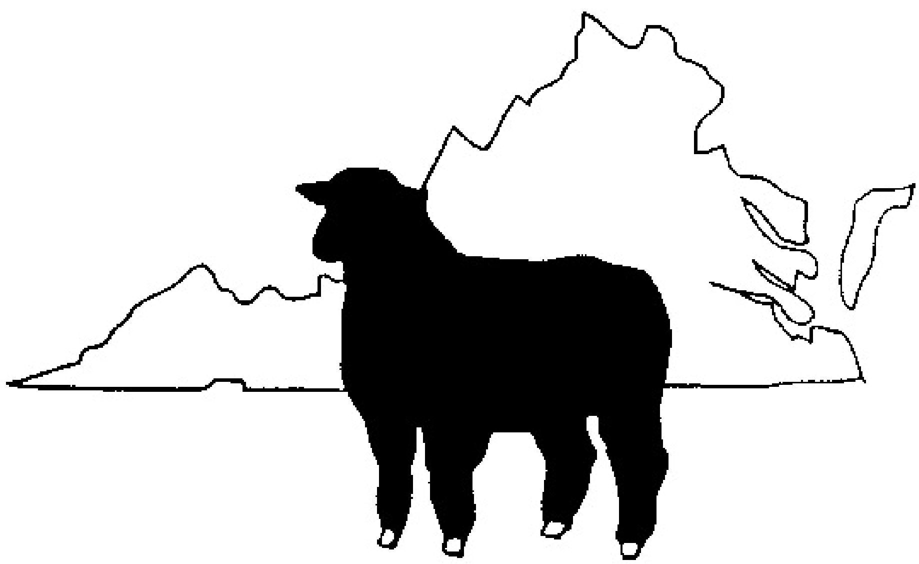
Proceedings

2018

VIRGINIA SHEPHERDS' SYMPOSIUM



January 12 - 13, 2018

AUGUSTA COUNTY GOVERNMENT CENTER
VERONA, VIRGINIA

FRIDAY, JANUARY 12

3:00 pm **Virginia Sheep Industry Board Meeting (open to public)**
Augusta Government Center

6:00 **Virginia Sheep Producers Association Board Meeting (open to public)**
Augusta Government Center

SATURDAY, JANUARY 13

ADULT SESSION

8:30 **Registration & Commercial Exhibits**

9:30 **Morning Session-**

"Understanding Biology of Parasites- Implications for Control"
Dr. Scott Bowdridge, West Virginia University
Dr. Scott Greiner, Virginia Tech

"Forage Management for Sheep Producers"
Dr. Gabe Pent, Southern Piedmont AREC, Virginia Tech

"**Tall Fescue- Friend or Foe?"**
John Benner, Virginia Cooperative Extension, Augusta County

"Johnes and OPP- Implications for your Flock"
Dr. Joseph Garvin, DVM, Program Manager, Office of Laboratory Service, VDACS

11:45 ***Roy Meek Outstanding Sheep Producer Award Presentation***

Virginia Sheep Producers Association Annual Business Meeting

12:15 pm **Lamb Lunch**

1:00 **"Update from ASI"**
Mr. Jimmy Parker, ASI Executive Board- Region II Director, Alabama

"How Good is My Hay? (and does it matter?)" hands-on session
Dr. Scott Greiner, Animal & Poultry Sciences, Virginia Tech

"Marketing Lambs and Wool- Opportunities and Challenges" - Panel
Moderator- Mr. Matthew Sponaugle, Livestock Marketing, VDACS
Mr. Stanley Strode, Mid-States Wool Cooperative, Ohio
Mr. Gary Hornbaker, Diamond H LLC, Berryville, VA
Producer Panel

YOUNG SHEPHERD SYMPOSIUM

Youth Session will be concurrent with adult session. We will feature two concurrent sessions – Junior and Senior. All activities will be hands-on and interactive. 4H and FFA youth of all experience levels are welcome.

9:00 am **Registration**

9:30 **Hay Evaluation/Ration Balancing**
Parasitology

12:15 pm **Lunch –** *will be provided*

1:00 PM **Meat Identification**
Cookery

3:00 **Adjourn**

Table of Contents

2018 VA Shepherds' Symposium
Presented By
Virginia Sheep Producers Association

Sponsors

Augusta Cooperative Farm Bureau, Inc. – Shawna Bratton/Allison Bagley
1205B Richmond Road
Staunton, VA 24401
540-885-1265, Ext. 231

Farm Credit of the Virginias – Jenna Roeder
PO Box 594
Wytheville, VA 24382
276-288-8666

Mid-States Wool Growers Cooperative Association
Stanley Strode
9449 Basil-Western Road NW
Canal Winchester, OH 43110

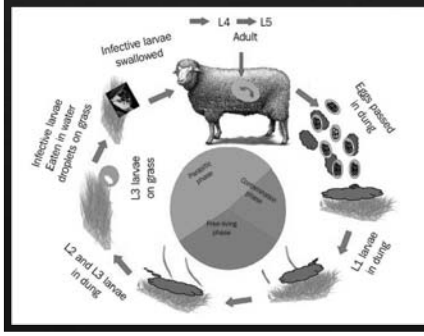
Virginia Sheep Industry Board
c/o Mike Carpenter
261 Mt. Clinton Pike
Harrisonburg, VA 22802
540-209-9143

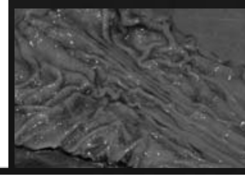
Virginia Sheep Producers Association
Dept of Animal & Poultry Sciences
Virginia Tech
Blacksburg, VA 24061
540-231-9163

Immune response to *Haemonchus contortus* infection and breed differences

Scott Bowdridge, Ph.D.
West Virginia University

Haemonchus contortus

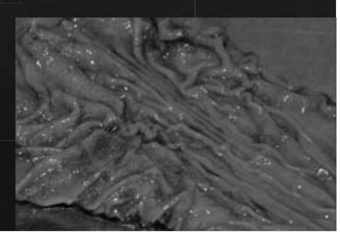




Adult worms in the abomasum

Pathology of *H. contortus* infection

- Blood-feeding nematode – residing in abomasum (true stomach)
  - 0.05ml/worm/day
- 10,000 eggs produced daily by gravid females
- Symptoms include
  - Anemia
  - Lethargy
  - Death



The Basis of Functional Immunity

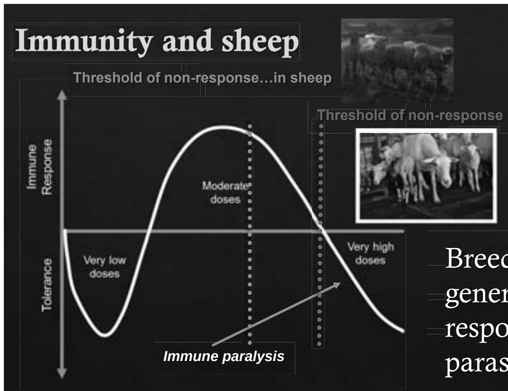
The three 'R's of immunity:

Recognition — Innate immune cells detect foreign bodies and signal other cells to migrate to that area

Response — Antigen presenting cells activate immune effector cells that mediate immune response

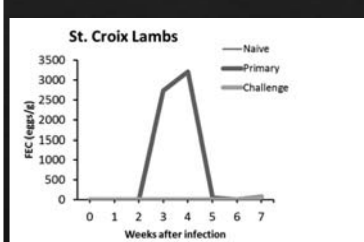
Resolution — Reduction of pathogenic load results in suppression of immunity and development of memory immune cells

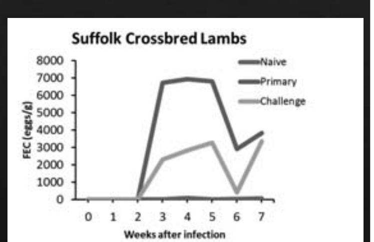
Immunity and sheep



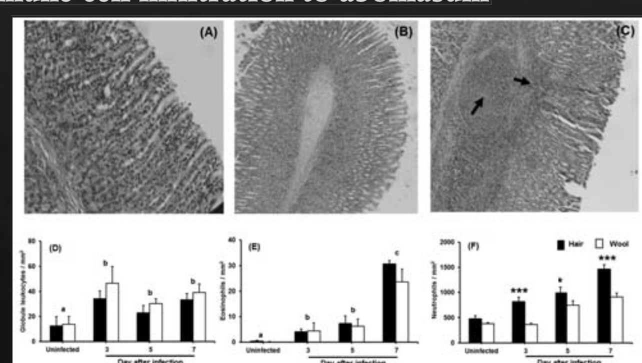
Breed differences in generation of immune response to nematode parasite infection

St. Croix Sheep Respond to Worm Infection

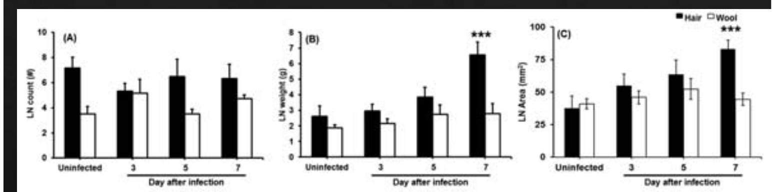




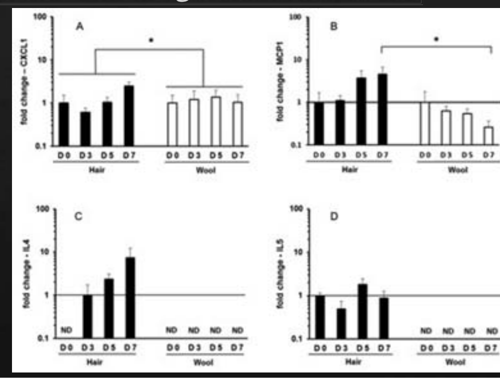
Immune cell infiltration to abomasum



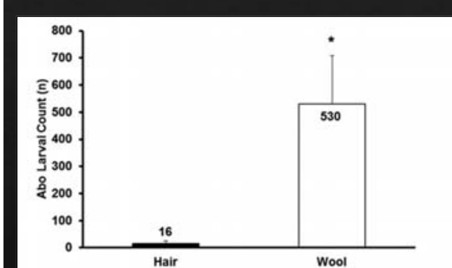
Draining LN development after infection

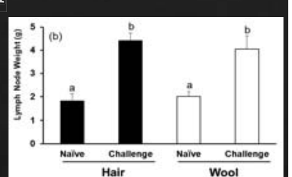


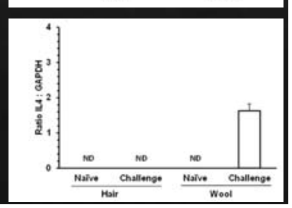
Expression of immune genes in abomasum



Day 10 after *H. contortus* infection







Resistant vs Susceptible Sheep

1.) 5 day delay in lymph node hypertrophy
2.) 7 day delay in initiation of IL-4 expression at infection site
3.) Marked difference in larval burden!

Carcass Characteristics of St. Croix

Age (days)	No. Lambs	Live Wt. (lbs)	Carcass weight (lbs)	Dressing %
287	4	100.31	42.48	42.35%
197	9	87.3	32.85	37.63%
Avg	13	93.8	37.7	40.0%

Evans and Foote, Utah State University, 1979

Carcass characteristics of pasture-raised hair sheep wethers of three breeds	Blackbelly	Katahdin	St. Croix
Hot carcass weight, lb	29.8	44.4	33.3
Loin muscle area, square inches	1.23	1.39	1.05
Leg score*	9.67	11.17	9.50
Quality grade*	9.62	11.21	10.12

Greiner and Duckett, VCE Update 2006

The Basis of Functional Immunity

The three 'R's of immunity:

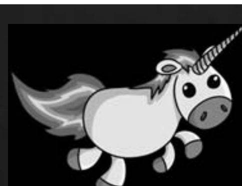
Recognition

Response

Resolution

Selection for immunity??

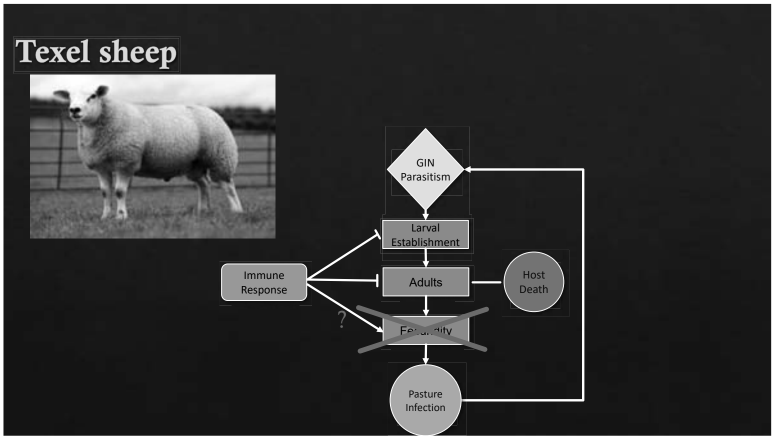
Unicorn Sheep

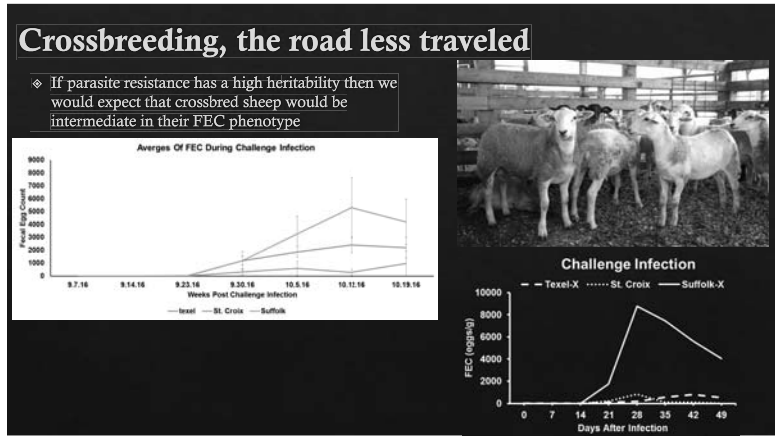


- We all have them and if so how do we identify them…
- They don't squeak – they are problem-free
  - First to breed
  - First to lamb
  - Always have twins
  - Never require attention
  - Parasite problems?
- For example WVU 125
- In the context of parasite resistance they are the sheep that never get dewormed
- Progress can be made

