



THE OHIO STATE UNIVERSITY

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COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

# Sheep 101 Field Day

## Parasite management and sheep health

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# Outline

## **Parasite management**

- What and Why?
- Understanding the Problem
- Management Solutions

## **Sheep health**

- General Health Concerns
  - Nutrition
  - Management
  - Reproductive
- Abortions and Stillbirths
  - Causes
  - Prevention





# Parasites – What Are We Dealing With?

Internal gastrointestinal parasitic infection

## Attachment

- Abomasum (true stomach)
- Small intestine



## Helminths

- Feed off host for nutrient needs

## Nematodes

- *Haemonchus contortus* \*





# Parasitic Infection

Result of an animal ingesting larvae from contaminated pasture

Once established, parasitic infection can result in:

- Anemia
- Nutrient malabsorption
- Decreased immunity
- Decreased feed conversion
- Decreased weight gain
- Decreased reproductive performance
- Decreased wool growth
- Death



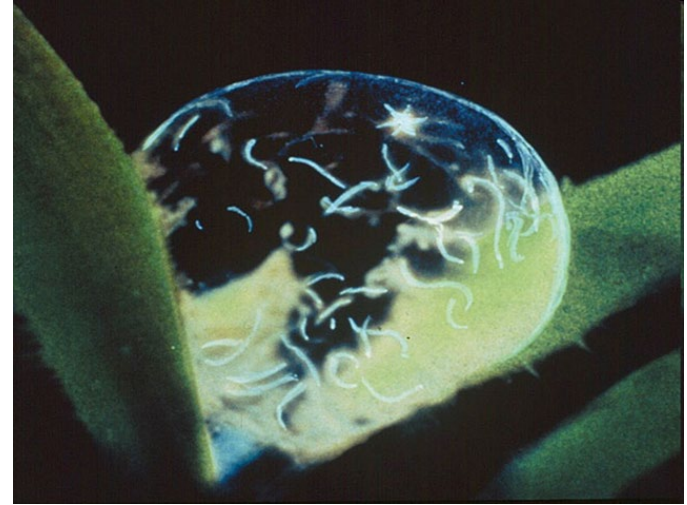




# Parasitic Infection

## Where do parasites live and thrive?

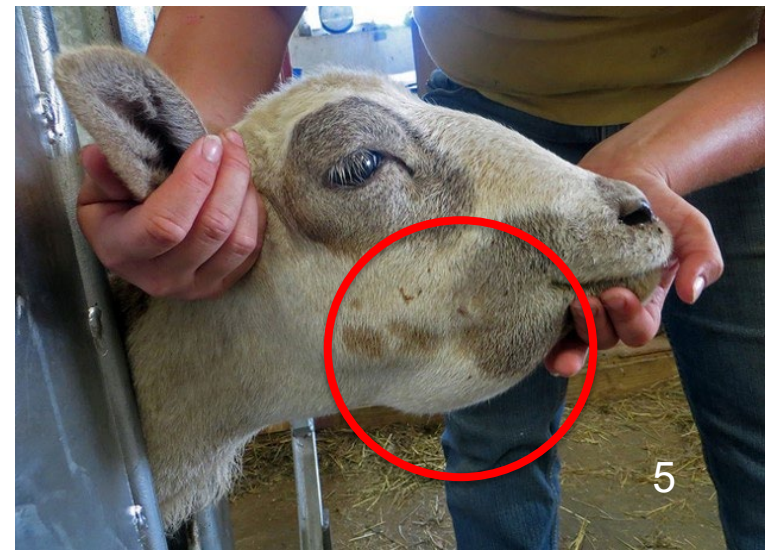
- Manure on pasture
- Wet, moist environments
- Beneath the forage canopy



## Indicators of parasitic infection

- Anemia
- Bottle jaw
- Ill thrift
- Weight loss

Is parasitic infection bad?





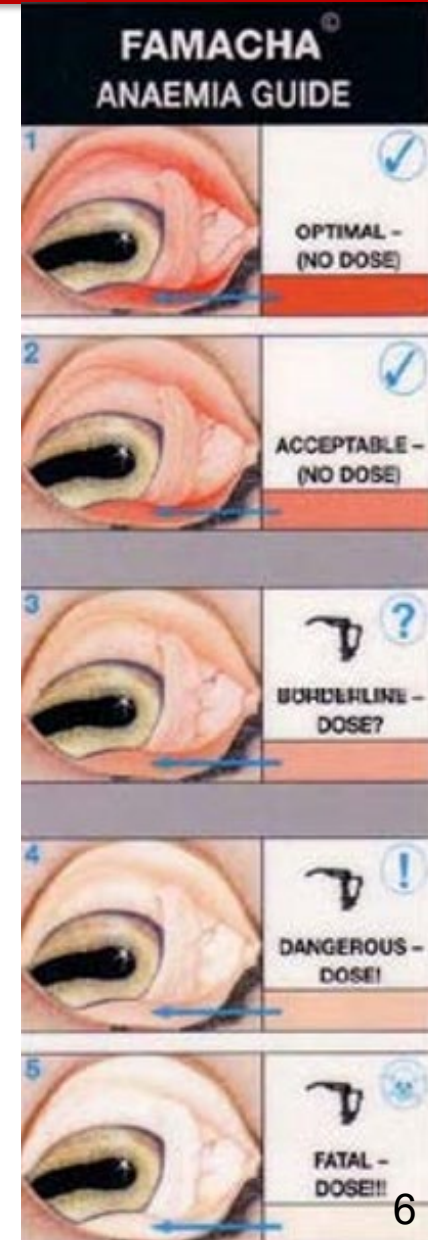
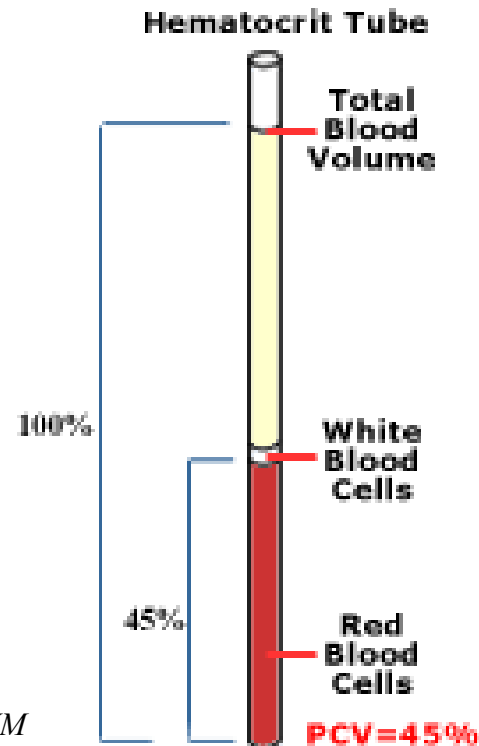
# Parasitic Infection – Tools of the Trade

How do we monitor parasitic infection?

## Alterations in:

- Body weight (BW)
- Packed Cell Volume (PCV)
- Fecal Egg Counts (FEC)
- FAMACHA eye scoring
- Total plasma protein conc.
- Immune parameters
- Larval counts – on pasture

