.65	x 10^6/uL
HGB	5.1	g/dL
HCT	13.7	%
MCV	19.7	fL
MCH	7.4	pg
MCHC	37.4	g/dL
RDW	21.6	%
PLATELET COUNT	477	x 10^3/uL
MPV	8.0	fL
RETIC_PCT	0.60	%
RETIC_ABS	41.5	x 10^3/uL
WBC	10.05	x 10^3/uL

Test	Diff %	Result	Units
SEG	(69%)	7.565	x 10^3/uL
BANDS	(1%)	0.110 H	x 10^3/uL
LYMPH	(28%)	3.066	x 10^3/uL
MONO	(2%)	0.219	x 10^3/uL
EOS	(0%)	0.000	x 10^3/uL
BASO	(0%)	0.000	x 10^3/uL
PLT.EST	WITHIN REFERENCE INTERVAL		
Plasma T/S	7.2 g/dL		
Fibrinogen T/S		200	mg/dl

TOTAL PROTEIN	6.12	g/dL
ALBUMIN	2.77	g/dL
GLOBULIN	3.35	g/dL
ALBUMIN/GLOBULIN RATIO	0.83	
SDH	0.5	U/L
AST	125	U/L
GGT	57	U/L
TOTAL BILIRUBIN	0.06	mg/dL
CPK	2039	U/L
BUN	209.8	mg/dL
CREATININE	19.8	mg/dL
CALCIUM	7.9	mg/dL
PHOSPHORUS	2.8	mg/dL
MAGNESIUM	6.1	mg/dL
GLUCOSE	77	mg/dL
BICARBONATE	14.1	mmol/L
SODIUM	140	mmol/L
POTASSIUM	3.2	mmol/L
CHLORIDE	93	mmol/L
ANION GAP	36.1	
OSMOL(CALC)	346	mOsm/kg
S.IRON	226	ug/dL

Slide 35

In hospital

- Repeat CBC/Chemistry on presentation 3 days later
  - BUN/Creatinine: increased (203/20)
- Transabdominal ultrasound
  - Large right kidney
    - Loss of medullary definition
  - Small left kidney
- Maintained on IV fluids during stay
- Choked twice while in hospital
  - Naxcel to combat aspiration

Slide 36

Necropsy :(

- Right kidney
  - Hematoma associated with rupture and chronic renal disease
- Both kidneys
  - Bilateral chronic glomerulonephritis

Slide 37

Thank you!

- kmw0030@auburn.edu