Management and Selection Strategies

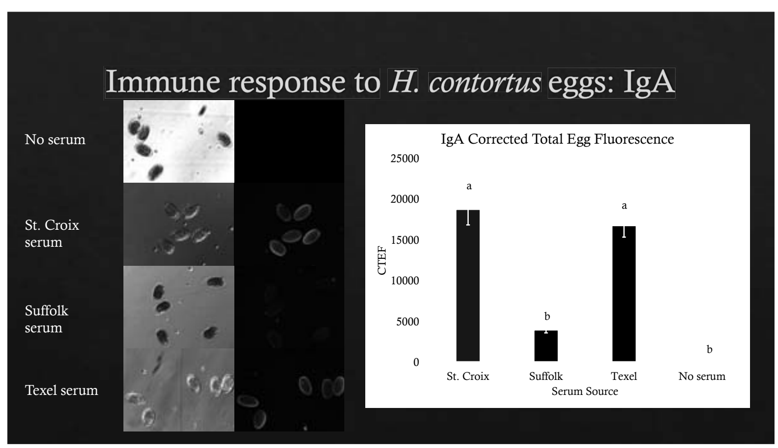
That support effective immune responses

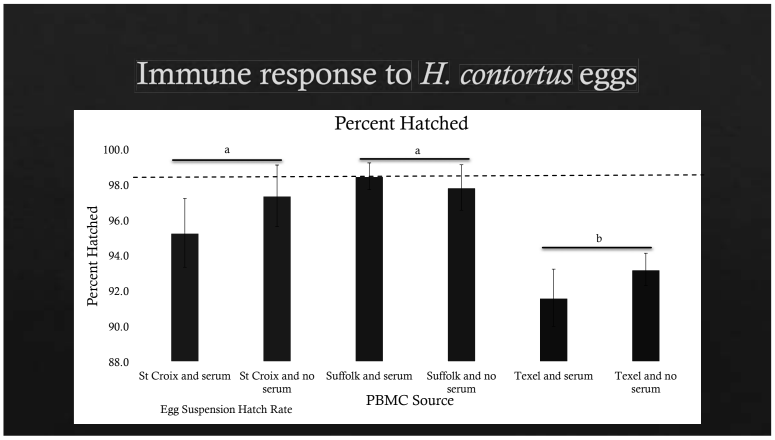


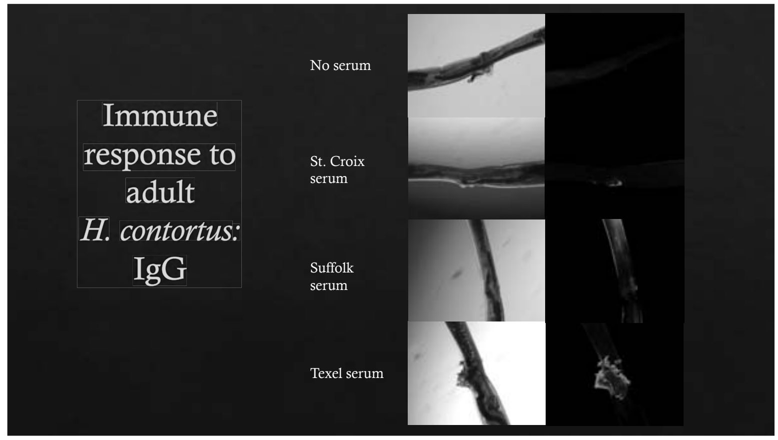


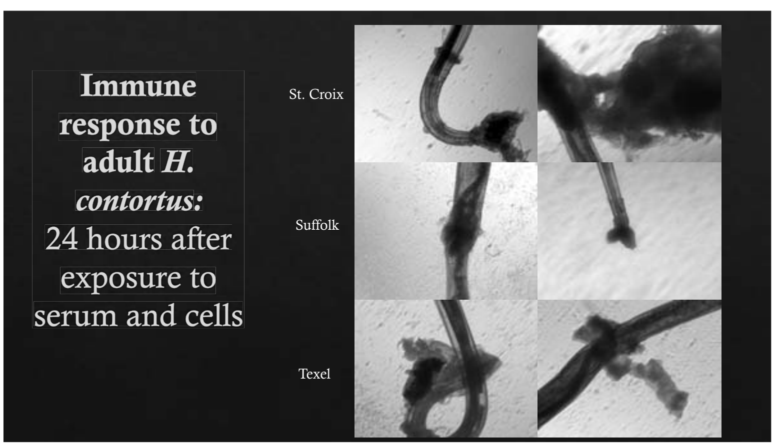
Carcass Data of Katahdin Crossbred Lambs

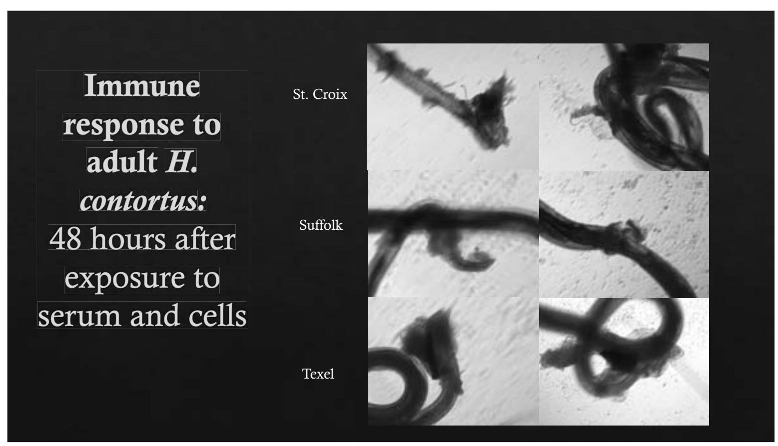
	Sire Group				
	Katahdin	Suffolk	Texel	SEM	*P*-value
Hot carcass weight (kg)	24.01	32.9	29.96	2.51	0.0721
Live weight (kg)	47.6	59.6	52.75	3.92	0.1399
Dressing Percent (%)	50.3	55.2	56.8	1.75	0.0511
Fat depth (in)	$0.202^{A,B}$	0.268^{A}	0.194^{B}	0.0176	**0.0224**
KPH (%)	3.77	3.03	2.79	0.44	0.3063
REA (in^2)	2.31	2.93	3.03	0.19	**0.0417**
Leg Score	11^{B}	$12^{A,B}$	12.8^{A}	0.42	**0.0344**
Yield Grade	$2.42^{A,B}$	3.08^{A}	2.34^{B}	0.18	**0.0224**



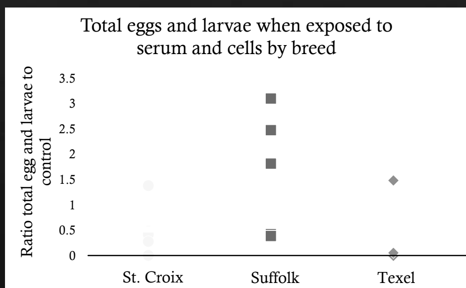

Immune response to H. contortus eggs
Percent Hatched
100.0
98.0
96.0
94.0
92.0
90.0
88.0
Percent Hatched
a
a
b
St Croix and serum
St Croix and no serum
Suffolk and serum
Suffolk and no serum
Texel and serum
Texel and no serum
PBMC Source
Egg Suspension Hatch Rate


Immune response to adult H. contortus: IgG
No serum
St. Croix serum
Suffolk serum
Texel serum


Immune response to adult H. contortus: 24 hours after exposure to serum and cells
St. Croix
Suffolk
Texel


Immune response to adult H. contortus: 48 hours after exposure to serum and cells
St. Croix
Suffolk
Texel

Immune response to adult *H. contortus:* Worm Prolificacy



Now that I am an immunologist, how do I incorporate these data into a sound breeding program to control parasitism?

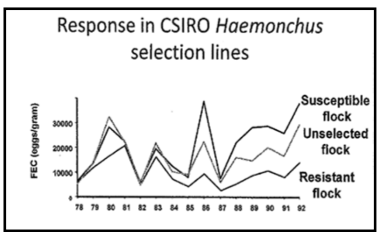
VirginiaTech
Invent the Future

Genetic Selection for Parasite Resistance

Scott P. Greiner, Ph.D.
Extension Animal Scientist
Virginia Tech
sgreiner@vt.edu 540.231.9159

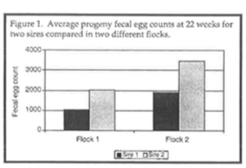
Virginia Cooperative Extension
Virginia Tech • Virginia State University
www.ext.vt.edu

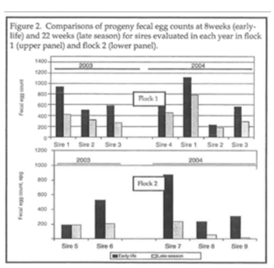
Within-Breed Selection



- FEC reduced 50% in Australian Merinos
- Parasite resistance is a qualitative trait!

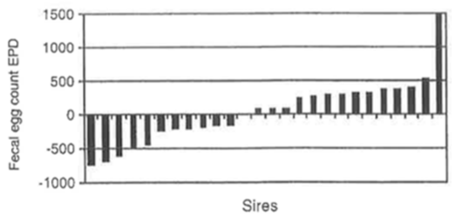
Selection: Katahdin research



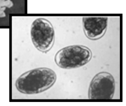


Sire Difference in Breeding Value

Figure 3. FEC EPDs for 26 Katahdin sires at 22 weeks of age. EPDs are ranked from lowest to highest.



Genetics of Parasite Resistance



- Why FEC?
  - Objective measure
  - Variation between sheep
  - Predicitive of pasture infestation
- Heritability is high (0.30-0.50)
  - Similar to growth traits
- FEC is highly repeatable
  - Measures taken early in life predicitve of future FEC
- Genetic correlations of FEC high among measurements taken at various ages
  - FEC taken at young age effective in improving overall parasite resistance

Identifying Genetic Differences

- Step #1- WE MUST MEASURE IT !!!!
- Step #2- data must be available in form that we can utilize to assess genetic differences

Phenotype = Genetics + Environment

- Step #3- apply genetic selection (along with other important traits)

NSIP: Estimated Breeding Values

- EBVs are tools that:
  - Minimize guesswork of ram selection
  - Assign number values to genetic merit
  - Allows for quick, easy comparison
  - More powerful than actual performance data or adjusted means
  - Comprehensive focus on economically important traits

NSIP National Sheep Improvement Program
America's Genetic Foundation for a Profitable Sheep Industry

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How do we Get EBVs?

- Step 1: Measure phenotypic traits of animal
  - Weights, reproduction, carcass, FEC, wool
- Step 2: Account for environmental differences
  - Birth/rear type, feed, etc.
- Step 3: Analyze pedigress
  - Consider animal and all its relatives
- Step 4: Assign numeric value to genetic merit
  - Superior tool than raw weights, adj. records, ram tests

NSIP National Sheep Improvement Program
America's Genetic Foundation for a Profitable Sheep Industry

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Post-Weaning EBVs

Ram	PWW EBV
A	+7
B	+1
Diff.	6 kg

Ram A has 6 kg additional genetic merit for post weaning weight. Half this transmitted to his progeny (3 kg). When mated to same ewes, lambs sired by Ram A would weigh 3 kg more (~6 lb.) at 120 d age.

Virginia Cooperative Extension
Virginia Tech • Virginia State University www.ext.vt.edu

FEC EBVs

Ram	FEC EBV
A	+20
B	- 30
Diff.	50%

Ram B has superior genetic merit for FEC. Half this transmitted to his progeny (25%). When mated to same ewes, lambs sired by Ram B would have 25% reduction in FEC.

2017 Ewe Lamb FEC

Animal ID		Strongylid	Sire
W026	Dorset	200	Huntrods 5887
W053	Dorset	100	Huntrods 5887
W056	Dorset	50	Huntrods 5887
W066	Dorset	100	Huntrods 5887
W068	Dorset	1450	Huntrods 5887
W090	Dorset	500	Huntrods 5887
W091	Dorset	350	Huntrods 5887
W101	Dorset	100	Huntrods 5887
W001	Dorset	100	Heisdorffer 1263
W008	Dorset	350	Heisdorffer 1263
W009	Dorset	150	Heisdorffer 1263
W035	Dorset	650	Heisdorffer 1263
W036	Dorset	500	Heisdorffer 1263
W002	Dorset	250	VA Tech P026
W005	Dorset	150	VA Tech P026
W007	Dorset	50	VA Tech P026
W016	Dorset	50	VA Tech P026
W018	Dorset	500	VA Tech P026
W019	Dorset	350	VA Tech P026
W020	Dorset	550	VA Tech P026
W033	Dorset	50	VA Tech P026
W034	Dorset	200	VA Tech P026
W037	Dorset	400	VA Tech P026
W048	Dorset	150	VA Tech P026
W077	Dorset	300	VA Tech P026
W094	Dorset	500	VA Tech P026
W095	Dorset	1750	VA Tech P026
W100	Dorset	200	VA Tech P026

2017 lamb crop FEC EBVs

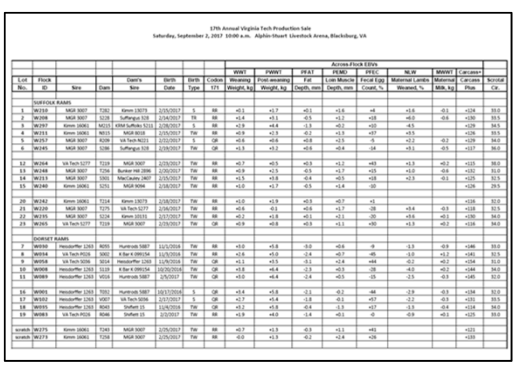
	Mean EBV	EBV range
Dorset		
FEC, %	+9	-55 to +325
Suffolk		
FEC, %	+7	-36 to +183

Dorset Sires

Sire	BW	WW	PWW	Milk	NLB	NLW	PMD	PFAT	FEC
HTR 5887	+0.3	+0.6	+1.9	-0.9	-0.2	+3.5	+1.5	-4.4	-21
HEIS 1263	+0.3	+2.9	+5.0	-0.8	-9.8	-6.1	-0.4	-0.7	-32
VT S036	-0.5	-0.4	+2.3	+0.6	-4.7	-0.2	+2.4	-2.7	+198
VT P026	+0.3	+2.9	+5.3	+0.6	-6.1	-1.9	+0.3	-2.6	-29

Suffolk Sires

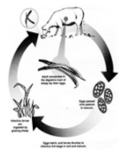
Sire	BW	WW	PWW	Milk	NLB	NLW	PMD	PFAT	FEC
BH 2896	+0.3	+4.6	+8.7	-0.1	+0.0	-7.8	+1.0	-2.8	+34
MGR 3007	-1.0	-0.9	-0.6	-0.8	-0.4	+4.0	+2.9	+1.2	+10
SU 328	-0.2	+0.4	+1.1	+0.0	+2.9	+2.6	+0.8	-0.1	-5
VT N221	-0.3	+0.7	-1.0	-0.6	+1.4	+4.7	+2.1	+1.5	+0
KM 16061	-0.4	-0.1	+0.7				+1.5	-0.2	+19


17th Annual Virginia Tech Production Sale
Saturday, September 2, 2017 10:00 a.m. Alphin-Stuart Livestock Arena, Blacksburg, VA