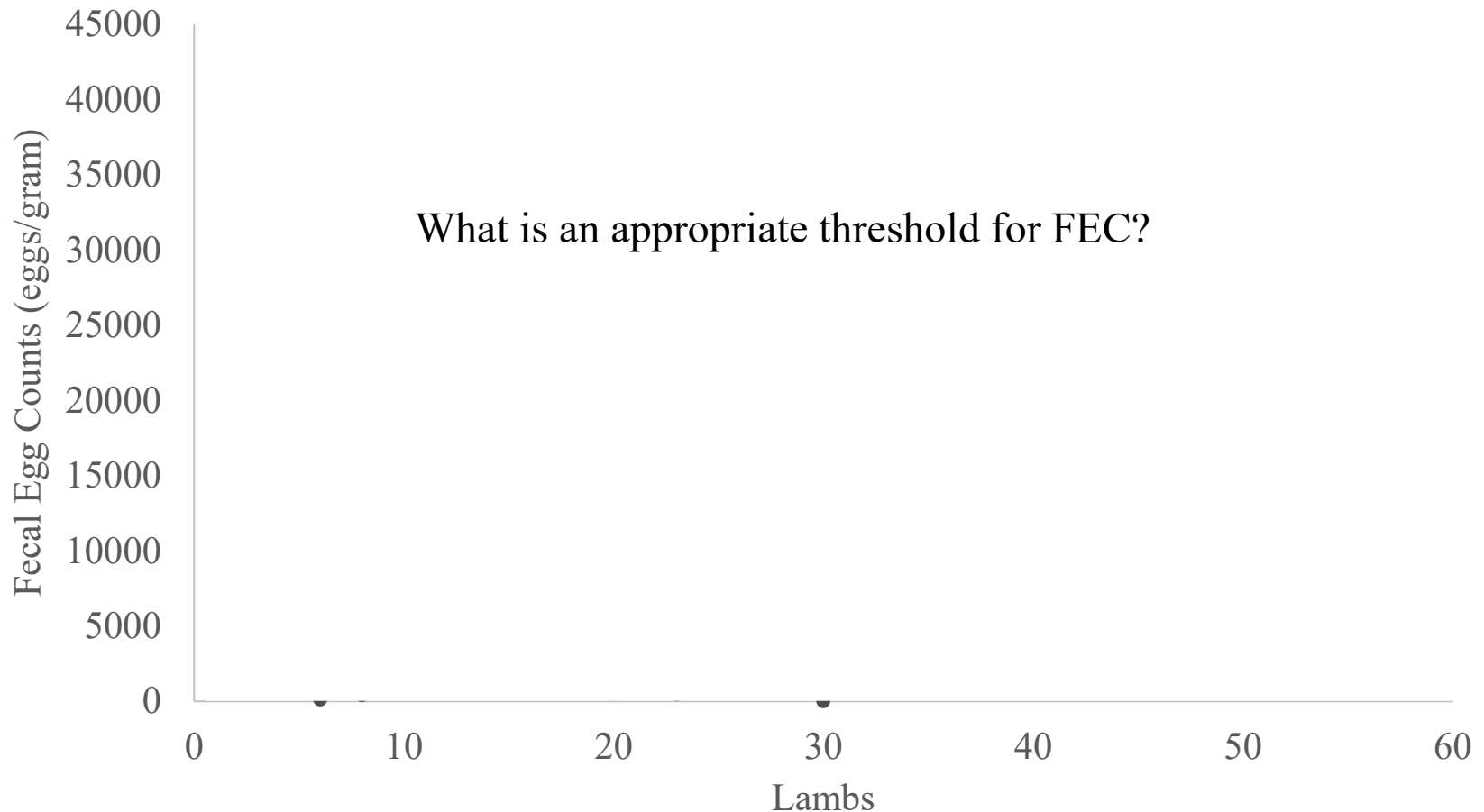
*Race Foster, DVM*





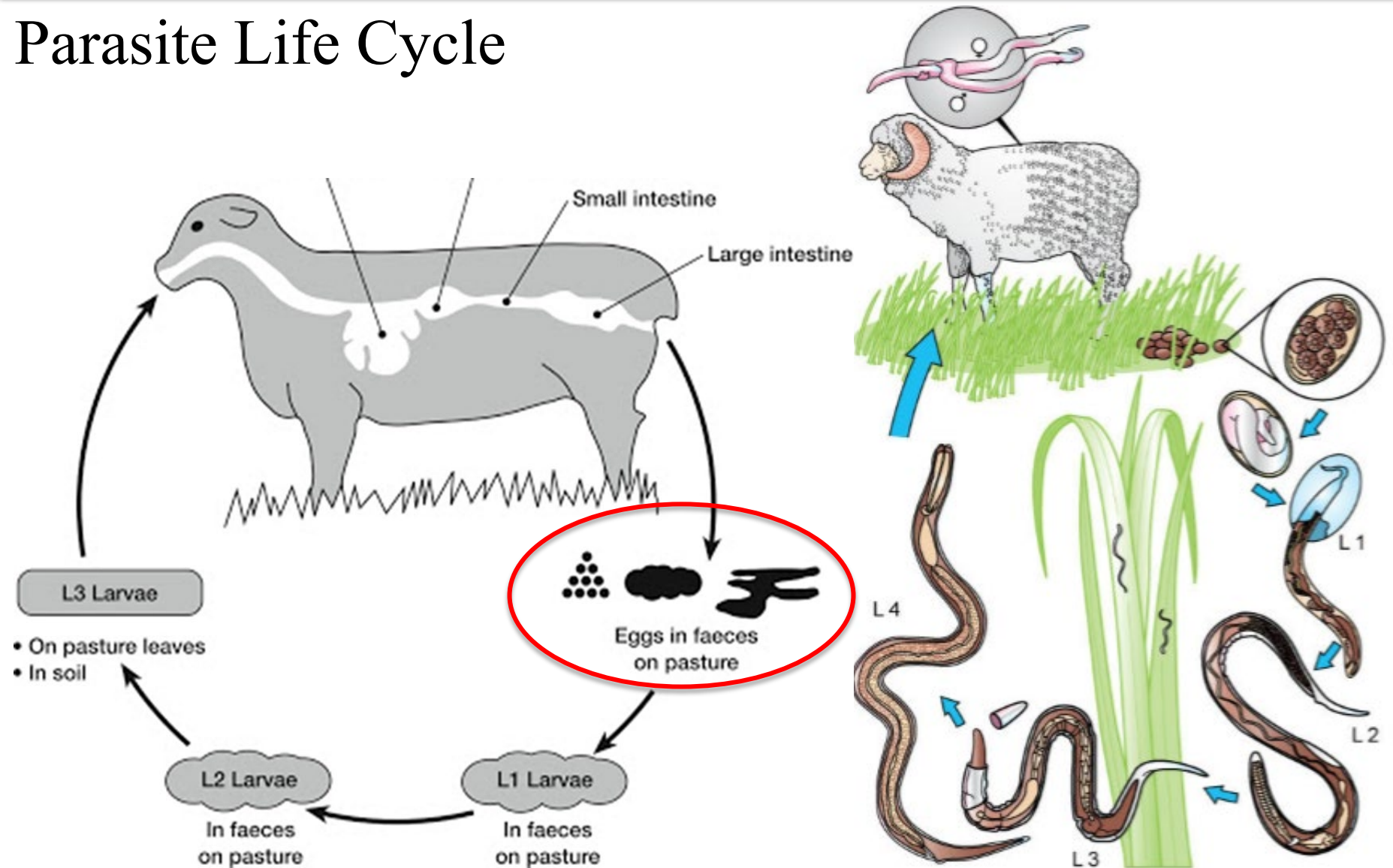
# Parasitic Infection – 2018 Fall Grazing Lambs

FEC's of 2018 Fall Born Lambs (61 days of age)





# Parasite Life Cycle







# Understanding the Problem

## Anthelmintics (de-wormers):

- The most common form of parasite management

## Anthelmintic resistance:

- The heritable capability of parasitic nematodes to survive what would be considered an effective anthelmintic dose

## Causes:

- Under dosing
- Repetitive use
- Failed equipment
- Decrease in refugia populations
- Transfer from dam?

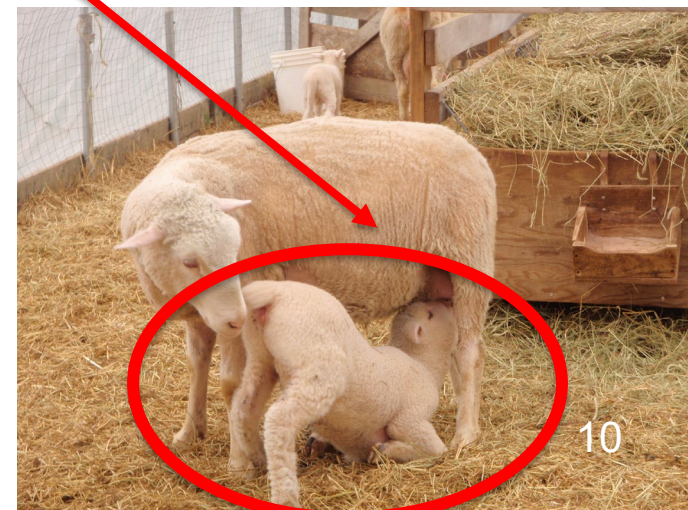
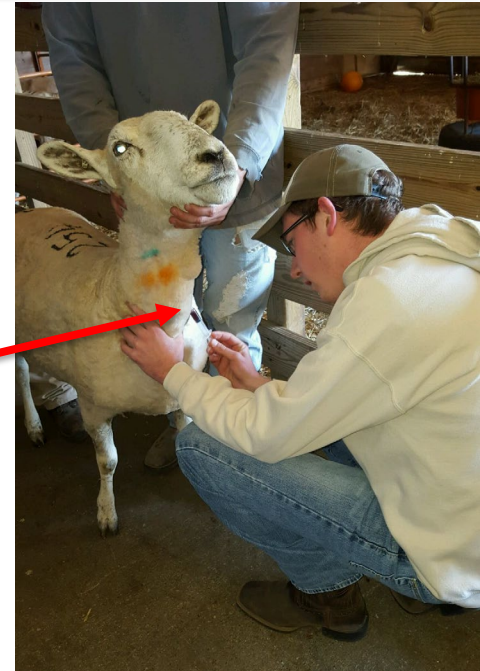
Anthelmintics (dewormers) available in the U.S.

Drug class		Ingredient	Trade name
BZD	Benzimidazole	Thiabendazole Fenbendazole Albendazole Oxtemdazole	TBZ® Panacur®, SafeGuard® Valbazen® Synanthic®
IMID	Nicotinic agonist Imidazothiaoles Tetrahydropyrimidines	Levamisole Morantel Pyrantel	Prohibit®, Levasol®, Tramisol® Rumatel®, Nematel®, Strongid®
ML	Macrocyclic lactone Avermectins Milbemycins	Ivermectin Epinomectrin Doramectin Moxidectin	Ivomec®, Primectin® Eprinex® Dectomax® Cydectin®, Quest®

Only Valbazen® drench, Ivomec® drench, Prohibit® drench, and Cydectin® drench are FDA-approved for use in sheep in the United States. 9