Lot No.	Flock ID	Sire	Dam	Dam's Sire	Birth Date	Birth Type	Codon 171	Across-Flock EBVs: WWT Weaning Weight, kg	PWWT Post-weaning Weight, kg	PFAT Fat Depth, mm	PEMD Loin Muscle Depth, mm	PFEC Fecal Egg Count, %	NLW Maternal Lambs Weaned, %	MWWT Maternal Milk, kg	Carcass+ Carcass Plus	Scrotal Cir.
	SUFFOLK RAMS															
1	W210	MGR 3007	T282	Kimm 13073	2/15/2017	S	RR	+0.1	+1.7	+0.1	+1.6	+4	+1.6	-0.1	+124	33.0
2	W208	MGR 3007	S228	Suffangus 328	2/14/2017	TR	RR	+1.4	+3.1	-0.5	+1.2	+18	+6.0	-0.6	+130	33.5
3	W297	Kimm 16061	M215	KRM Suffolks 5211	2/28/2017	S	RR	+2.9	+4.4	-1.3	+0.2	+10	-4.5		+129	34.5
4	W211	Kimm 16061	N015	MGR 8018	2/15/2017	TW	RR	+0.9	+2.3	-0.2	+1.3	+37	+3.5		+126	33.5
5	W257	MGR 3007	R209	VA Tech N221	2/22/2017	S	QR	+0.6	+0.6	+0.8	+2.5	-5	+2.2	-0.2	+129	34.0
6	W245	MGR 3007	S286	Suffangus 328	2/19/2017	TW	QR	+1.3	+3.2	+0.6	+0.4	-14	+3.1	-0.5	+117	36.0
12	W264	VA Tech 5277	T219	MGR 3007	2/23/2017	TW	RR	+0.7	+0.5	+0.3	+1.2	+43	+1.3	+0.2	+115	38.0
13	W248	MGR 3007	T256	Bunker Hill 2896	2/20/2017	TW	RR	+0.9	+2.5	-0.5	+1.7	+15	+1.0	-0.6	+132	31.0
14	W213	MGR 3007	S301	MacCauley 2407	2/15/2017	TW	RR	+1.5	+3.8	-0.4	+0.5	+18	+2.3	-0.1	+125	32.5
15	W240	Kimm 16061	S251	MGR 9094	2/18/2017	TW	RR	+1.0	+1.7	-0.5	+1.4	-10			+126	29.5
20	W242	Kimm 16061	T214	Kimm 13073	2/18/2017	TW	RR	+1.0	+1.9	+0.3	+0.7	+1			+116	32.0
21	W220	MGR 3007	T275	VA Tech 5277	2/16/2017	TW	RR	+0.6	-0.1	+0.6	+1.7	-28	+3.4	-0.3	+118	32.5
22	W235	MGR 3007	S224	Kimm 10131	2/17/2017	TW	RR	+0.2	+1.8	+0.1	+2.1	-20	+3.6	+0.1	+130	34.0
23	W265	VA Tech 5277	T219	MGR 3007	2/23/2017	TW	QR	+0.9	+0.8	+0.3	+1.1	+30	+1.3	+0.2	+116	34.0
	DORSET RAMS															
7	W030	Heisdorffer 1263	R055	Huntrods 5887	11/1/2016	TW	RR	+3.0	+5.8	-3.0	+0.6	-9	-1.3	-0.9	+146	33.0
8	W034	VA Tech P026	S002	K Bar K 099154	11/3/2016	TW	RR	+2.6	+5.0	-2.4	+0.7	-45	-1.0	+1.2	+141	32.5
9	W058	VA Tech S036	S014	Heisdorffer 1263	11/9/2016	TW	QR	+1.1	+3.5	-3.1	+2.4	+44	-0.2	+0.2	+154	31.0
10	W008	Heisdorffer 1263	S119	K Bar K 099154	10/20/2016	TW	QR	+3.8	+6.4	-2.3	+0.3	-28	-4.0	+0.2	+144	34.0
11	W089	Heisdorffer 1263	V016	Huntrods 5887	2/5/2017	TW	QR	+3.0	+6.4	-2.4	+0.5	-15	-2.5	-0.3	+145	32.0
16	W001	Heisdorffer 1263	T032	Huntrods 5887	10/17/2016	S	QR	+3.4	+5.8	-2.1	-0.2	-44	-2.9	-0.3	+134	32.0
17	W102	Heisdorffer 1263	V007	VA Tech S036	2/17/2017	S	QR	+2.7	+5.4	-1.8	-0.1	+57	-2.2	-0.3	+131	33.5
18	W035	Heisdorffer 1263	R043	Shiflett 15	11/4/2016	TW	QR	+3.2	+5.8	-0.4	-1.3	+17	-1.3	-0.4	+114	34.0
19	W083	VA Tech P026	R046	Shiflett 15	2/2/2017	TW	RR	+1.9	+4.0	-1.4	+0.1	-0	-0.9	+0.1	+125	33.0
scratch	W275	Kimm 16061	T243	MGR 3007	2/25/2017	TW	RR	+0.7	+1.3	-0.3	+1.1	+41			+121	
scratch	W273	Kimm 16061	T258	MGR 3007	2/25/2017	TW	RR	-0.0	+1.3	-0.2	+2.4	+26			+133	

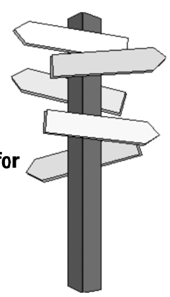
Parasite Control: Comprehensive Strategy

- Genetics
  - Breed differences
  - Individuals within breed
- Selective deworming
  - FAMACHA
  - Susceptible sheep
- Management
  - Nutrition (protein)
  - Pasture rotation
  - Management- drylot vs. pasture
- New/Alternative dewormers (?)

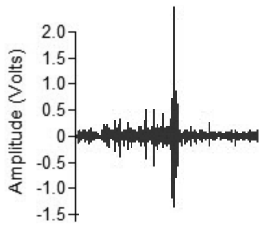


Genetic Selection: How Do We Get There?

- Identify problem animals
  - FAMACHA
  - Records, records, records (sire groups)
- Commercial producers
  - Obtain rams with known genetic merit for parasite resistance
- Seedstock producers
  - Enroll in NSIP
  - Incorporate FEC as a tool



Forage management for sheep producers

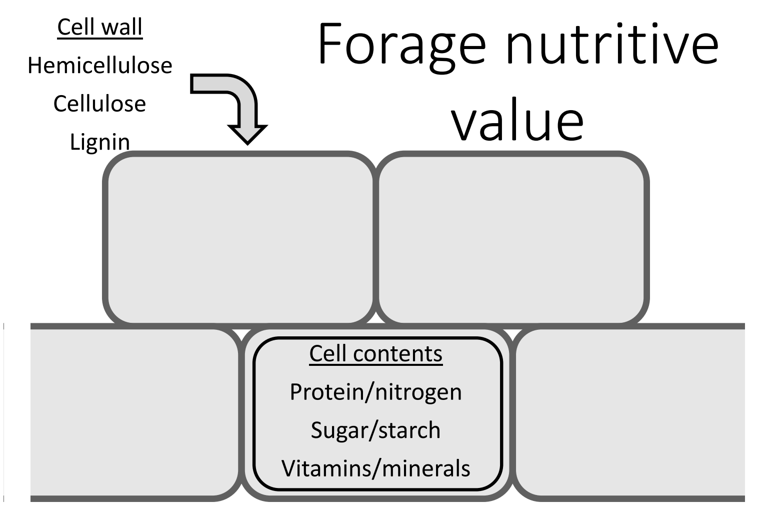


Shepherds' Symposium 2018
Gabriel J. Pent, PhD
Ruminant Livestock Systems Specialist
Southern Piedmont Agricultural Research and Extension Center

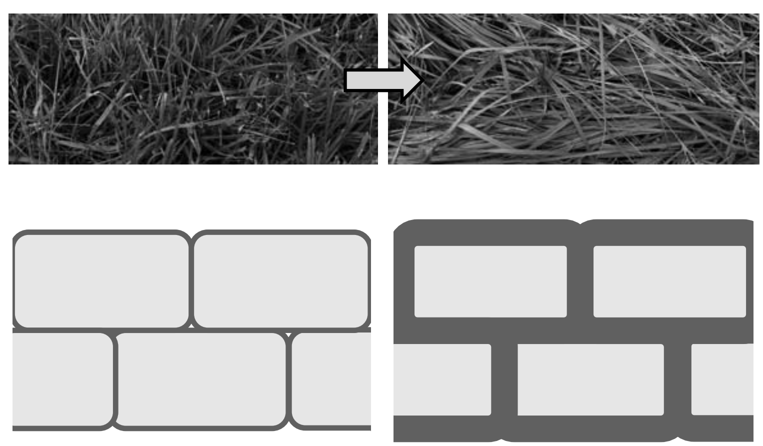
Forage management for sheep producers

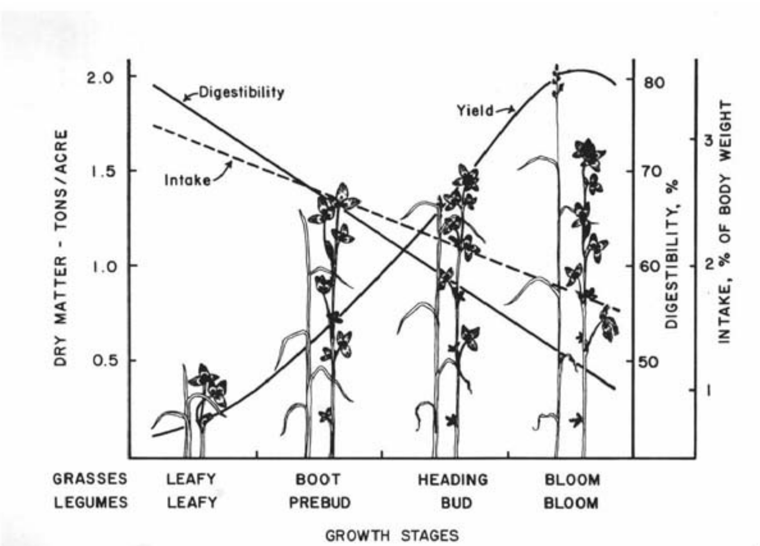
- Factors affecting forage nutritive value
- Forage quality is animal performance
- Lessons from silvopasture work

Forage nutritive value



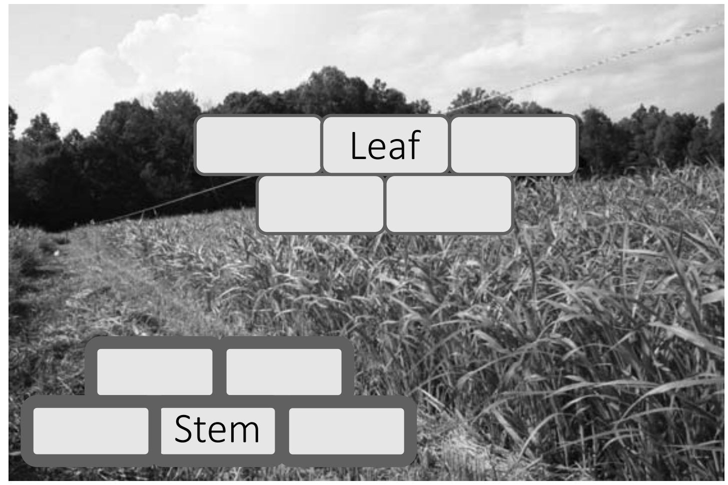
Maturity



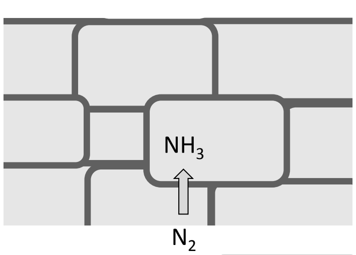


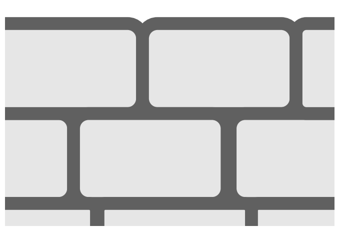
Blaser et al. 1986. Forage-animal management systems. VAES 86:7.

Plant part



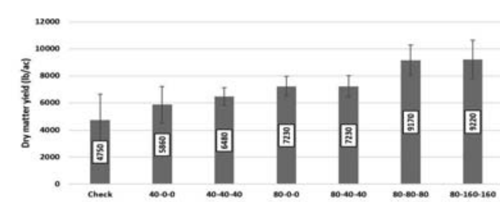
Species





Fiber higher in warm-season species

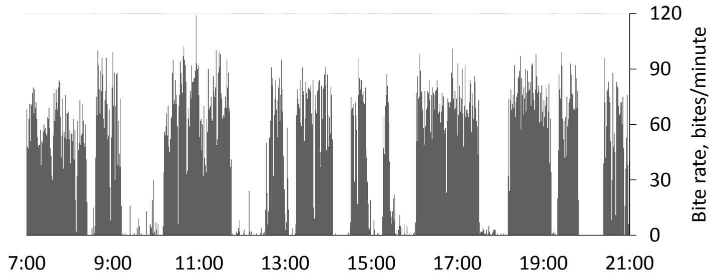
Fertilization



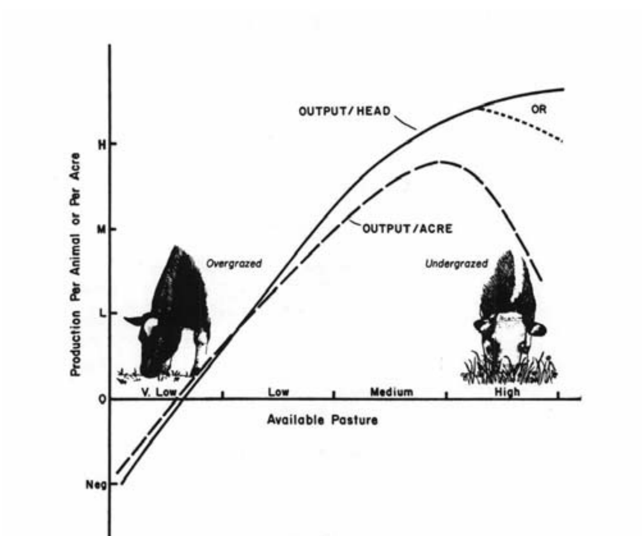
Forage quality is animal performance

- *Forage quality* is ultimately defined by what the animal produces: milk, meat, or offspring
- *Forage nutritive value* can be used to predict forage quality
  - Crude protein
  - Total digestible nutrients (energy)
- *Intake* and *nutrient composition* influence forage quality

Intake = number of bites X bite size



On average, each lamb took 19,000 bites of forage per day



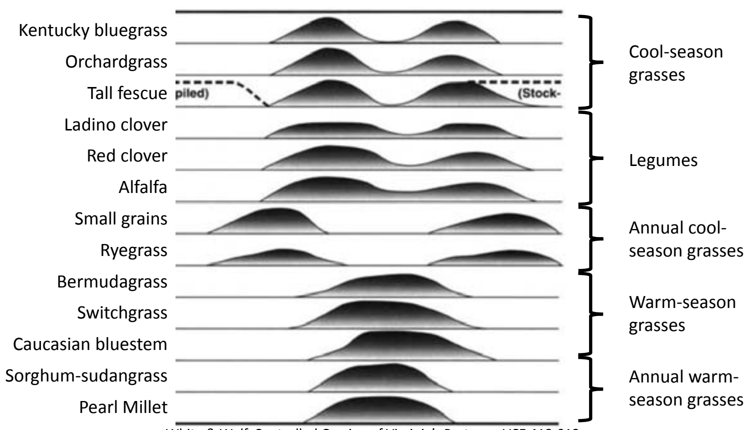
Blaser et al. 1986. Forage-animal management systems. VAES 86:7.