# Understanding the Problem



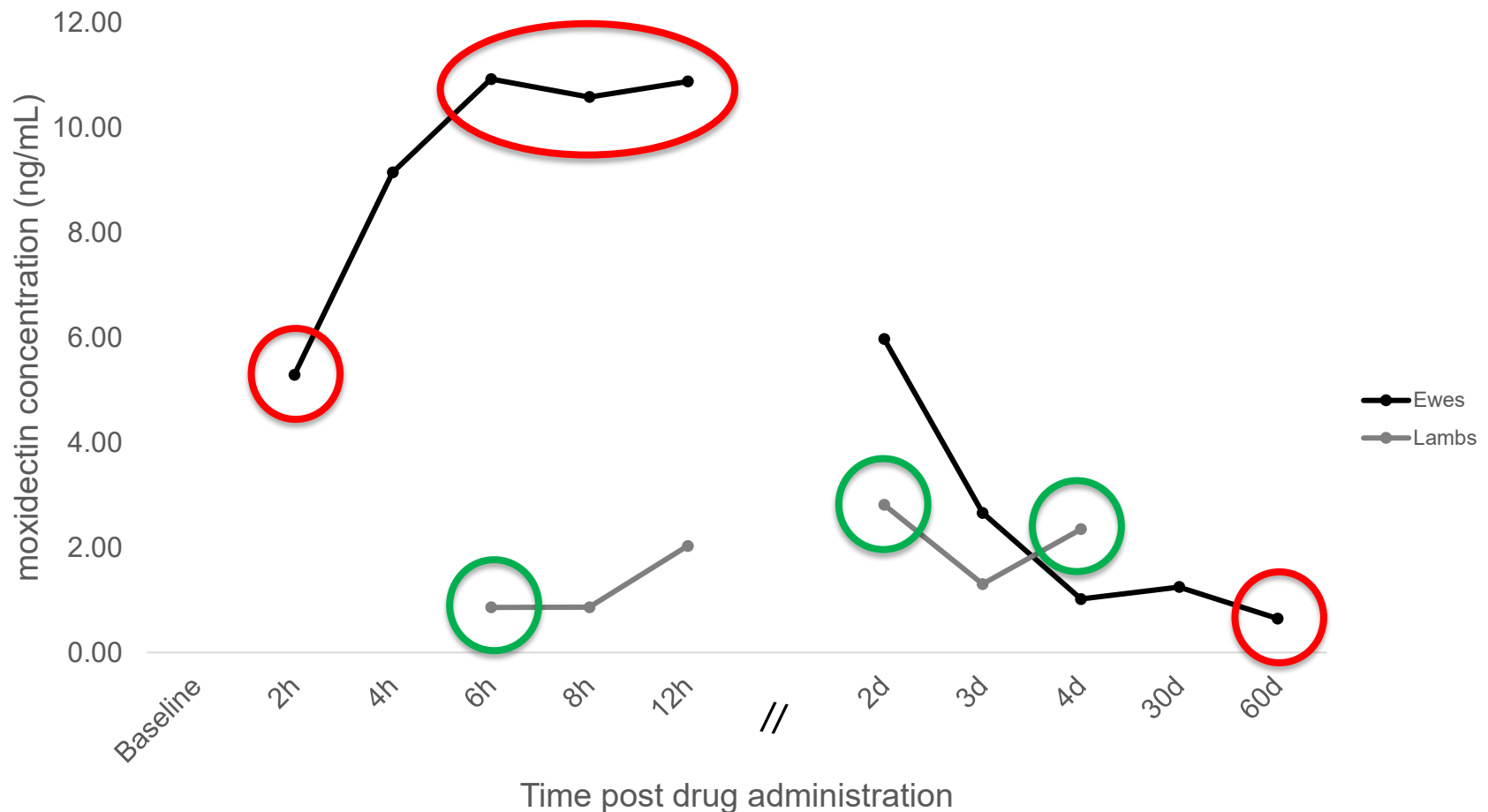
## What do we know about Cydectin?





# Understanding the Problem

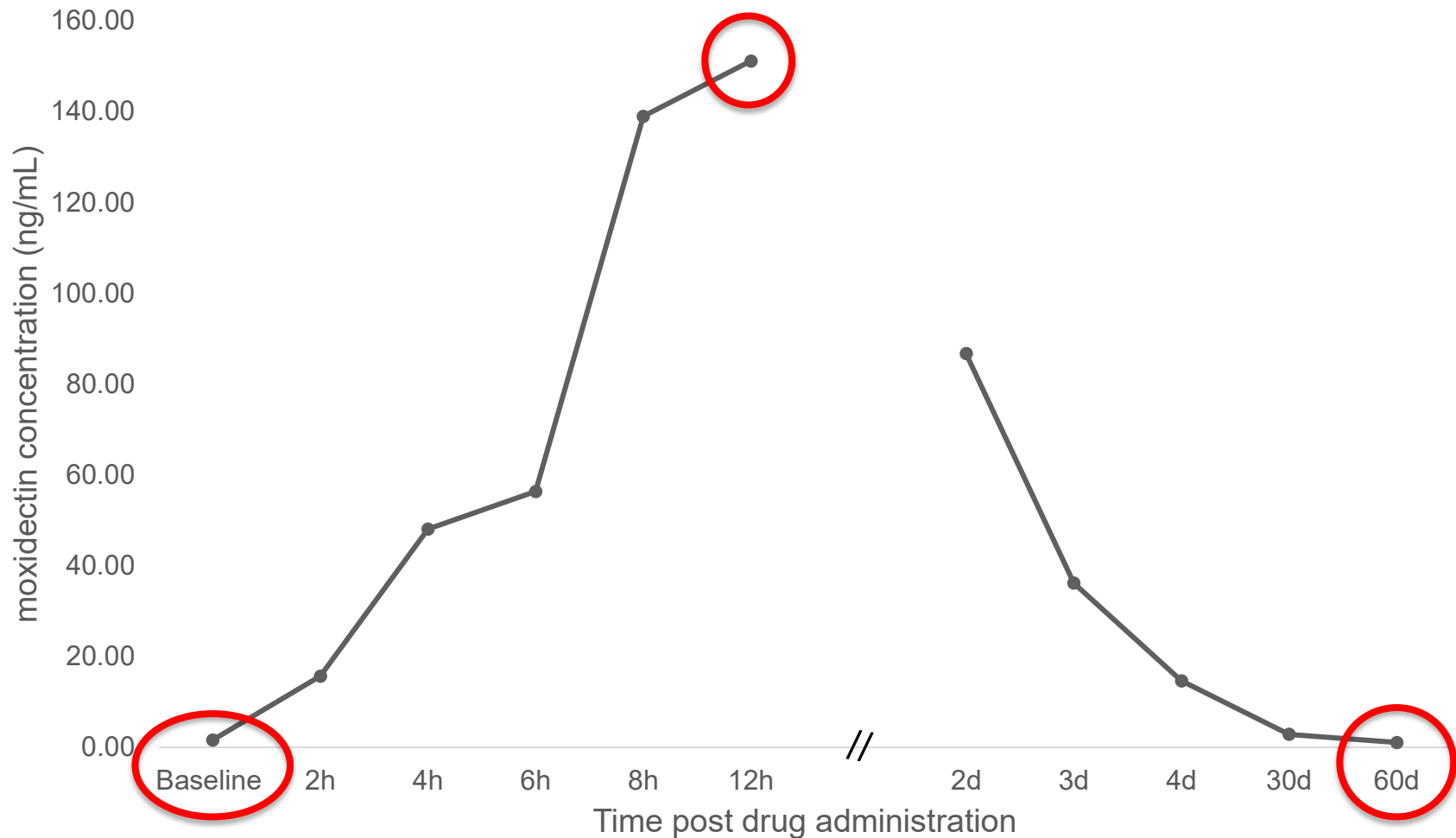
## Results - average ewe and lamb plasma concentration





# Understanding the Problem

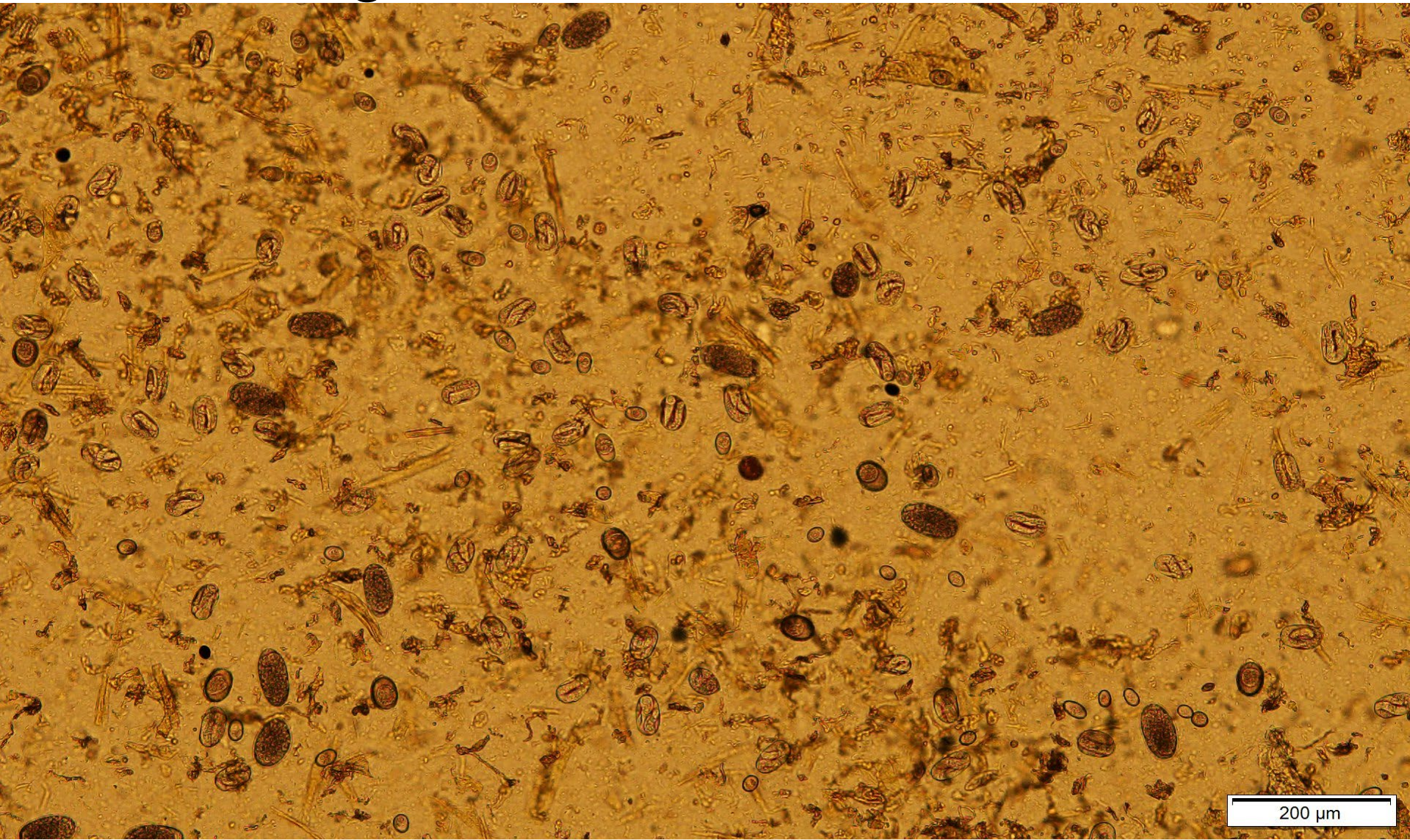
## Results - average ewe milk concentration