Maximizing performance and minimizing costs

Stored forage
Fills forage gaps to maintain high stocking rate

Deferred forage
Cheaper
Higher quality

Match forage supply to demands

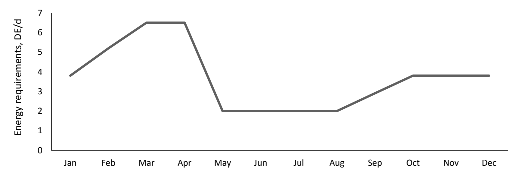


White & Wolf. Controlled Grazing of Virginia's Pastures. VCE 418-012.

Sheep nutrient requirements

Class	BW, lb	DMI, lb	TDN, lb	CP, lb
Ewe, early gestation	150	3.1	1.68	0.28
Ewe, late gestation	150	4.2	2.47	0.51
Ewe, lactation	150	6.1	3.77	1.00
Lamb, 4-7 months	88	3.5	2.70	0.41

NRC. 1985. Nutrient Requirements of Sheep. 6th Ed.



Open pastures compared to silvopastures

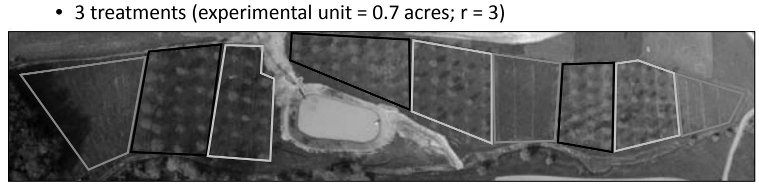
Open pasture

Black walnut silvopasture

Honeylocust silvopasture

Experimental design

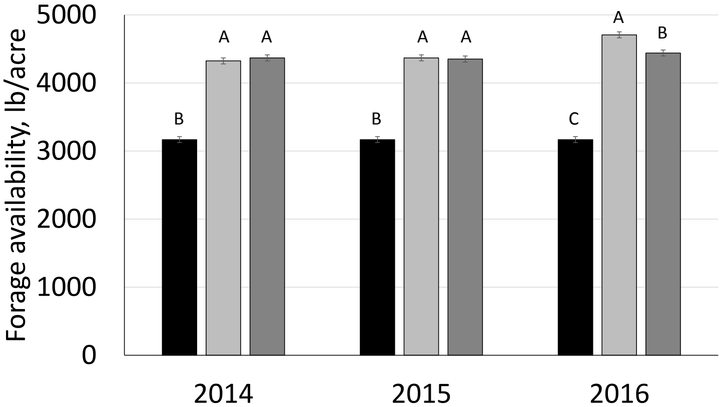
- 3 treatments (experimental unit = 0.7 acres; r = 3)



— Black walnut silvopasture — Honeylocust silvopasture — Open pasture

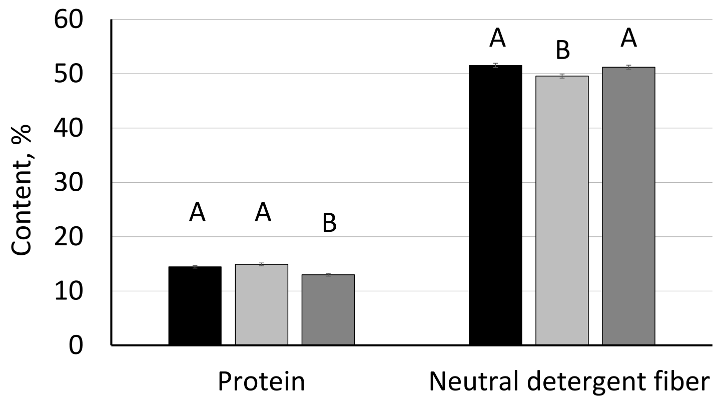
- Rotationally stocked with lambs
  - 2014: Suffolk x Dorset (average weight = 108 lb)
  - 2015: Suffolk x Dorset (average weight = 55 lb)
  - 2016: Dorper x Dorset (average weight = 46 lb)
- Statistical analysis
  - Randomized complete block design
  - Repeated measures
  - Tukey's HSD (P<0.05)

Forage mass declined under the black walnut trees



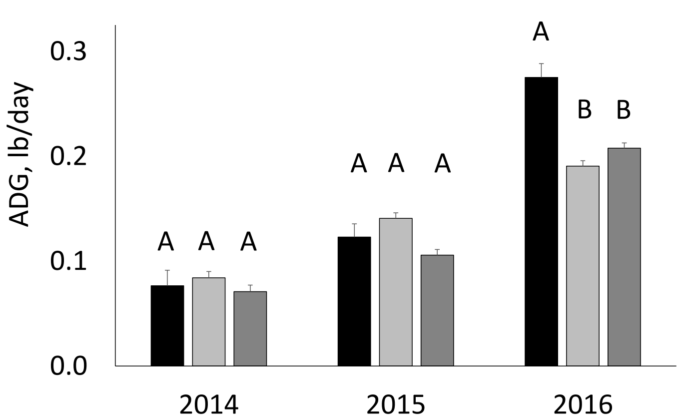
Means with no letter in common within a year are significantly different from each other, P<0.05

Silvopasture forages were higher in protein, but variable in fiber



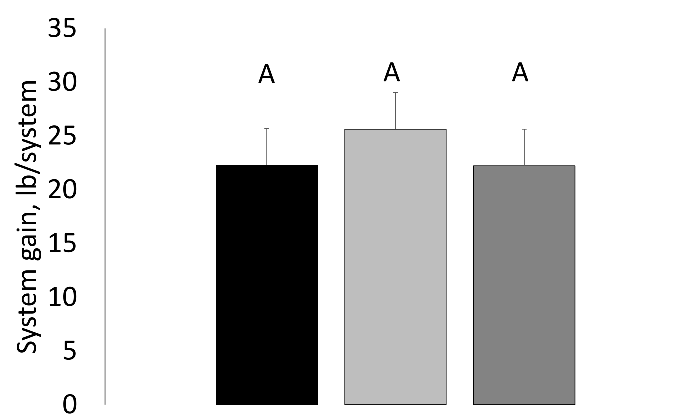
Means with no letter in common are significantly different from each other, P<0.05

Lambs in silvopastures gained as well or better than lambs in open pastures



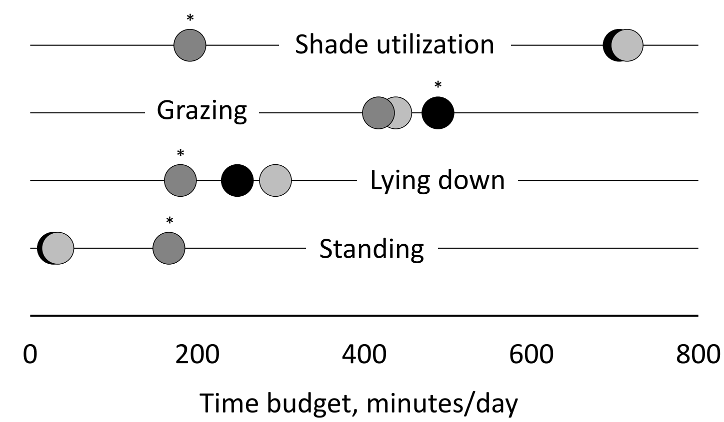
Means with no letter in common within a year are significantly different from each other, P<0.05

Total system gains equivalent across treatments



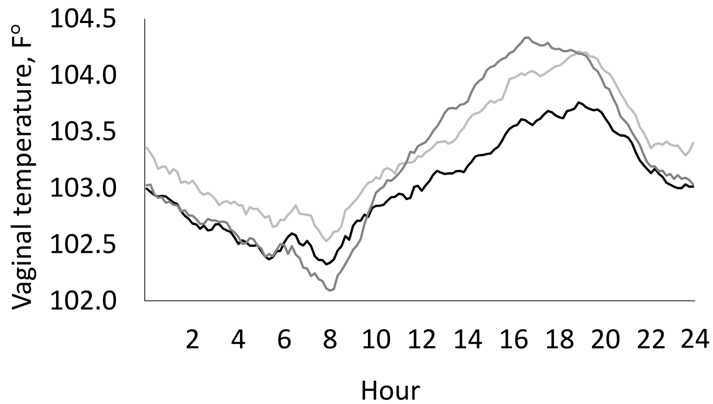
Treatment effect was not significant, P=0.7209

Lamb behavior



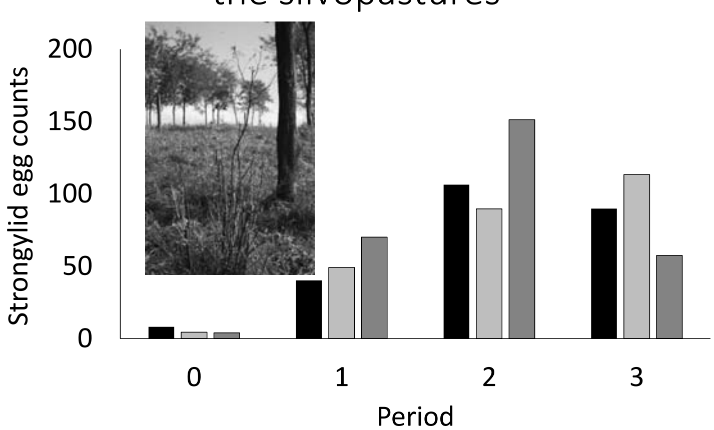
* differs from other treatments, P<0.05

The black walnut trees kept lambs cooler during the hottest part of the day



Ewes in the black walnut silvopasture and honeylocust silvopasture were significantly cooler than lambs in the open pastures between 12 to 7 PM and at 3 PM, respectively, P<0.05

Parasites 2015: Lower fecal egg counts in the silvopastures



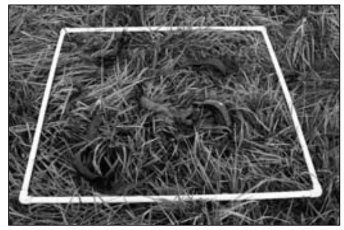
Winter stockpiled forages, honeylocust **pods, and lamb performance in hardwood silvopastures**

Honeylocust seedpod nutritive value

Feed	Protein	NDF	ADF	TDN
‘Millwood’ pods	9.9	23.5	16.1	82.3
Whole-ear corn	9.0	28.0	11.0	88.0
Oat grain	13.3	32.0	16.0	82.4

Johnson et al. (2013). *Agroforestry Systems*, *87*, 849-856.

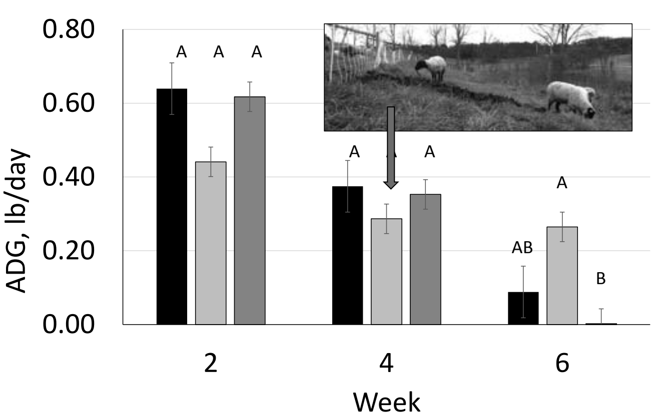
Honeylocust pod productivity



Honeylocust pod yield = 4290 lb/acre

160 bushels/acre of corn grain = 12,900 lb/acre whole-ear corn (25% moisture)

Lamb performance



Means with no letter in common within a week are significantly different from each other, P<0.05

Forage management for sheep producers

- Factors affecting forage nutritive value
  - Maturity: digestibility decreases with age
  - Plant part: leaves are more digestible than stems
  - Species: legume vs. grass; cool season > warm season
  - Fertilization: important for yield and protein
- Forage quality is animal performance
  - Affected by intake and nutrient composition
  - Match forage supply with flock demands
- Lessons from silvopasture work
  - Animal comfort can compensate for reduced forage
  - Availability of browse may reduce parasite loads
  - Alternative forages may improve weight gains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Tall Fescue - Friend or Foe?

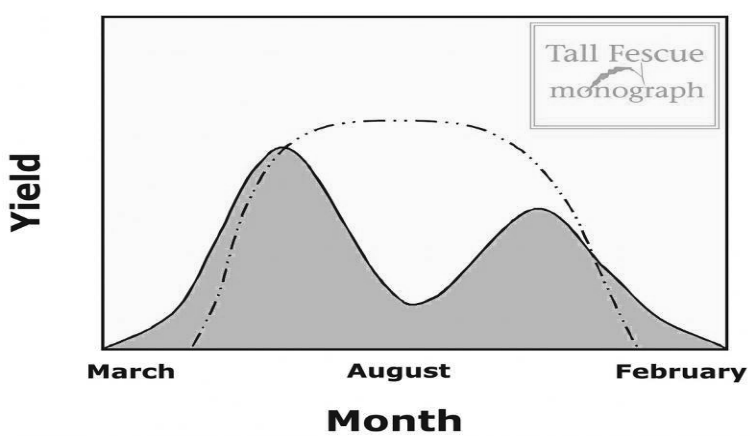
2018 Virginia Shepherds' Symposium
John Benner
VCE-Augusta

History of Tall Fescue

- Originally discovered on a hill in Kentucky
  - Discovered in 1931 by E.N.Fargus, released in 1943 as "Kentucky 31"
  - Propagated throughout the South 40's -50's
- Pros
  - Hardy, drought tolerant, cool season growth
- Cons
  - Tall Fescue Toxicosis

Tall Fescue Growth Characteristics

- Cool Season Forage – High growth in spring after green up and in the fall
- Low productivity in the summer - "Summer Slump"



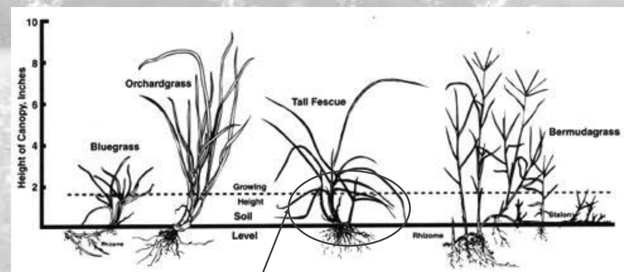
Tall Fescue Growth Characteristics

- Tolerates grazing to 2-3 inches
  - Stores non-structural carbohydrates in tillers and rhizomes

Grazing height tolerance:

Bluegrass>Tall Fescue> Orchardgrass

Plant Anatomy of Common Perennial Forages



Tall Fescue possesses short rhizomes that can store carbohydrates as well has a greater number of "semi-prostrate" leaves lower to the ground.