# Understanding the Problem



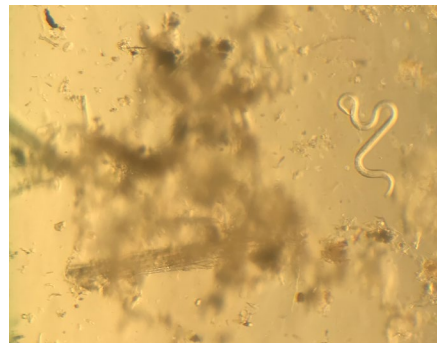




# Management

## Alternative management practices:

- Confinement
- Delayed weaning
- Judicious use of anthelmintics
- Breeds
- Mineral supplementation
- Protein supplementation
- Fall grazing
- Pasture management
- Grazing strategies
- Forage management
- Alternative forages
- Future technology





# Management – Confinement





# Management – Delayed Weaning

## Effects of alternative weaning strategies on lamb Body Weight (lbs.)

Item	Pasture Control	Ewe	Social Facilitator	Feedlot control
d 0	39.3	41.0	39.7	39.3
d 7	45.6 <sup>a</sup>	47.6 <sup>a</sup>	46.5 <sup>a</sup>	40.4 <sup>b</sup>
d 14	47.4 <sup>a</sup>	51.2 <sup>a</sup>	47.9 <sup>a</sup>	40.8 <sup>b</sup>
d 28	50.1 <sup>b</sup>	55.8 <sup>a</sup>	49.8 <sup>b</sup>	42.1 <sup>c</sup>
d 42	54.0 <sup>b</sup>	66.8 <sup>a</sup>	55.1 <sup>b</sup>	50.3 <sup>b</sup>
d 56	54.2 <sup>c</sup>	69.5 <sup>a</sup>	55.3 <sup>bc</sup>	60.2 <sup>b</sup>

**a, b, c means within a row with different superscripts differ ( $P < 0.05$ )**





# Management – Delayed Weaning

**Effects of alternative weaning strategies on lamb performance during the feedlot phase (lbs.)**

Item	Pasture Control	Ewe	Social Facilitator	Feedlot Control
<b>Total Weight Gain</b>	60.9 <sup>b</sup>	46.5 <sup>c</sup>	63.3 <sup>b</sup>	78.3 <sup>a</sup>
<b>Total DMI</b>	333.2 <sup>a</sup>	269.2 <sup>b</sup>	330.8 <sup>a</sup>	336.0 <sup>a</sup>
<b>Total Days in Feedlot</b>	108.7 <sup>b</sup>	76.0 <sup>c</sup>	104.3 <sup>b</sup>	132.0 <sup>a</sup>
<b>Total Days during Feedlot Phase</b>	108.7	76.0	104.3	76.0

**a, b, c means within a row with different superscripts differ ( $P < 0.05$ )**



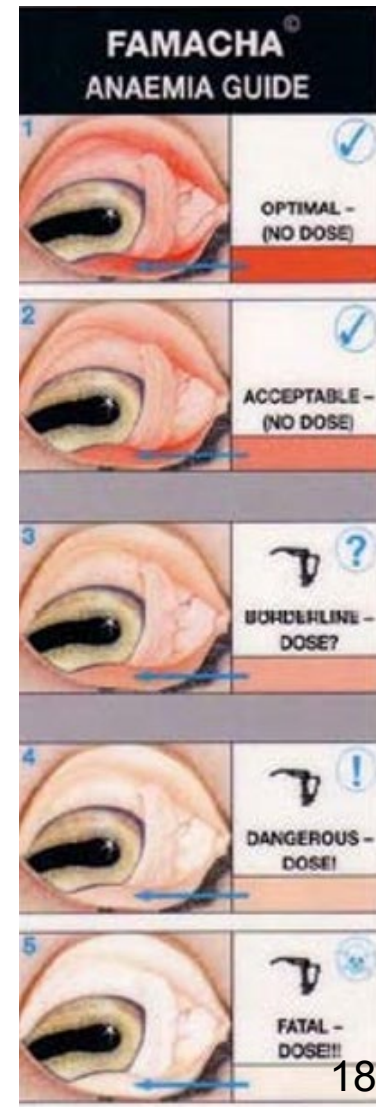
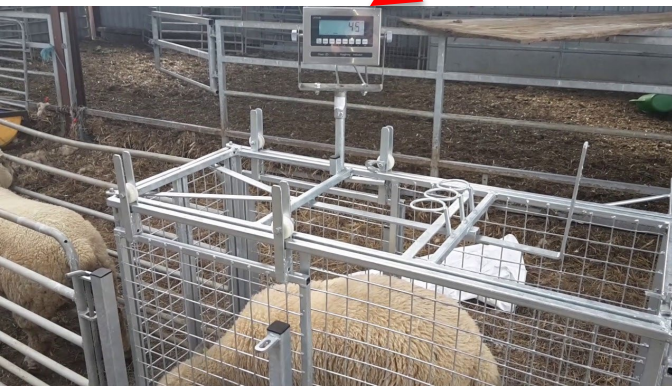
# Management – Judicious use of Anthelmintics

## Treat only those that need treated!

- FAMACHA eye scoring
- Packed Cell Volume (PCV)
- Fecal Egg Count (FEC)
- Total Plasma protein

## Administration

- PO
- SQ





# Management – Breeds

Immune response

Parasite tolerance vs. resistance

Location



## Sheep breeds

- Barbados Blackbelly, Dorper, Katahdin, St. Croix
- Texel

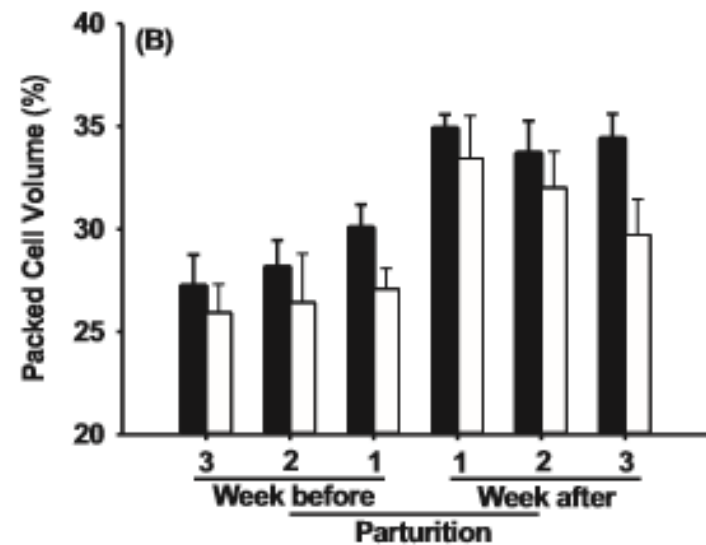
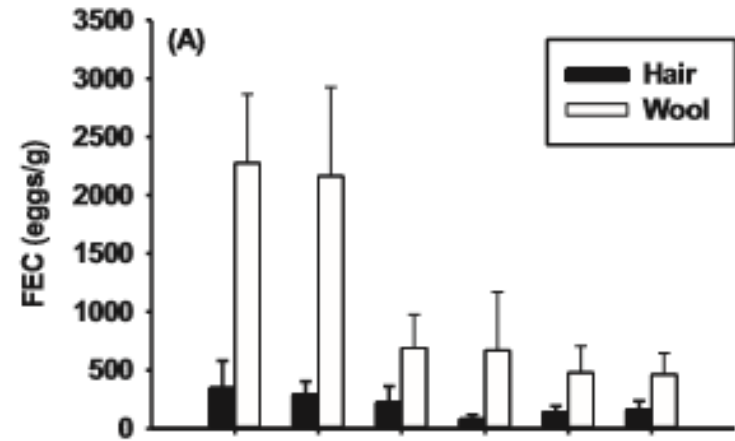
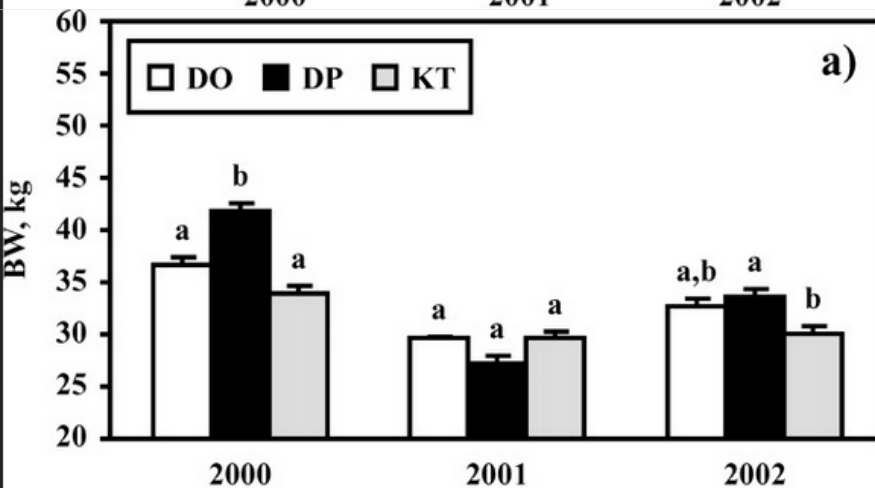
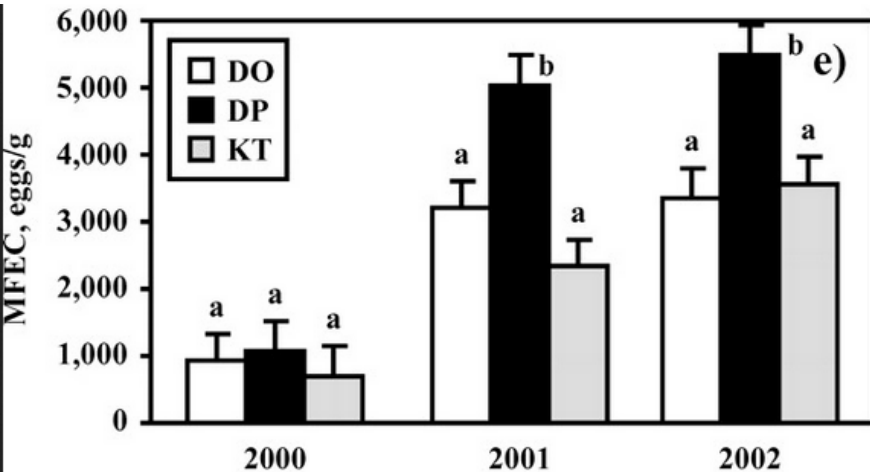
## Why hair sheep?