More about Fescue

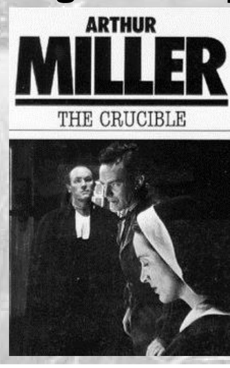
- Predominant forage in Southeastern United States
  - 35 million acres throughout US
  - Over 1 million within Virginia (With Fescue at least 20% of pasture)
- High seeding vigor, tolerant of drought, poorly drained soils, acidic soils and alkaline
- Sod forming bunchgrass
- Superior to other forages for fall stockpiling
  - Can produce top growth as low as 40°F
  - 85°F top active growth temperature

The down side

- *Most* tall fescue is infected by a fungal endophyte
- Endophyte produces toxic compounds known as ergot alkaloids (Ergopeptine Alkaloids)- that cause Fescue Toxicosis
- What is an alkaloid?
- Encyclopedia Britannica – a naturally occurring organic compound containing nitrogen bases.
- Examples: Caffeine, Morphine, Lysergic Acid Diethylmide (LSD)
- 3,000 types of alkaloids are found in 4,000 plants

Endophytes and their alkaloids throughout history

- Grain related illnesses and blights noted in writings of Hebrew, Egyptian, Assyrian and Greek societies.
- Middle Ages – "Ergotism" epidemics in France, Germany, and Northern Europe
- Possibly responsible for Salem Witch Trials



Fescue Toxicosis

- Summer Syndrome
  - Low average daily gain
  - Reduced feed intake
  - Reduced milk production
  - Poor Reproductive performance
- Vasoconstrictive effects disrupt Thermoregulation
- Exacerbated by warmer temperatures
- Fescue foot
  - Gangrenous condition, related to low blood flow to extremities
  - Cold weather

Potential flowchart of Acute Fescue Toxicosis

High % fescue field
?Naïve? Livestock
Sustained Temperatures above 88°F

→ Other forages are quickly consumed
Animal body temperature increases
Dry matter intake decreases

→ Reduction in Reproductive Performance
Reduction in ADG/loss

Acute Fescue Toxicosis - Signs

- Problem is most noticeable on high % fescue pastures
  - Low legumes, maybe broadleaf killer applied? Low % of other forages?
- You will notice long blades of fescue untouched, livestock seem to be spending most of their time near shade or water
  - Females losing condition, opens, low milk
- With untouched fescue, animals seem to be “eating around the fescue”,…eating it last
- Problems can persist in warm falls into Sept. –Oct
- Tendency to see acute symptoms in high N fertility regimes

Tall Fescue Alkaloids

- Endophyte produces series of ergot alkaloids
  - As much as 80-90% of total alkaloids are ergovaline, thought to be primary toxic alkaloid.
- Endophyte grows in symbiosis with plant
- Protects plant from overgrazing, plant provides energy and amino acids for growth

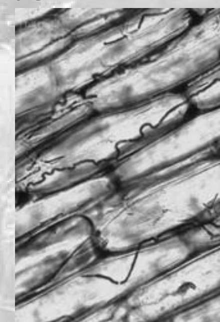
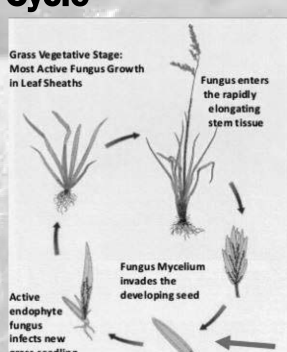


Image credit: Tall Fescue Monograph N.S. Hill

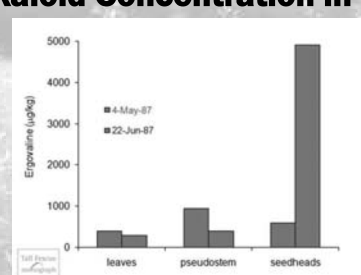
Endophyte Life Cycle

- Endophyte passed from plant to plant through seed
- Endophyte preserved and viable in fescue seed for 1-2 year



Graphic courtesy of Craig Roberts, University of Missouri

Alkaloid Concentration in Plant



Concentration (ug/kg) of ergovaline in leaves, leaf sheaths, and seedheads of tall fescue in spring and summer at Columbia, MO. (Rottinghaus, et al., 1991)

Measuring Endophyte

- Two Methods –

1. Measure % or number of plants infected (15-40 tillers)
2. Measure total ergot alkaloids or ergovaline concentration

Method 1 collecting tiller at crown just above soil surface to below first leaf

Method 2 – use quadrat to collect total forage alkaloids or use "grab method, mimicking grazing livestock"

Sampling Procedures

- Sampling may be justified on a high risk or problem field
- Sampling should be done between late Spring and Early Autumn
- Samples must be preserved on ice and shipped overnight
- Some labs prefer dry ice packaging
- Analysis ($35-$55/sample) plus shipping

Sampling Procedures Continued

- Avoid areas near urine or manure pats
- Should we sample only fescue or entire sward?
- Large more robust tillers/larger leaf material are preferable
- Collect as random as possible for best composite for pasture

Extent of Endophyte Infection in Virginia

Sampling in the 1980's revealed that 75% of fields surveyed had fungus present in 50% or more of the plants. Levels of 40% or more can generally be expected to produce moderate to severe adverse effects in animals, although no level of infection can be considered completely safe. To determine the infection level of a pasture, it is necessary to obtain a good plant tissue sample for analysis. A minimum of 40 tillers (basal stems of

From extension publication "Making the most of Tall Fescue in Virginia." Hall, et al., 2009.

2013 Endophyte Survey

- Tested 26 pastures in Rockingham, Augusta, & Rockbridge
- Sampled tillers from 15 plants in each pasture, sent to Agrinostics Lab.- Georgia
- 65% of pastures were 100% infected
- 30% of pastures were 80-90% infected
- Lowest infection rate (1 pasture) was 50%

2017 Fescue CIG project

- Statewide fescue replacement project with non-toxic “novel” fescue
- 17 pastures sampled – 20 tillers in each sample
- 6 (36%) pastures were 100% infected
- 5 (29%) pastures were 85%-95% infected
- 5 (29%) pastures were 65%-75% infected
- 1 (6%) pasture was 50% infected

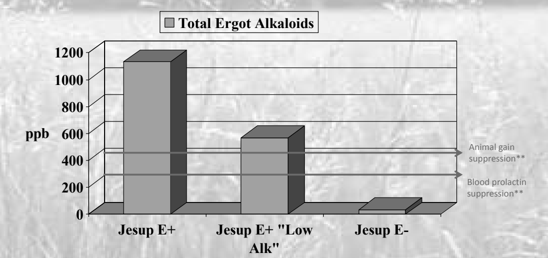
Implications of Presence of Infection

- Majority of Tall Fescue is infected, though not all, and not to the same level or severity.
- Variability within field – Random presence (may not be uniform)
- Research has indicated correlation between increasing infection level and decreasing animal performance
  - *Holstein Steers* - for every 10% increase in infection – potential for 0.15 decrease in ADG – (Crawford, et al., 1989)
- Due to lower % of infection producing lower alkaloids

Measuring Endophyte Alkaloids

- Infection level may not tell the whole story
  - Alkaloid levels present a more specific picture
  - Toxicity of Alkaloids are very potent – measured in parts per billion (ppb), ($\mu g/kg^{-1}$) of plant dry matter
- Toxicity
  - As low as 200-500 ppb concentrations reported to have toxic effects
    - Particularly if other environmental factors are present (heat)

Implications on Alkaloid levels
Ergot alkaloid levels on 3 Varieties of Tall Fescue



From Hill et al., Crop Sci, (2002), slide courtesy of Joe Bouton

Reducing Alkaloid Levels in E+ Tall Fescue by Selection and Breeding

Cultivar	Sheep Avg. Daily Gain	Body Temp. *	Blood Prolactin
	lb/head/day	*^{0} F*	*ng/ml*
Jesup E+	0.31	104.9	<1
Jesup E-	0.59	103.0	228
Jesup E+ “LowAlk”	0.45	105.6	<1

* Sampled on 2 May 2000.

From Hill et al., Crop Sci, 2002), slide courtesy of Joe Bouton

Fluctuations in Ergot Concentrations over time

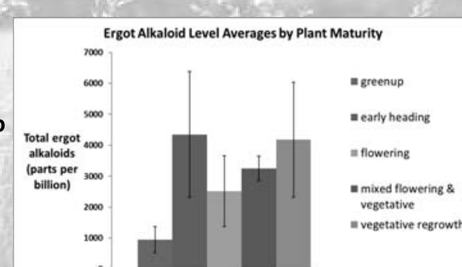
- Production of total ergot alkaloids follows growth curve of plant
  - Bimodial distribution – alkaloid concentration increases in spring to seedhead development dips or remains stagnant during summer then picks up again during fall.
- Peak toxicity in seedhead
- Ergovaline tends to increase in regrowth over summer and can be present in the fall

2014 Shenandoah Valley Alkaloid Sampling

- 8 pastures
- Sampled only fescue
- Sampled from May 1 to August 8

Total ergots measured

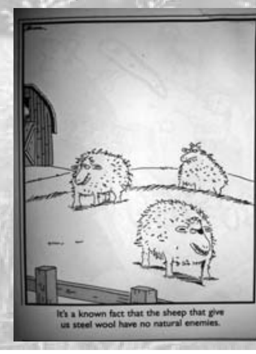
Final take away –
Levels are HIGH



So how do we best manage fescue?

- **Encourage pasture diversity through grazing management**
  - **Sample of entire sward – may be closer to 200-300 ppb**
- **Frost seed clovers where appropriate**
- **Keep fescue vegetative**
  - **Reduces toxicity and improves forage quality**
- **Stockpile fescue for winter**
  - **Fescue holds quality better through winter than other cool season forages**
  - **Post frost grazing**
- **Avoid unneeded N fertilization**
- **Remove infected K-31 and plant Novel Fescue**

Questions?



Ovine Progressive Pneumonia: Awareness, Management, and Seroprevalence

Background

Ovine Progressive Pneumonia (OPP) is a slowly progressive viral disease of adult sheep caused by an ovine lentivirus. Most sheep do not show clinical signs of OPP, but the sheep that do typically don't display signs until 2 years of age or older because of the virus's long incubation period. Often, the first sign noticed is a general loss of body condition referred to as "thin ewe syndrome." Weight loss occurs despite the affected sheep having normal appetites.

Another common sign of OPP is increased breathing effort at rest; animals tire easily and may be seen trailing the flock. These sheep are often called "lungers." Secondary bacterial infection is very common and results in additional signs such as fever, cough, lethargy, and nasal discharge. OPP infection also can cause "hard bag," an enlarged, firm udder with reduced or no milk flow.

Infection with OPP virus also may cause other problems such as meningitis and encephalitis. Clinical signs include an unsteady gait, twitching, or stumbling, which can progress to hind limb or total paralysis. Arthritis may accompany OPP infection. Pain and swelling of the joints and a shortened gait are common.

Once infected, animals remain infected for life, though many will never show clinical signs of disease. Flocks infected with OPP can have lowered production efficiency because of early culling, decreased milk production, and lower weaning weights. However, a general consensus on the economic importance of OPP for individual flocks has yet to be established.

Sheep 2001 Study Results

The seroprevalence of OPP was measured nationally using randomly selected operations during the USDA's National Animal Health Monitoring System (NAHMS) Sheep 2001 study.

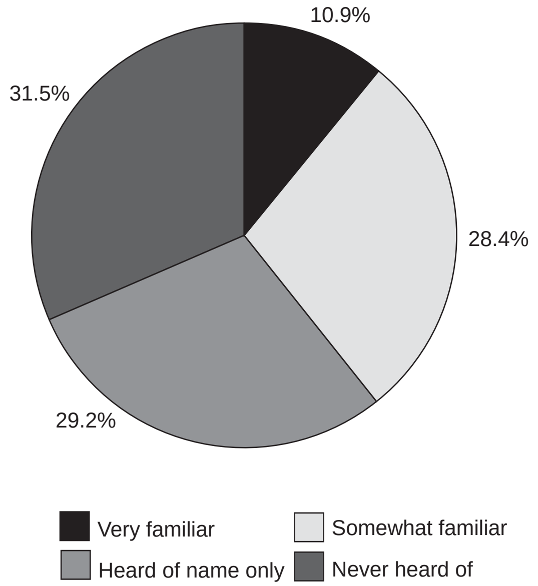
For Sheep 2001, data on sheep health and management practices were collected from a stratified random sample of sheep production sites in 22 States.[1] Information on health-related management practices was collected from 3,210 participating operations in the first interview from December 29, 2000, to January 26, 2001. Of the original participants, 1,101 were interviewed a second time between February 5 and April 27, 2001. Of the participating operations, 682 (61.9 percent) agreed to biological sampling for OPP. Up to 40 ewes were sampled per operation, depending on flock size; 21,369 samples were tested.

Producer Awareness and Management

As part of the study, producers were asked to describe their familiarity with OPP. While 10.9 percent of operations were very familiar with OPP, overall nearly one in three operations (31.5 percent) reported never having heard of OPP prior to the study. Fewer producers in the West Central region reported being very familiar with OPP (6.1 percent), compared to the Pacific (12.1 percent), Central (13.0 percent), or Eastern (12.5 percent) regions (Figure 1).

[1] **Regions/States:**
Pacific region: California, Oregon, Washington
West Central region: Colorado, Idaho, Montana, Nevada, New Mexico, Texas, Utah, Wyoming
Central region: Arkansas, Illinois, Indiana, Iowa, Kansas, Minnesota, South Dakota, Wisconsin
Eastern region: Ohio, Pennsylvania, Virginia

Figure 1. Percent of Operations by Familiarity with OPP Before the Sheep 2001 Study



Management and Control of OPP

Participating producers who had, at the very least, heard of OPP (68.5 percent) provided further information about their efforts to control the infection. For this group, 10.6 percent had a flock health management program to control or prevent the disease at the time of the study. For producers in this group that had added ewes or rams, most did not know the OPP test status of the newly acquired ewes (68.2 percent of operations) or rams (70.4 percent of operations) (Figures 2, 3).

Figure 2. For Operations That Had at the Very Least Heard of OPP and Had Acquired Ewes, Percent of Operations That Acquired Breeding Ewes From an OPP-Negative Flock

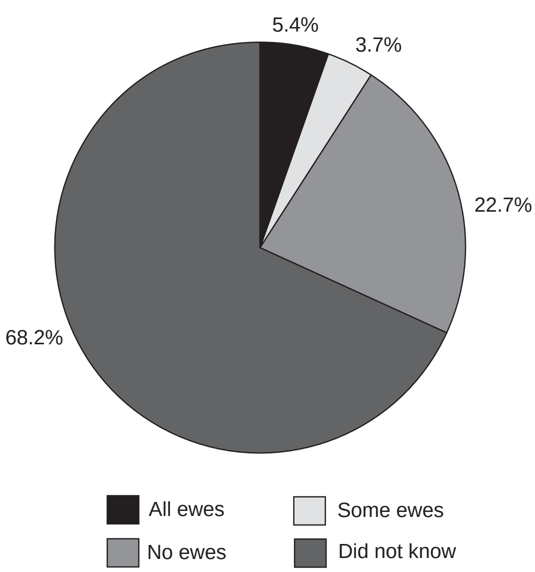
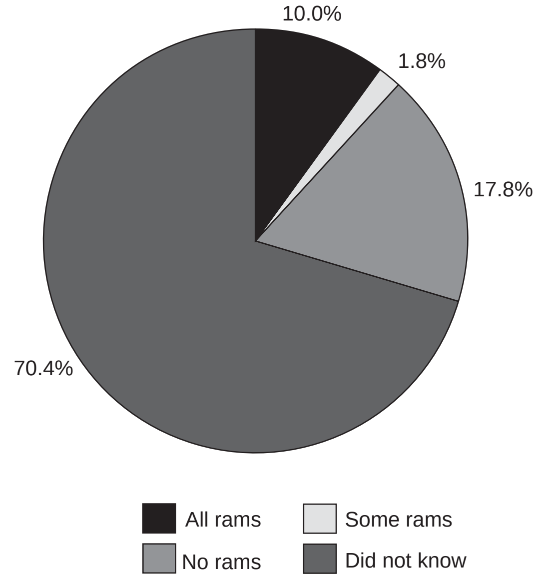


Figure 3. For Operations That Had at the Very Least Heard of OPP and Had Acquired Rams, Percent of Operations That Acquired Breeding Rams From an OPP-Negative Flock



The most common method used to control or prevent OPP within the flock was to keep the flock isolated from infected sheep and/or goats (18.4 percent of operations). Only 6.6 percent of operations removed all seropositive sheep and lambs from the flock. Removal of animals included either selling them and/or isolating them in separate facilities.

Most producers (92.4 percent) never tested their animals for OPP. Of the 7.6 percent that did test their animals for OPP, most (4.3 percent) tested only selected sheep. A few producers (0.1 percent) tested the majority of their sheep two or more times a year, and 1.5 percent tested the majority of their sheep once a year. The rest of the producers (1.7 percent) tested their sheep less frequently than once a year.

Very few producers (1.2 percent) believed their sheep were currently infected with OPP. The majority of producers (86.3 percent) did not know the current OPP status of their flock.

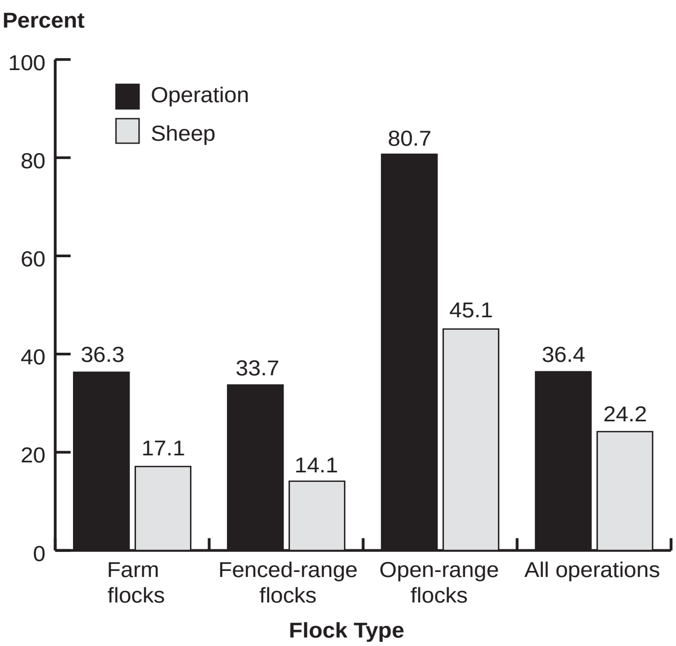
Seroprevalence of OPP

All blood samples were tested using a competitive enzyme-linked immunosorbent assay (cELISA) technique that detects antibodies in the serum of sheep sampled. The cELISA provides direct quantification of serum antibodies to OPP virus, which the commonly used agar gel immunodiffusion (AGID) test does not permit, making the cELISA a more objective method for determining the seropositivity of a sample than the AGID.

Overall, 36.4 percent of operations had one or more animal test positive for OPP, and 24.2 percent of animals tested positive for OPP. The prevalence of infection varied depending on flock type, region, and flock size.

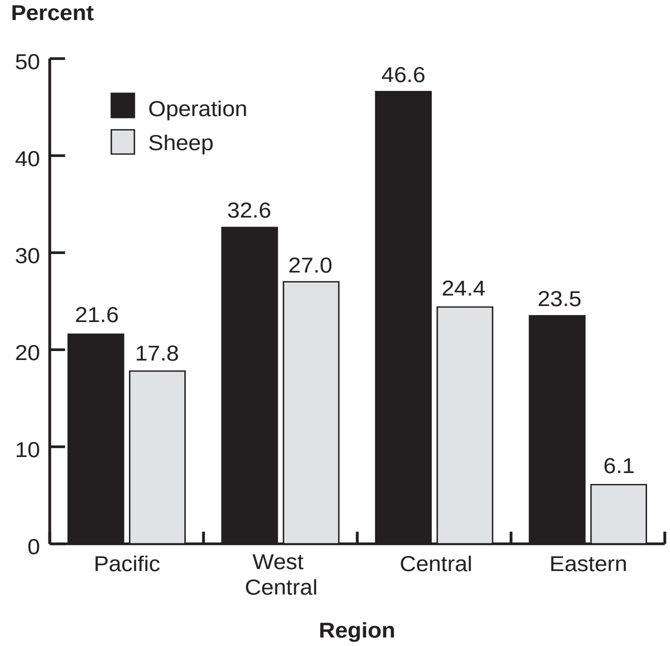
Most open-range flocks (80.7 percent) had one or more animal test positive for OPP, and 45.1 percent of sheep tested from open-range flocks were positive. Approximately one-third of flocks (33.7 percent) categorized as fenced-range operations were positive; only 14.1 percent of sheep tested from fenced-range flocks were positive. In farm flocks, 36.3 percent of operations and 17.1 percent of sheep tested from farm flocks were positive (Figure 4).

Figure 4. Percent of Operations (and Percent of Sheep) Positive for OPP, by Flock Type



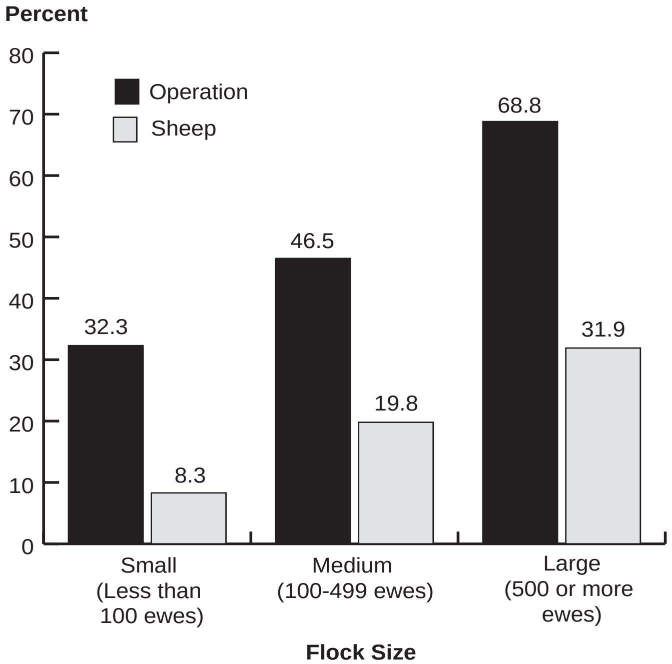
In the Pacific region, 21.6 percent of operations and 17.8 percent of sheep tested positive for OPP. In the West Central region, 32.6 percent of operations tested positive, and 27.0 percent of sheep tested positive. Of operations in the Central region, 46.6 percent tested positive, and 24.4 percent of sheep tested positive. In the Eastern region, 23.5 percent of operations, and 6.1 percent of sheep tested positive (Figure 5).

Figure 5. Percent of Operations (and Percent of Sheep) Positive for OPP, by Region



The percentage of large operations positive for OPP (68.8 percent) was more than twice the percentage of small operations positive for OPP (32.3 percent). The percentage of sheep testing positive for OPP on large operations (31.9 percent) was nearly four times the percentage of sheep testing positive on small operations (8.3 percent) (Figure 6).

Figure 6. Percent of Operations (and Percent of Sheep) Positive for OPP by Flock Size



Conclusion

While very few producers believed their flocks were currently infected with OPP, the serosurvey indicated a relatively high level of infection (36.4 percent of operations). One explanation for this discrepancy may be that most producers (92.4 percent[2]) do not test for OPP on their operations. In addition, for those that acquire breeding rams or breeding ewes, only 10.0 percent and 5.4 percent of producers acquired all their rams and ewes, respectively, from flocks known to have tested negative for OPP. The economic effect of this disease varies from flock to flock and depends on a number of factors: the prevalence of infection within the flock; general management of the flock; and the production goals of the flock. Since there is no treatment for OPP, prevention is the best strategy for reducing morbidity and mortality. Introduction of OPP can be reduced through a closed herd policy or testing all newly acquired animals prior to introduction onto the farm.

For operations with OPP-infected sheep, serologic testing of the flock at appropriate time intervals, with removal or isolation of infected animals, is the first step toward control. In addition, an appropriate diagnostic and control plan should be developed with a local veterinarian.

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#N414.1203

Reference:
Cutlip RC, Lehmkuhl HD, Sacks JM, et al. Seroprevalence of ovine progressive pneumonia virus in sheep in the United States as assessed by analyses of voluntarily submitted samples. Am J Vet Res, June 1992, 53(6):976-979.

[2] Includes only producers who had at the very least heard of OPP. It is reasonable to assume that most of the producers who had not heard of OPP would not have tested for the disease.

Johne's Disease in Sheep

Johne's disease (pronounced "yo-nees") is a contagious, chronic, and usually fatal infection that affects primarily the small intestines of ruminants. Johne's disease is caused by a resistant species of bacteria belonging to the same family as tuberculosis and leprosy and is found all over the world.

Concern about Johne's disease among U.S. owners of ruminant livestock is increasing due to the economic impact of the disease on individual producers and the possible impact on international marketing.

Individual Flock Owners Should Be Concerned

Johne's disease can be an economic drain. Sheep flocks with high rates of infection may lose up to 10 percent of their adult ewes due to wasting (loss of body condition). The disease can require early culling of ewes, on average at 2.5 to 4 years of age. Initially, Johne's disease may show up in older ewes, but as the disease becomes more prevalent in the flock, younger animals begin to show clinical signs. The disease can also cause decreased milk and carcass yield and affect sales of replacement and breeding stock.

What Is Johne's Disease?

Johne's disease, or paratuberculosis, is a chronic bacterial infection caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP). There are several strains of MAP. The agent seems to change depending on the species it infects. For example, the C or cattle strain in bison has different culture requirements, making it grow slower and be more difficult to culture than the same strain from cattle. The S or sheep strain has been very difficult to culture, and an optimal method for detection has yet to be found for U.S. strains in sheep.

In Johne's-infected sheep, the intestines become thick and less efficient at absorbing nutrients. Affected sheep continue to eat but lose weight and "waste away." Although the disease causes diarrhea in cattle, less than 20 percent of sheep show diarrhea. In up to 70 percent of sheep, the disease may remain at subclinical levels, where individual animals never show signs of the disease but shed the agent in their feces and infect other sheep and contaminate the environment.

Johne's Disease and Humans

The *M. avium paratuberculosis* bacteria—sometimes referred to as MAP bacteria—that causes Johne's disease is not currently known to cause disease in humans, but it has been detected in humans with Crohn's disease, as have numerous other bacteria and viruses. The symptoms for Crohn's disease in humans are similar to the signs of Johne's disease in ruminants. However, no definitive evidence is available proving MAP causes Crohn's disease.

Research from the U.S. Department of Agriculture's (USDA) Agricultural Research Service indicates that commercial pasteurization inactivates MAP bacteria in milk. However, some researchers still have concerns about MAP in undercooked meat, unpasteurized milk products, and water as potential sources of exposure. While MAP remains largely an animal health issue, the risk of human exposure through contaminated food sources creates a quality assurance concern in milk and meat products.

Because of the potential public health concerns related to this disease, animal production industries must give Johne's disease more attention USDA-APHIS has invested over $99 million since 2000 to research, develop, and maintain a national control program for Johne's disease.

Other Factors That Cause Wasting in Adult Sheep

Johne's disease often mimics other diseases or problems in sheep such as caseous lymphadenitis abscesses, dental disease, ovine progressive pneumonia, scrapie, nutritional problems, parasitism, and chronic infections of the lung, liver, or kidney. In MAP-infected sheep, concurrent infections may occur because of a weakened immune system. For example, if an individual sheep appears to have a parasite problem in a flock with a good deworming program, Johne's should be investigated as the possible underlying infection actually causing the wasting.

How Sheep Get Infected

Johne's disease is a disease producers "buy into." It usually enters flocks via an infected but outwardly healthy animal that is releasing MAP into the environment through its feces. Lambs are more susceptible than adult sheep, but age resistance can be overcome with higher doses or prolonged exposure. In cattle, MAP has been shown to be passed to unborn calves in utero, and MAP can be found in colostrum and milk.

The same is probably true for sheep. MAP is resistant to heat, desiccation, UV light, freezing, and disinfectants, it and can survive in manure in pastures and pond water for up to 11 months.

How the Disease Progresses in Infected Sheep

As with many infectious diseases, there are several stages of Johne's disease. Stage I is silent infection. This stage is usually seen in animals less than 1 year old that show no signs of the disease. At this stage, the disease is not detectable by any tests.

Stage II is subclinical disease. Sheep with Stage II Johne's disease show no signs but may be shedding the agent in its feces. Few sheep disclose the disease in this stage.

Stage III is clinical disease. Sheep with Stage III of the disease eat well but lose weight. At this time, a blood test can detect some infected sheep.

Stage IV is advanced clinical disease. The Stage IV sheep is weak and emaciated, shedding large numbers of the organism in its feces. Sheep will not survive once the disease has progressed to this stage.