- Partitioning of nutrient requirements?





# Management – Breeds







# Management – Mineral Supplementation

Mineral should ALWAYS be available



## Why?

- Zinc - foot health, eye health, growth, immunity, parasites
- Selenium - muscle development, immunity, growth
- Copper - bone formation, growth, foot health, parasites

Mineral interactions

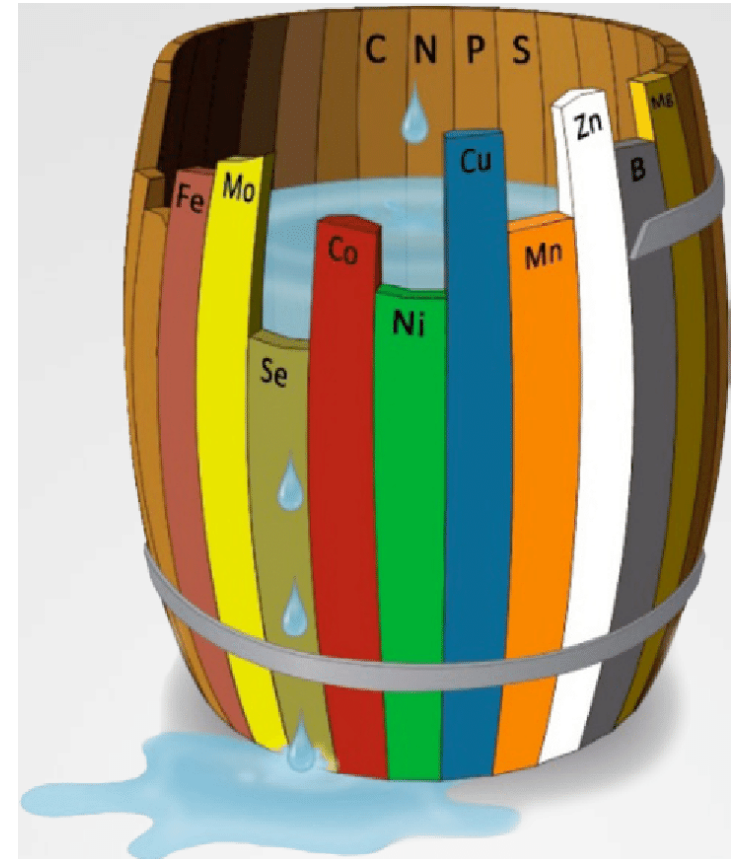
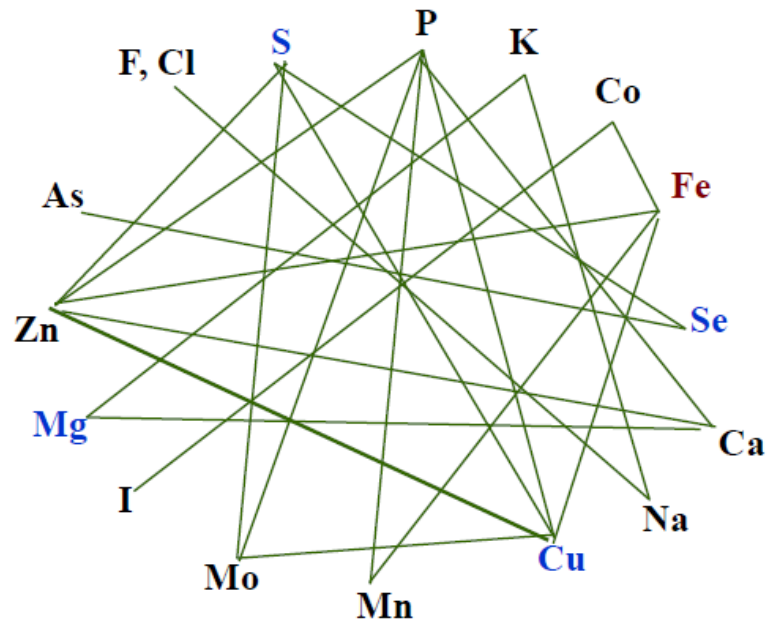
How is the mineral being provided?





# Management – Mineral Supplementation

## Trace Mineral Interactions



*Liebig's barrel – Liebig's Law of the Minimum*



# Management – Mineral Supplementation

## Mineral form

**TABLE 2.** Salt intake by weaned lambs<sup>1</sup>

Item	Treatment						SE	P-value		
	Location		Feed		Salt Form			Pen vs. Field	ALF vs. BAR	Loose vs. Block
	Pen <sup>2</sup>	Field <sup>3</sup>	ALF <sup>4</sup>	BAR <sup>5</sup>	Loose <sup>6</sup>	Block <sup>7</sup>				
Average Salt Intake, oz • lamb <sup>1</sup> • d <sup>1</sup>	0.011	0.004	0.007	0.008	0.010	0.005	0.04	< 0.01	0.91	< 0.01

1. No two- or three-way interactions were detected for location, feed or salt form.

2. Pen = Sheltered confinement.

3. Field = Wheat stubble field.

4. ALF = pellet containing 71% alfalfa, 18% barley, 5% molasses, 0.013% Bovatec, and 8.1% vitamin/mineral package (no salt).

5. BAR = pellet containing 80% barley, 26% alfalfa, 4% molasses, 4% bentonite, 2.5% soybean-hi pro, 0.016% Bovatec, and 7.4% vitamin/mineral package (no salt).

6. Loose = Plain white granulated salt. American Stockman brand with a guaranteed analysis of 98.0% to 99.9% Sodium Chloride.

7. Block = Plain white 22.7-kg block salt. American Stockman brand with a guaranteed analysis of 98.0% to 99.9% Sodium Chloride.

*Ragen et al. (2015)*





# Management – Protein Supplementation

## Pasture supplementation

- Effects of parasitism
- Protein vs. Energy
- Additional cost
- Mechanics behind effect?