Johne's disease is a herd problem. For every clinical case, there may be 10–15 subclinically infected sheep in the flock. This phenomenon is referred to as the "Johne's iceberg." The number of observed cases is just the tip compared to the number of subclinical (or incubating) animals in the flock.

How To Determine If Your Sheep Are Infected With MAP

To determine whether your sheep are infected with MAP, you will need to combine history, clinical signs, and test results. Tests include:

- **Fecal or tissue culture** (usually from tissues obtained at necropsy). Culture of the sheep strain has been difficult, detecting less than 12 percent of infected sheep. New methods, which use liquid culture media and real-time PCR (polymerase chain reaction), are currently being validated and will greatly improve the sensitivity of cultures.
- **Tissue histology.** The presence of acid-fast bacteria and lesions typical of Johne's disease found on tissues obtained at necropsy can help with the diagnosis.
- **Blood tests.** The agar gel immunodiffusion (AGID) test is currently the blood test of choice for diagnosing Johne's disease in sheep. This test can be used to diagnose disease in individual animals or to screen a flock of sheep for Johne's disease. The test works best in sheep at Stage III and IV (finding 85–100 percent of infected animals) and has a low rate of false-positive reactions. Most of these false positives are cross-reactions due to caseous lymphadenitis infection. Electroimmunosorbent assay (ELISA) tests for Johne's disease in cattle have been adapted for diagnosing the disease in sheep. However, the use of ELISA tests is also limited due to cross reactivity to caseous lymphadenitis.

Do I Need To Test All My Sheep?

Flock screening using targeted testing can determine if you have a problem in your flock. One-quarter of the flock is tested, beginning with sheep that have the lowest body conditioning scores. Targeted testing saves on costs while involving the animals most likely to be infected.

Sheep positive on the AGID test should have their status confirmed with fecal culture or tissue culture because false-positive AGID reactions can occur. Until fecal culture for sheep strain becomes available in the United States, histology is the definitive or confirmatory test. Alternatively, the AGID could be repeated in 8 to 10 weeks. Most cross-reactive antibodies will disappear in that period of time.

Most MAP-infected AGID-positive sheep do not revert to a negative status. If the AGID test discloses a positive result, confirmation by histology should still be pursued to rule out other sporadic infections, such as *Mycobacterium avium*.

What If I Don't Think My Sheep Have Johne's Disease?

Consider testing your flock, perhaps with the screening method above. If your sheep test negative, take steps to protect your flock's status. Make sure your lambs kept for replacement do not get exposure to adult manure, even at shows and on trailers. Before buying new sheep, inquire about the disease status of the source flock. Ask that the 25 percent of the flock with the lowest body-condition scores be tested before purchasing replacement animals from that flock.

What If My Sheep Do Have Johne's Disease?

There is no treatment for Johne's disease, and a vaccine for sheep is not available in the United States. (Vaccines currently available in other countries do not prevent new infections but do reduce shedding of MAP into the environment.) However, flock-cleanup plans can reduce the prevalence of infection in your flock and eventually eliminate the disease. Work with your flock veterinarian to develop a flock-cleanup plan specific to your operation, abilities, and goals.

Management changes alone can decrease the prevalence of infection in a flock and reduce associated losses. These changes include using milk replacer and reducing exposure of lambs to adult manure. Flock cleanup is often possible with management changes and institution of a test-and-cull program. Prevalence reduction can be achieved in several years, but complete cleanup may take 7 years or longer due to the chronic nature of the disease and difficulty in diagnosing animals infected at subclinical levels.

Plans to Address Johne's Disease in U.S. Sheep

The U.S. sheep industry is concerned about Johne's disease and has begun to develop a test-negative program through the efforts of the United States Animal Health Association's Small Ruminant Committee. USDA is working with several other agencies and universities to develop and validate the technology to culture the S strain of MAP.

For any Johne's disease-reduction program to be successful, all laboratories testing animals for MAP must be performing at the same level to provide increased confidence in the test results. Laboratories can currently be approved to conduct tests for the disease in cattle by passing a check test from USDA's National Veterinary Services Laboratories (NVSL). NVSL plans to offer such testing for sheep in the future once tests are validated.

For More Information

If you would like to know more about Johne's disease control and prevention, contact:

National Center for Animal Health Programs
USDA–APHIS–Veterinary Services
4700 River Road, Unit 43
Riverdale, MD 20737
Telephone: (301) 851-3569

Johne's Disease Q & A for Sheep Owners

The National Johne's Education Initiative recognizes Dr. Elisabeth Patton and Dr. Gretchen May with the Wisconsin Department of Agriculture, Trade and Consumer Protection and Dr. Elizabeth Manning with the University of Wisconsin-Madison Johne's Information Center for their contributions to this piece. Some photos have been provided by the Johne's Information Center, University of Wisconsin-Madison, *http://johnes.org.*

Q: *What is Johne's disease?*

A: Johne's ("YO-knees") disease is a fatal gastrointestinal disease of sheep and other ruminants (including goats, cattle, elk, deer and bison) caused by the bacterium *Mycobacterium avium* subspecies *paratuberculosis (MAP)*. Also known as paratuberculosis, this infection is contagious and can spread in your flock.

The *MAP* organism is most commonly passed in the manure of infected adult animals. Lambs typically become infected when they swallow water, milk or feed that has been contaminated by manure from infected animals. Most owners are taken by surprise when the infection is diagnosed, and learn too late that the infection has taken hold in multiple animals in a flock.

Due to lack of testing and reporting, it is not known how widespread Johne's disease is in sheep in the United States. The infection has been confirmed, however, in many flocks and sheep breeds throughout the country, and it is a problem in most other sheep-rearing countries.

The costs of this infection are due to increased culling and reduced production—limited weight gain and poor fleece growth and quality. Flocks that do not address the infection may lose up to 10% of adult sheep each year.

There is no cure for Johne's disease. A vaccine that is available in other countries is not approved for use in sheep in the United States.

Prevention is the key to control.

Q: *How do I know if my flock has Johne's disease?*

A: A sheep that appears perfectly healthy may be infected with *MAP*. Most sheep become infected in the first few months of life and remain free of clinical illness until months or years later. Unfortunately, an infected sheep sheds *MAP* before it is visibly sick.

When sheep finally do become ill, the symptoms are vague and similar to other ailments: rapid weight loss and, in some cases, diarrhea (scouring). Despite continuing to eat well, infected sheep soon become emaciated and weak.

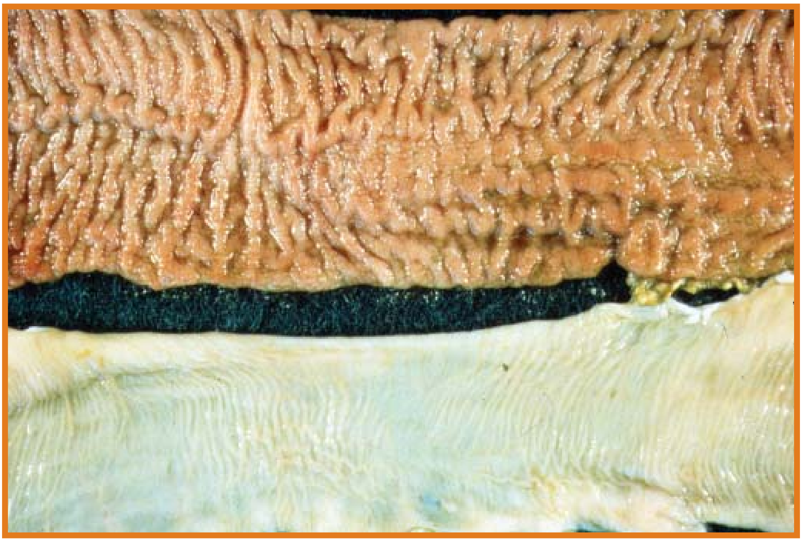
Since the signs of Johne's disease are similar to those for several other diseases—parasitism, dental disease and caseous lymphadenitis (CLA), laboratory tests are needed to confirm a diagnosis.

A sheep showing symptoms of Johne's disease.

When an animal with signs of Johne's disease is discovered, it is very likely that other infected animals—even those that still appear healthy—are in the flock. Control of the infection requires that you and your veterinarian address it on a whole flock basis rather than on an individual animal basis.

Q: *Why do animals with clinical signs of Johne's disease lose weight and become weak?*

A: When an animal is infected with *MAP*, the bacteria reside in the last part of the small intestine—the ileum—and the intestinal lymph nodes. At some point, the infection progresses as bacteria multiply and take over more and more of the tissue. The sheep's immune system responds to the *MAP* with inflammation that thickens the intestinal wall and prevents it from absorbing nutrients. As a result, a sheep in the final stages of Johne's disease in effect starves to death. At this stage, the organism may also spread beyond the gastrointestinal tract, travelling in the blood to muscles or other major organs such as the liver or lungs.



Top: Thickened intestinal mucosa caused by Johne's disease.
Bottom: Thin, pliable, normal intestine

Q: *How do sheep become infected? How is MAP spread in a flock?*

A: Johne's disease usually enters a flock when an infected, but healthy-looking, sheep is purchased. With *MAP* hiding in its small intestine, this infected sheep sheds the organism in its pellets onto pasture or into water shared by its new flockmates.

Sheep—particularly those less than 6 months old—are at risk as they repeatedly swallow the organism. If the ewe is infected, her offspring can become infected even before they are born (*in utero* transmission). Since the organism is also shed in an infected ewe's milk and colostrum, lambs ingest *MAP* through suckling. Other sources of infection are manure-stained teats plus feed, grass or water contaminated by manure containing *MAP*.

Bottle-fed lambs may also become infected if the milk was contaminated.

Since sheep usually produce more than one lamb per birthing, Johne's disease can spread swiftly in a flock, especially if the infection remains undetected in a flock for several lambing seasons.

While lambs are most susceptible to infection, older sheep may become infected, particularly when their immune systems are suppressed for other reasons.

MAP infection can be transmitted from one ruminant species to another—for example from cows to sheep, sheep to goats, etc.

Q: *When do infected animals start shedding the bacteria?*

A: *MAP*-infected sheep shed the organism on and off throughout their lives. The older the animal, the more likely that shedding occurs as the infection progresses. As sheep enter the latter stages of infection and clinical signs begin to appear, *MAP* is shed more often and more heavily.

Q: *Is it difficult to know if my flock has Johne's disease?*

A: Sometimes.

Johne's disease is often mistaken for other problems such as intestinal parasitism, chronic malnutrition, environmental toxins, cancer and caseous lymphadenitis—particularly in sheep thought to have internal abscesses.

In early stages of flock infection, infected sheep appear healthy. You then might notice a number of poor doers that don't respond to deworming. Many flocks rotate parasite treatments for several rounds before testing and determining that Johne's disease is the reason their sheep are so thin.

If Johne's disease is suspected but has not been confirmed in a flock, a necropsy of a sheep with symptoms of the disease may be helpful in determining if the infection is in the flock. This necropsy may reveal enlarged intestinal lymph nodes and a thickened, corrugated intestinal tract.

To give you the greatest confidence in the diagnosis, a complete necropsy of sheep suspected of having Johne's disease should include culture of the intestine and adjacent lymph node to isolate the organism plus microscopic examination of these tissues.

The sooner you confirm the infection, the sooner you can act and keep it from spreading.

Q: *How can I help keep Johne's out of my flock?*

A: Buyer beware! The most common way that the infection is introduced to a flock is through the purchase of an animal from an infected flock. Since many people raising sheep are unaware of Johne's disease, both the seller and buyer may be surprised when the diagnosis is made.

In short, it is easier to keep *MAP* out of a flock than to control the disease once *MAP* is found.

Practices that can help prevent the introduction of Johne's disease into a flock are:

- Maintain a closed flock. Don't buy Johne's disease.
- If you bring new sheep into the flock, purchase animals only from flocks that have tested for Johne's disease. Ideally, purchase only from flocks that have had a negative whole-flock test in the last year. If this is not possible, you should buy from someone who is aware of the infection, has tested for it and can provide accurate records on the disease in their flocks than to purchase an animal from individuals who have never evaluated their flock for Johne's disease.
- If no diagnostic testing has been conducted in the source flock, at least closely evaluate the body condition of all the adult animals, discuss the history of any clinical signs in the flock over the past few years with the seller and test the adult animal to be purchased.
- If the animal to be purchased is less than a year old, test its dam since young animals in an early stage of infection are unlikely to test positive.
- Do not bring in or share pastures with other untested ruminants since they are all susceptible to Johne's disease.
- Avoid grazing sheep on pastures where *MAP*-infected ruminants have grazed. Graze young sheep on such a pasture only after it has rested for a year. To date, *MAP* infection of free-ranging ruminants such as deer or elk is uncommon, and currently these species are not believed to be an important source of infection to your flock or pastures.

Q: *How can I control Johne's disease once it has entered in my flock?*

A: Since there is no cure for Johne's disease, control of the infection is critical. Control of Johne's disease takes time and a strong commitment to management practices focused on keeping young animals away from contaminated manure, milk, feed and water. A typical flock clean-up program may take a number of years.

The basics of control are simple: New infections must be prevented, and animals with the infection must be identified and removed from the flock.

Your State Designated Johne's Coordinator can help you undertake an on-farm risk assessment that evaluates your operation, your resources and your goals. This on-farm risk assessment highlights current management practices that may put your flock at risk for spreading Johne's disease and other infections. At the completion of a risk assessment, your veterinarian can work with you to develop a management plan designed specifically for you and your flock that will minimize the identified risks for disease transmission. (Risk assessment is discussed as part of the Johne's disease course for sheep producers at ***www.vetmedce.org***.)

Most control plans follow basic rules of sanitation to block transmission of the infection within the flock. Management recommendations include:

- Prepare "low risk" lambing and weaning paddocks that are used only for sheep believed to be free of infection. (Six weeks destocking of a premises can dramatically reduce contamination levels.)
- Lamb suspect or test-positive ewes in an area separate from low-risk ewes.
- Fence off wet and low-lying areas so young animals do not graze these areas.
- Cull clinically ill or test-positive animals as soon as possible, and consider culling the most recently born lambs of these ewes as well.

- Progressively destock and decontaminate sections of the property, restocking with the lowest-risk adult sheep you can find after the premises have been empty for several months.
- If feasible, clean the udders of ewes before lambs nurse. If bottle feeding, use milk and colostrum from test-negative ewes, does or cows.
- Be aware that colostrum purchased from another flock or herd may be contaminated. Pasteurization needs to be at 145°F (63°C) for 30 minutes (batch pasteurization) or 162°F (72°C) for 15 seconds (flash pasteurization) to kill *MAP* in milk.