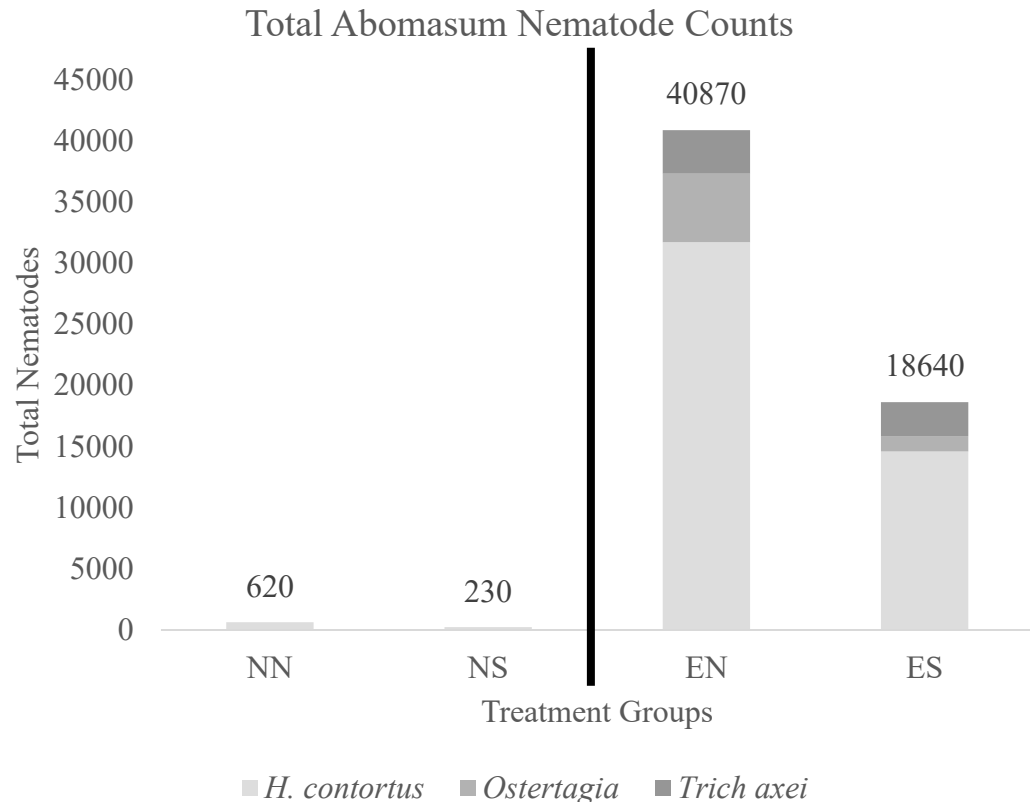




# Management – Protein Supplementation

## Increase protein in the diet

- Corn\*
- Soybean meal/hulls
- By-products
  - Wheat middling's
  - Corn gluten feed
  - DDGS
- Forage crops
  - Annuals
  - High tannins
- Substitution effect?





# Management – Protein Supplementation

Table 3. Effect of dried distillers grains with solubles (DDGS) or soybean hull (SBH) supplementation on pasture performance and parasite status of grazing lambs in Exp. 3.

Item	CONT <sup>1</sup>	SBH <sup>2</sup>	DDGS <sup>3</sup>	SEM	P-value
No. replicates	2	2	2	-	-
No. animals	32	32	32	-	-
BW, kg					
Initial	24.85	25.26	24.58	0.36	0.45
Final	31.79 <sup>b</sup>	38.82 <sup>a</sup>	40.73 <sup>a</sup>	0.73	0.01
Days	72	72	72	-	-
Supplement DMI, g/hd/d	-	611	631	10	0.31
ADG, g/d	95 <sup>a</sup>	188 <sup>b</sup>	224 <sup>c</sup>	7	0.01
Supplement efficiency <sup>4</sup>	-	0.152	0.205	0.015	0.13
Treated, % <sup>5</sup>	81.3 <sup>a</sup>	31.2 <sup>b</sup>	9.4 <sup>b</sup>	7.4	0.01
No. treatments/lamb treated	1.27 <sup>a</sup>	1.00 <sup>b</sup>	1.00 <sup>b</sup>	0.02	0.01
Avg day of first treatment	42.0	42.5	55.5	5.0	0.25
ADG treated lambs, g/d	95 <sup>b</sup>	177 <sup>a</sup>	200 <sup>a</sup>	15	0.03
ADG non-treated lambs, g/d	86 <sup>c</sup>	195 <sup>b</sup>	227 <sup>a</sup>	1	0.01
FAMACHA <sup>®</sup> Score <sup>6</sup>					
d 22	2.1 <sup>a</sup>	1.7 <sup>b</sup>	1.5 <sup>c</sup>	0.04	0.01
d 43	3.3 <sup>a</sup>	2.1 <sup>b</sup>	1.7 <sup>b</sup>	0.2	0.02
d 72	2.7 <sup>a</sup>	1.9 <sup>b</sup>	1.6 <sup>b</sup>	0.1	0.01
Packed cell volume					
d 22	31.5	30.5	33.2	1.4	0.49
d 43	22.7 <sup>b</sup>	26.9 <sup>a</sup>	29.5 <sup>a</sup>	0.7	0.02
d 72	28.1	29.5	31.4	1.2	0.29
Fecal egg count					
d 22	1,616	1,675	765	648	0.60
d 43	2,743	5,173	3,185	1,221.000	0.43
d 72	1,070	4,232	1,567	589	0.06

<sup>1</sup> CONT = no supplement.

<sup>2</sup> SBH = supplemented with SBH (66.4% NDE, 50.6% ADE, 11.2% CP).

<sup>3</sup> DDGS = supplemented with DDGS (24.8% NDE, 11.5% ADE, 26.8% CP, 11.8% EE, and 0.77% S).

<sup>4</sup> Gain above CONT lambs/g of supplemented feed.

<sup>5</sup> Treatment with anthelmintic based on a packed cell volume less than 20.

<sup>6</sup> Scale of 1 – darkest to 5 – palest.

<sup>ab</sup> Means within a row with different superscripts differ ( $P < 0.05$ ).



# Management – Protein Supplementation

**Table 3.** Mean  $\pm$  SEM body weight (kg) and average daily gain (ADG<sup>2</sup>, g/day) for lambs grazing new or established pastures and either supplemented or non-supplemented.

Item	Pasture		SEM <sup>1</sup>	Supplementation		SEM <sup>1</sup>
	New	Established		Supplemented	Non-supplemented	
Body Weight			2.53			2.54
d 0	28.4	28.3		28.3	28.4	
d 14	24.8 <sup>a</sup>	28.3 <sup>b</sup>		27.4 <sup>a</sup>	25.8 <sup>b</sup>	
d 28	28.8 <sup>a</sup>	30.5 <sup>b</sup>		31.1 <sup>a</sup>	28.2 <sup>b</sup>	
d 42	29.6	30.2		32.1 <sup>a</sup>	27.7 <sup>b</sup>	
d 56	31.3 <sup>a</sup>	32.8 <sup>b</sup>		34.9 <sup>a</sup>	29.2 <sup>b</sup>	
d 70	33.1	32.9		36.8 <sup>a</sup>	29.2 <sup>b</sup>	
d 84	33.6	33.8		37.8 <sup>a</sup>	29.6 <sup>b</sup>	
d 98	34.4 <sup>a</sup>	33.4 <sup>b</sup>		38.4 <sup>a</sup>	29.5 <sup>b</sup>	
d 112	36.8 <sup>a</sup>	35.4 <sup>b</sup>		40.7 <sup>a</sup>	31.4 <sup>b</sup>	
ADG <sup>2</sup>			19			17
d 14	-254 <sup>a</sup>	-1 <sup>b</sup>		-66 <sup>a</sup>	-190 <sup>b</sup>	
d 28	281 <sup>a</sup>	157 <sup>b</sup>		264 <sup>a</sup>	174 <sup>b</sup>	
d 42	59 <sup>a</sup>	-25 <sup>b</sup>		72 <sup>a</sup>	-38 <sup>b</sup>	
d 56	121 <sup>a</sup>	190 <sup>b</sup>		198 <sup>a</sup>	113 <sup>b</sup>	
d 70	130 <sup>a</sup>	8 <sup>b</sup>		137 <sup>a</sup>	1 <sup>b</sup>	
d 84	39	62		73 <sup>a</sup>	28 <sup>b</sup>	
d 98	57 <sup>a</sup>	-27 <sup>b</sup>		42 <sup>a</sup>	-11 <sup>b</sup>	
d 112	168	137		169	137	

<sup>a, b</sup> Means within a row with different superscripts differ ( $P < 0.05$ ).

<sup>1</sup> Pooled standard error of the mean.





# Management – Fall Grazing

## Out of season breeding

- Fall born lambs
- Premium lamb market
- High quality feed source
- Environmental challenges

## Optimal temperature range

- *H. contortus*
  - 50°F - 104°F
- Forages?
  - Growth
  - Viability





# Management – Fall Grazing

## Annuals:

- Cover crops
- Disruption of the parasite life cycle
  - Anaerobic environment
- Plant structure
- Excellent feed source (17% - 20% CP)







# Management – Fall Grazing

**Table 1**

Mean  $\pm$  SEM body weight (kg) and average daily gain (g/day) of fall-born lambs grazing autumn sown pastures of Turnip (*Brassica rapa* subsp. *Rapa*), Oat (*Avena sativa*), and Stockpiled Pasture.

Item	Turnip	Oat	Stockpiled Pasture	SEM <sup>1</sup>
No. of lambs	18	16	18	–
Body weight				1.14
d 0	24.0	24.3	24.0	
d 14	24.3	24.6	23.6	
d 28	27.3	25.8	25.3	
d 42	29.1 <sup>a</sup>	24.7 <sup>b</sup>	25.5 <sup>b</sup>	
d 56	30.0 <sup>a</sup>	25.0 <sup>b</sup>	25.9 <sup>b</sup>	
ADG <sup>2</sup>				18
d 14	20	20	–25	
d 28	218 <sup>a</sup>	85 <sup>b</sup>	121 <sup>b</sup>	
d 42	125 <sup>a</sup>	–79 <sup>c</sup>	13 <sup>b</sup>	
d 56	67	22	27	
Overall ADG, g/d	107 <sup>a</sup>	13 <sup>b</sup>	34 <sup>b</sup>	21

<sup>a, b</sup> Means within a row with different superscripts differ ( $P < 0.05$ ).

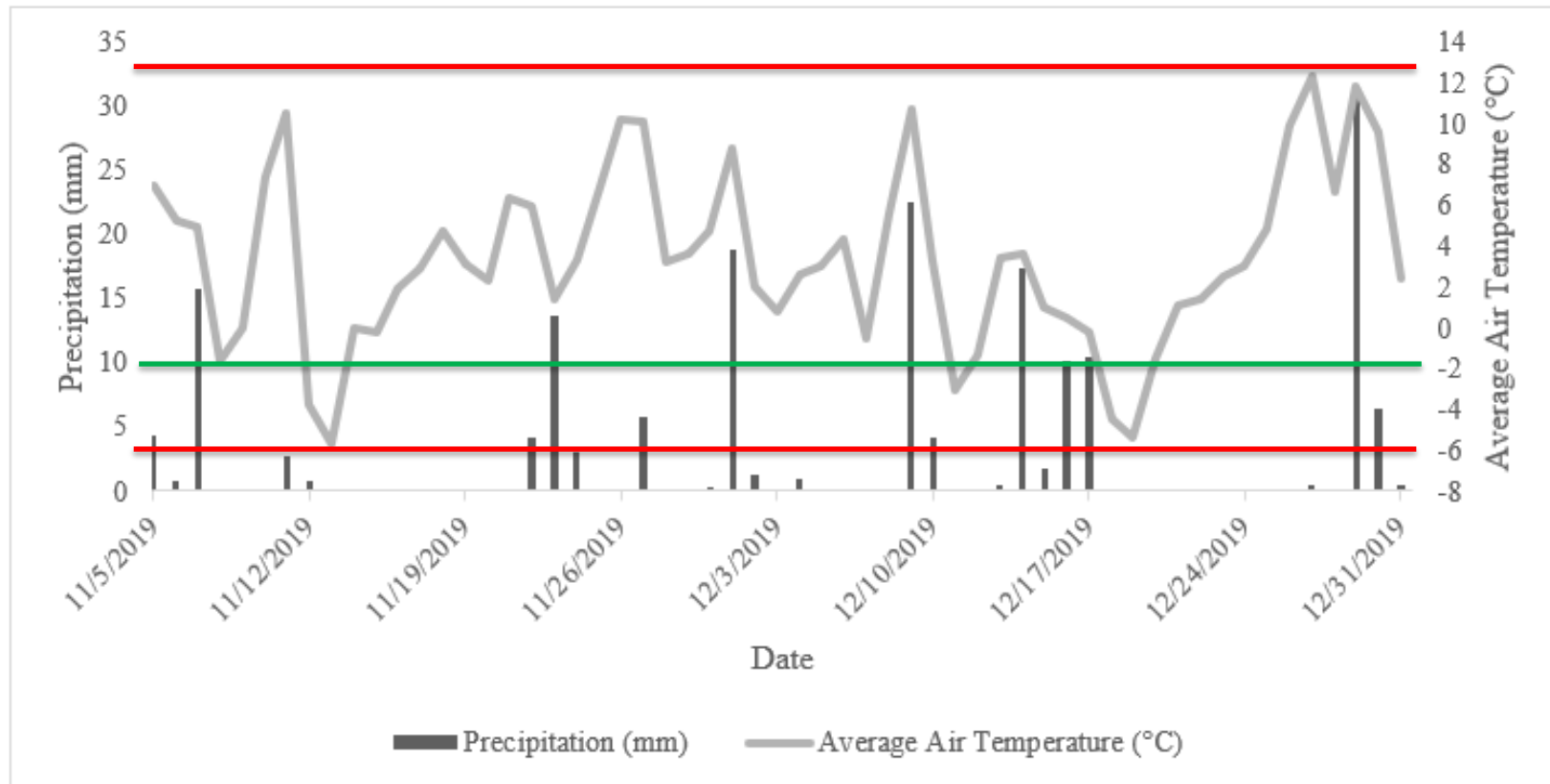
<sup>1</sup> Pooled standard error of the mean.

<sup>2</sup> ADG = Average Daily Gain (g/day).





# Management – Fall Grazing



**Figure 1.** Average Daily Precipitation and Temperature Summary from the Eastern Agricultural Research Station: November 5, 2019 to December 31, 2019.



# Management – Pasture Management

## Development of clean pastureland

- Newly established pasture
- No previous exposure to livestock
- Parasite history?
- “Clean” population of sheep
- Potential issues?
- Economics?





# Management – Pasture Management

**Table 5.** Mean  $\pm$  SEM Fecal Egg Count (eggs/g) for lambs grazing new or established pastures and either supplemented or non-supplemented.

Item	Pasture			Supplementation		
	New	Established	SEM <sup>1</sup>	Supplemented	Non-supplemented	SEM <sup>1</sup>
<b>Fecal Egg Count</b>						
Transformed, log(x = 10)			0.27			0.24
d 0	2.3	2.3		2.3	2.3	
d 14	2.5	2.7		2.6	2.5	
d 28	2.7 <sup>a</sup>	7.3 <sup>b</sup>		4.7 <sup>a</sup>	5.2 <sup>b</sup>	
d 42	3.0 <sup>a</sup>	7.4 <sup>b</sup>		5.0 <sup>a</sup>	5.5 <sup>b</sup>	
d 56	2.6 <sup>a</sup>	7.2 <sup>b</sup>		5.1	4.7	
d 70	2.8 <sup>a</sup>	7.5 <sup>b</sup>		5.3	5.0	
d 84	2.8 <sup>a</sup>	5.8 <sup>b</sup>		4.1	4.4	
d 98	3.0 <sup>a</sup>	4.9 <sup>b</sup>		3.8	4.0	
d 112	2.7 <sup>a</sup>	4.7 <sup>b</sup>		3.5 <sup>a</sup>	4.0 <sup>b</sup>	
<b>Back transformed</b>			----			----
d 0	0	0		0	0	
d 14	3	4		4	3	
d 28	4	1482		104	178	
d 42	10	1672		134	223	
d 56	3	1383		153	105	
d 70	7	1713		189	136	
d 84	6	317		53	74	
d 98	10	121		36	47	
d 112	5	101		23	43	

<sup>a, b</sup> Means within a row with different superscripts differ ( $P < 0.05$ ).

<sup>1</sup> Pooled standard error of the mean.

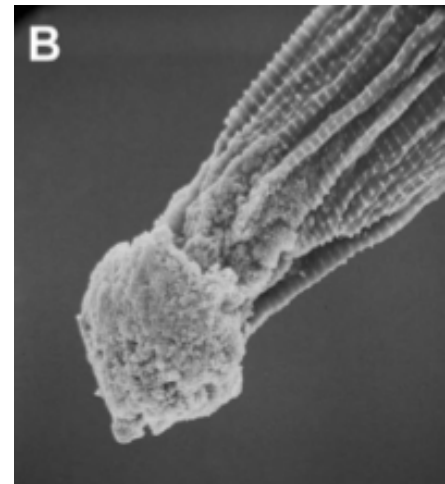
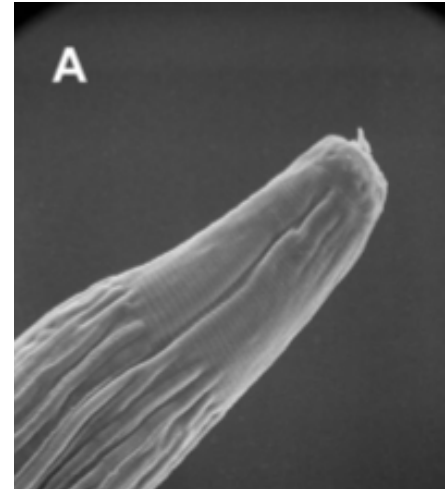




# Management – Alternative Forages

## Plant secondary metabolites

- Condensed tannins
  - Chicory (forb)
  - Plantain (forb)
  - Birdfoot trefoil (legume)
  - Sericea lespedeza (invasive weed)
- Direct
  - Bypass protein
- Indirect
  - Elicit an immune response
  - Prevents exsheathment
- Several benefits, yet some issues...



*Hoste et al., 2012*



# Management – Alternative Forages

## But what are the issues?

**Table 4:** Fattening performance parameters<sup>1</sup> of male lambs according to different amounts of dried grape pomace in diets

Variable	Experimental diets (DGP %)					SE	P
	T1 (0)	T2 (5)	T3 (10)	T4 (15)	T5 (20)		
Body weight, kg (100 days)	25.22 a	25.56 a	25.38 a	25.68 a	25.72 a	0.42	NS
Final body weight, kg (183 days)	42.06 b	43.08 b	45.28 a	39.80 c	37.50 d	0.73	**
Daily weight gain, g day <sup>-1</sup>	200.40 bc	207.47 ab	236.77 a	171.13 cd	140.17 d	38.06	**
Dry matter intake, g day <sup>-1</sup>	1.24 a	1.19 ab	1.22 a	1.14 b	1.04 c	1.02	**
FCR, (g feed: g gain)	6.56 ab	6.09 b	5.55 b	7.99 a	8.08 a	1.6	**

a,b,c,d Means along the rows with no common superscript are significantly different ( $P < 0.05$ ). <sup>1</sup> Values are means of ten observations per treatment and their standard errors. FCR= Feed Conversion Ratio. <sup>3</sup> P: NS=  $P > 0.05$ ; \* =  $P < 0.05$ ; \*\* =  $P < 0.01$ .



# Management – Other Strategies

- Natural model
  - Animal health history (cull)
- Strict pasture rotation schedule
  - Allow pastures to rest and regenerate
  - Co-species grazing
- Stocking rate
  - What is the recommended stocking rate?
- Harvesting forages
  - UV light
- Grazing periods
  - When do small ruminants graze?
- Pasture topography





# Break Time!





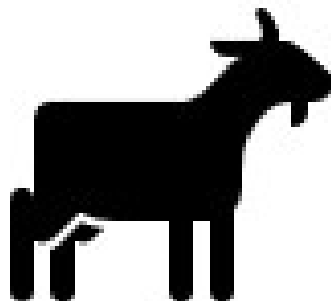
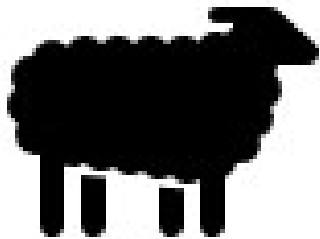


# Sheep Health

## Disclaimer:

**Producers must have a valid relationship with a licensed veterinarian when developing a comprehensive flock health and parasite management program.**

**Today's discussion will provide direction of guidance; however, the implementation of treatment should be discussed and confirmed by your attending veterinarian.**





# General Health Concerns

## Know your animal(s)

### Behavior (visual assessment)

- Normal behaviors
- Abnormal behaviors

### Posture (visual assessment)

- Head placement
- Ear set

### Internal body temperature of sheep

- 102.3°F
- Can vary +/- 1°F





# General Health Concerns – Nutrition

## Urinary calculi

### What causes this?

- Imbalance of 2 minerals
- Ca and P
- 2:1 normal

### What are the consequences?

- Calcium build up in the urinary tract
- Kidney stones

### How can we avoid this?

- Evaluate feed labels
- Monitor water source







# General Health Concerns – Nutrition

## Acidosis

### What causes this?

- Abrupt change in the diet / introduction of high grain-based diets
- Altered rumen pH
- Decreased rumination

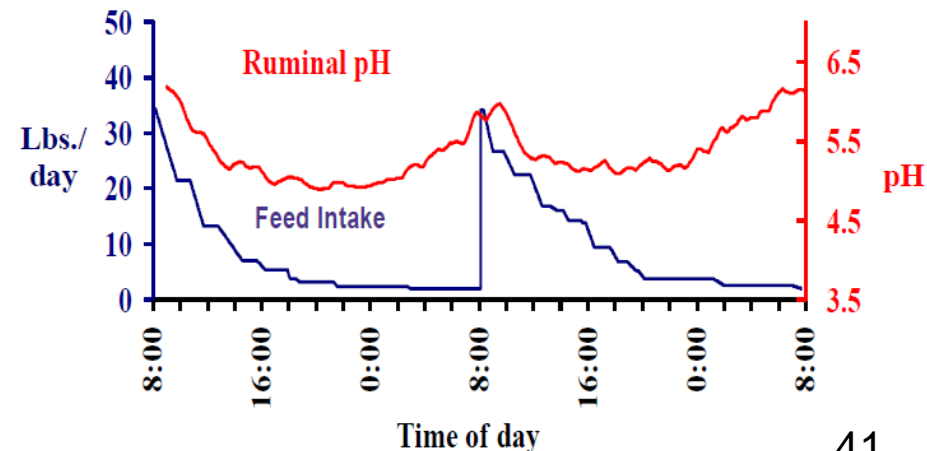
### How can we prevent?

- Provide roughage
- Keep the animal hydrated

### What are the signs and symptoms?

- Decreased feed intake
- Diarrhea
- Anorexia

### Typical Feed Intake And Ruminal pH





# General Health Concerns – Nutrition

## Acidosis

**What does the manure of a healthy sheep look like?**





# General Health Concerns – Nutrition

## Enterotoxemia

### What causes this?

- Bacterial infection
- *Clostridium perfringens* types C and D

### How can we prevent?

- Vaccinate – CD&T (> 17 days of age)
- Antibiotics?
- Difficult to treatment once symptoms occur
- Clean feeding area

### What are the signs and symptoms?

- Physical signs of pain
- Loose stool
- Visible blood in manure







# General Health Concerns – Nutrition

## Coccidiosis

### What causes this?

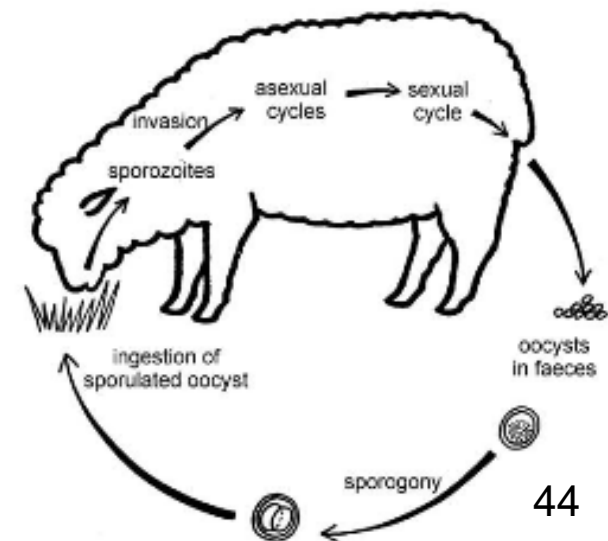
- Protozoal organisms (naturally present)
- Ingestion of oocysts

### How can we prevent?

- Decrease stress
- Decrease stocking density
- Good hygiene
- Coccidiostats – lasalocid or monensin

### What are the signs and symptoms?

- Diarrhea, decreased feed intake, anemia, dehydration, un-thriftiness





# General Health Concerns – Nutrition

## White Muscle Disease

- Caused by Selenium deficiency
- Negatively effects white muscle fibers (cardiac)
- Effects are quick
  - heavily muscled animals = more susceptible
- Provide supplement Se in feed or via injection

## Polioencephalomalacia (PEM)

- Thiamine deficiency – or – high sulfur levels
- Examine sulfur levels in feed and water
- Supplemental thiamine
  - Injection
  - Feed





# General Health Concerns – Management

## Club lamb fungus – ring worm and Sore mouth

### What causes this?

- Sore mouth – Orf virus (zoonotic)

### How is it transferred?

- Direct contact
- Both animals and humans can be vectors

### How can this be prevented?

- Vaccines
- Keep barn dry / Good barn hygiene
- Ether containing products
- Wash your hands between handling animals







# General Health Concerns – Management

## Rectal prolapse

- Sex (ewes vs. wethers)
- Diet (feedlot setting – heavy lambs)
- Environment (dust) – ventilation
- Genetics

## Tetanus

- Cause by *Clostridium tetani*
- Spores remain active in the soil
- Avoid cuts/scratches (safe environment)
- Vaccine?
  - CD&T – inexpensive insurance policy
  - Antitoxin → low recovery rate





# General Health Concerns – Management

## Stress mitigation

### Gregarious creatures by nature

- Flocking instincts

### How do we handle our animals?

- Low stress is key (i.e., handling systems)

### Stress can negatively impact...

- Health
- Immunity
- Growth / Development

### How do we avoid this?

- Habituation
- Small groups





# Abortions and Stillbirths

## Campylobacteriosis (vibriosis)

### Causes and concerns?

- Bacteria – *Campylobacter fetus* spp. *fetus* (zoonotic)
- Transferred by wild animals and birds
- 50% of lambs die in uterus
- Liver lesions and swelling of SQ tissues

### How can we control?

- Vaccinate – follow manufacturers label
  - Booster usually required
- Isolate infected ewes (cull)
- Development of natural flock immunity





# Abortions and Stillbirths

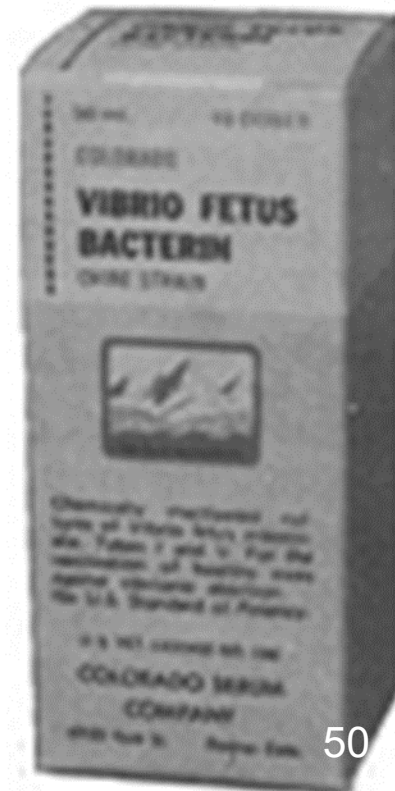
## Chlamydia

### Causes and concerns?

- Enzootic bacteria – *Chlamydophila abortus* (zoonotic)
- Infected sheep are often undetected
- Issues – last 2-3 weeks of pregnancy
- Weak or stillborn lambs

### How can we control?

- Vaccine – do you have an issue?
- Disinfect lambing area, equipment, and clothing
- Dispose of placenta immediately







# Abortions and Stillbirths

## Toxoplasmosis

### Causes and concerns?

- Protozoan parasite – *Toxoplasma gondii* (zoonotic)
- Carriers – domestic cats and wildlife consuming oocysts
- First 60 days – fetus is absorbed
- 60-147 days – abortion, mummies, stillbirths, or weak lambs

### How can we correct for it?

- Vaccine – do you have issues?
- Clean eating and watering areas
- Remove cats and deter wildlife from barn
- Natural flock immunity





# Abortions and Stillbirths

## Listeriosis / Moldy feed

### Causes and concerns?

- Bacteria – *Listeria monocytogenes*
- Commonly found in cooler climates
- Soil, feed, haylage/silage, and feces
- Brain lesions
- Abortions/stillbirths may occur at any point

### How can we control?

- Recovery is rare
- No current vaccine
- Previously infected animals should be considered carriers





# Questions?



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