- Move young animals and their dams to "clean" pastures as soon as possible after lambing.
- Keep water sources clean, particularly those used by lambs. Use waterers designed to minimize manure contamination.
- Raise all feeders and avoid feeding on the ground.
- Use diagnostic tests to identify infected animals and remove them promptly from the flock.
- Necropsy sick or cull animals to determine if your flock is infected with *MAP*.
- If your flock has had numerous cases of Johne's disease, discuss depopulation with your veterinarian, or, at a minimum, immediately remove all test-positive animals and their last-born lamb. Do not allow lambs to be exposed to milk or manure from infected animals.

Remember: Preventing Johne's disease is much less costly than controlling it.

Q: *How can I clean equipment, sheds or fields potentially contaminated with MAP?*

A: The *MAP* organism is very hardy in the environment: It resists heat, cold, drying and dampness. Although the majority of organisms die after several months, some may remain for a year or more. In fact, research shows that *MAP* can survive—at low levels—for up to 11 months in soil and 17 months in water. *MAP* has also been recovered from grasses fertilized with *MAP*-contaminated manure. This is why pastures and fields known to be contaminated with *MAP* should not be grazed by lambs, calves or kids for at least one year after last exposure.

Feed and watering equipment that may have become contaminated with *MAP* should be washed and rinsed. When cleaning a water trough, sediment and slime from the sides and bottom should not be dumped onto ground that will be grazed by young sheep.

Disinfectants labeled as "tuberculocidal" may be used as directed for cleaning tools, implements and some surfaces. These disinfectants, however, are inactivated by organic material—such as dirt and manure—and are therefore not effective on dirty surfaces, wood surfaces, soil or even cement floors.

Composting of manure and used bedding can reduce the number of living *MAP* organisms they may contain.

Q: *Should I test my flock for Johne's disease?*

A: If you have sheep with a normal appetite that have become thin and are not responding to treatment, talk to your veterinarian. The culprit may be Johne's disease.

Remember: Since Johne's disease is a flock problem, testing should focus on the flock and not just on a single animal.

Diagnostic testing for Johne's disease can help to:

1. Determine if *MAP* infection is present in your flock.
2. Estimate the extent of *MAP* infection in your flock.
3. Control *MAP* in an infected flock.
4. Make a diagnosis for a sick animal.
5. Check if *MAP* is present in the environment.
6. Meet a pre-purchase or shipping requirement.
7. Demonstrate to potential buyers that your animals are low risk for Johne's disease (test negative).

Once your veterinarian knows your goals in testing for Johne's disease, a testing plan that best meets your needs can be put in place. This plan should outline the type of test, when to test, which sheep to focus on, the cost of testing, how to interpret the results and what actions to take based on test results.

Decide how you plan to act on your test results **before** you have collected the samples.

Q: *What diagnostic tests are available? Which one is best?*

A: There are a number of effective assays for Johne's disease testing in sheep. The best testing program is one developed by you and your veterinarian since you know your operation best—its goals, resources, other animal health issues.

Diagnostic tests for Johne's disease look for either the organism that causes Johne's disease (*MAP*) or the animal's response to infection.

Tests that look for the organism in manure include culture and direct PCR. Individual animals can be tested or a laboratory can pool manure samples from multiple animals and provide owners with effective Johne's disease surveillance for a fraction of the cost of individual culture or PCR.

The animal's body eventually responds to *MAP* infection by making antibodies. The test that measures antibody levels in the blood is the ELISA.

Due to the biology of *MAP* infection, older, infected sheep are much more likely to shed *MAP* or produce antibody. Therefore, diagnostic tests are less reliable for most sheep less than 18 months old.

Testing approaches that have worked well for other flocks include:

Testing Purpose	Option A	Option B
Confirm presence of *MAP* in a flock.	Culture 5 – 10 environmental fecal samples collected at high sheep traffic areas.	Using ELISA* or fecal culture, test the oldest or thinnest sheep—10% or more of the flock.
Determine number of sheep that are infected.	Blood test (ELISA*) all adult sheep.	Collect fecal samples for the lab to test by pooling for culture. Samples comprising positive pools are retested individually.
Control or eradicate *MAP* in an infected flock.	Blood test (ELISA*) sheep after their second lambing or older.	Collect fecal samples for the lab to test by pooling for culture. Samples comprising positive pools are retested individually.
Diagnose a sick sheep (weight loss and/or diarrhea).	If previous cases have been seen in the flock: ELISA*. (Fecal culture if CLA is a problem in the herd or if the flock has been vaccinated for CLA.)	If *MAP* has never been confirmed in the flock, use fecal culture.

**Use commercial ELISA kit approved by the USDA for small ruminants to limit the chance of false-positive results due to cross-reacting antibodies from other types of infections.*

Test samples should be submitted to a laboratory that has passed an annual “check test” demonstrating their competency. These labs are listed here:
http://www.aphis.usda.gov/animal_health/lab_info_services/approved_labs.shtml

Q: *Where can I find more information about Johne's disease?*

A: The University of Wisconsin School of Veterinary Medicine's website—**www.johnes.org**—addresses all aspects of Johne's disease for multiple species, including sheep. The site has an "Ask An Expert" feature that allows you to submit your own questions and receive a personalized response from an expert.

The University of Wisconsin School of Veterinary Medicine also offers a free online course for sheep producers. Simply go to **www.vetmedce.org**, click on "Courses" in the lower left hand corner of the homepage. Once on a new page, click on "Johne's Disease." At the next new page, click on "Johne's Disease Courses for Producers" followed by clicking on "0017—Johne's Disease for Sheep Producers."

To learn more about Johne's disease in sheep, please contact your State animal health regulatory agency or your State Designated Johne's Coordinator. Contact information for your State's Johne's disease program is available online at **www.johnesdisease.org** when you click on "State Contacts."

This information is provided by

13570 Meadowgrass Drive, Suite 201
Colorado Springs, CO 80921
Ph: 719.538.8843
www.animalagriculture.org

The Virginia Department of Agriculture and Consumer Services (VDACS) operates a network of regional animal health diagnostic laboratories to protect and enhance the economic viability of Virginia's animal agriculture industries by providing accurate, timely and accountable testing services for diseases of economic and public health significance.

With four laboratories located across the Commonwealth and more than 40 employees, we are able to provide clients with a wide range of diagnostic testing services. We accept samples from veterinarians, as well as livestock producers, poultry growers and pet owners. We offer necropsy, hematology, microbiology, molecular diagnostics, parasitology, pathology and serology. We provide support for VDACS' regulatory programs by testing milk products, meat and water samples to help protect the health of Virginia's citizens.

For additional information on services available, please contact your nearest VDACS Regional Animal Health Laboratory.

LABORATORY SERVICES

HARRISONBURG LABORATORY

261 Mount Clinton Pike
Harrisonburg, VA 22802
540.209.9130; Fax: 540.432.1195
E-mail: **RAHLHarrisonburg@vdacs.virginia.gov**

LYNCHBURG LABORATORY

4832 Tyreeanna Road
Lynchburg, VA 24504
434.200.9988; Fax: 434.947.2577
E-mail: **RAHLLynchburg@vdacs.virginia.gov**

WARRENTON LABORATORY

272 Academy Hill Road
Warrenton, VA 20186
540.316.6543; Fax: 540.347.6404
E-mail: **RAHLWarrenton@vdacs.virginia.gov**

WYTHEVILLE LABORATORY

250 Cassell Road
Wytheville, VA 24382
276.228.5501; Fax: 276.223.1961
E-mail: **RAHLWytheville@vdacs.virginia.gov**

Virginia Department of Agriculture and Consumer Services

Office of Laboratory Services
102 Governor St., Richmond, VA 23219 • 804.786.9202
www.vdacs.virginia.gov/animals-laboratory-services.shtml

VIRGINIA REGIONAL ANIMAL HEALTH LABORATORY SYSTEM

VDACS RAHLS FEE SCHEDULE

Bacteriology
- Acid fast stain — $5.50
- Aerobic culture — $16.50
- Anaerobic culture — $16.50
- Antimicrobial susceptibility — $13.20
- Bacterial FA — $11.00
- Bacterial ID — $14.30
- Campy fetus (vibrio) culture — $16.50
- Campy jejuni culture — $16.50
- C. difficile toxin ELISA — $27.50
- Contagious Eq. Metritis (CEM) culture — $27.50
- C. perfringens toxin ELISA — $15.40
- Direct microscopic exam — $7.00
- E. coli MPN — $13.20
- Environmental culture — $19.80
- Fungal culture — $16.50
- Giemsa stain — $5.50
- Gram stain — $5.50
- Listeria culture — $16.50
- Mycoplasma culture — $16.50
- Salmonella culture — $16.50

Dairy Microbiology
- Aflatoxin screen — $27.50
- Bulk tank culture — $16.50
- Bulk tank culture- prelim incubated — $16.50
- Bulk tank panel — $27.50
- Buttermilk and milk component — $4.40
- Charm SL3 — $27.50
- Cryoscope — $5.50
- Delvo-P — $11.00
- Direct micro. bacterial count — $7.70
- IDEXX SNAP — $11.00
- Lab pasteurized count — $7.70
- Mastitis antimicrobial susceptibility — $13.20
- Mastitis culture — $4.00
- Milk mycoplasma enrichment culture — $27.50
- Petrifilm aerobic count — $7.70
- Petrifilm coliform count — $7.70
- Phophatase — $27.50
- Preliminary incubated count — $7.70
- Somatic cell count — $4.40
- Preliminary incubation count — $7.70

Food Safety
- Campylobacter VIDAS screen/confirm — $19.80/$55.00
- E. coli 25g VIDAS screen — $19.80
- E. coli 325g VIDAS screen — $27.50
- E. coli VIDAS confirmation — $71.50
- Listeria VIDAS screen/confirm — $19.80/$55.00
- Salmonella VIDAS screen/confirm — $19.80/$55.00
- Staph enterotoxin VIDAS — $38.50

Hematology/Clinical Pathology
- Complete blood count — $30.80
- Differential WBC count — $7.70
- Equine chemical profile — $33.00
- Fibrinogen (plasma) — $9.90
- Food animal chemical profile — $27.50
- Fluid cytology — $16.50
- PCV- Packed cell volume — $2.75
- Small animal chemical profile — $38.50
- Total protein — $2.75
- Urinalysis — $22.00
- WBC- white cell count — $7.70

Molecular Testing
- Avian Influenza RT-PCR — $40.00
- Equine Herpesvirus PCR Combo — $50.00
- Infectious Laryngotracheitis PCR — $27.50
- Johne's Disease- Direct Fecal PCR — $29.70
- Johne's Disease- Direct Fecal PCR- pooled — $35.20
- Leptospira spp. PCR — $33.00
- Mycoplasma gallisepticum PCR — $24.20
- Mycoplasma synoviae PCR — $24.20
- Newcastle Disease PCR — $40.00
- ORT PCR — $44.00
- Potomac Horse Fever PCR — $33.00
- Turkey Coronavirus PCR — $33.00
- Tritrichomonas PCR — $44.00

Parasitology
- Baermann fecal — $7.70
- Cryptosporidium acid fast stain — $5.50
- Cryptosporidium ELISA — $30.80
- Direct smear blood parasites — $5.50
- Direct smear (fecal) — $5.50
- Fecal egg count — $16.50
- Fecal flotation — $11.00
- Giardia ELISA — $30.80
- Parasite Identification — $8.30
- Quantitative camelid fecal count — $19.80
- Tritrichomonas culture — $13.20

Pathology
- Euthanasia (mammal < 100 lbs) — $11.00
- Euthanasia (mammal > 100 lbs) — $27.50
- Histopath/biopsy (1-2 tissues) — $50.00
- Histopath/biopsy (>2 tissues) — $71.50
- Necropsy carcass disposal < 100 lbs — $11.00
- Necropsy carcass disposal 100-250 lbs — $27.50
- Necropsy carcass disposal 250-500 lbs — $38.50
- Necropsy carcass disposal > 500 lbs — $55.00
- Necropsy companion/exotic — $200.00
- Necropsy equine < 3mos. — $82.50
- Necropsy equine > 3mos. — $110.00
- Necropsy- Forensic- companion/exotic — $300.00
- Necropsy- Forensic- livestock/equine — $150.00
- Necropsy- Forensic- out-of-state — $500.00
- Necropsy- livestock/poultry — $82.50
- Spinal cord removal- complete — $50.00

Serology - Tiered pricing based on volume
Contact laboratory for details
- Anaplasmosis ELISA — $6/4.5/3
- Avian Influenza AGID or ELISA — $1.10
- Bluetongue virus AGID or ELISA — $8/6/4
- Bov Leukosis virus (BLV) AGID or ELISA — $8/6/4
- Brucella serology — $3.85
- Brucella canis IFA screen — $20.00
- BVD ELISA — $8/6/4
- CAE ELISA — $8/6/4
- Canine Heartworm — $14.30
- Chlamydia ELISA — $33.00
- EHD AGID — $6.60
- EIA AGID — $7.15
- EIA AGID panel — $9.65
- EIA Horse Board surcharge — $1.50
- EIA S-ELISA — $16.50
- EIA S-ELISA panel — $18.00
- Johne's ELISA — $8/6/4
- Leptospira micro-agglutination — $11.00
- Leptospira, add L. autumnalis — $2.20
- Leptospira, add L. canicola — $2.20
- Neospora ELISA — $6.60/4
- Neospora IFA screen — $6.60
- Ov progress pneum (OPPV) ELISA — $8/6/4
- Toxoplasmosis ELISA — $15.40
- WNV IgM Capture ELISA — $19.80

Virology
- Avian influenza antigen capture ELISA — $15.40
- Fluorescent antibody (per conjugate) — $11.00
  Bovine: BRSV, IBR, Corona, BVD, PI3
  Canine: CAV, Corona, CDV, CHV, Parvo
  Equine: EHV
  Feline: FIP, FPV, Viral Rhinotracheitis
  Porcine: TGE, Parvo
  Small Ruminant: Contagious Ecthyma
- Pathasure ELISA (per organism) — $15.40
  Coronavirus, Rotavirus, K99 E. coli
- Rotavirus latex agglut (Grp A) — $15.40

Miscellaneous
- Fax Fee for re-sending results — $2.00
- Out of state surcharge, per accession — 10%
- Records retrieval/copy, per accession — $2.00
- Shipping/handling for referrals — $20.00

Prices subject to change. Please visit: **www.vdacs.virginia.gov/animals-fees-for-testing-procedures.shtml** or contact a laboratory for information on how to submit a test and the most current fees.

Updated: October 2017

American Sheep Industry Association

ASI letter to the Trump Administration

- ASI formally shared the sheep industry priorities with President Trump and the transition team in December. Priorities that would impact and benefit the industry promptly include:
- Administration Support for Wildlife Services’ role in predation management
- Support for the work of the U.S. Sheep Experiment Station
- Delisting wolves and grizzly bears under the Endangered Species Act
- Withdrawing rules allowing imports from countries with a known history of Foot and Mouth Disease
- Publishing the final rule on scrapie in sheep and goats
- Re-opening markets lost to U.S. lamb. Japan remains closed to our producers and the United Kingdom and European Union maintain significant barriers to lamb trade
- Enhance the key role the H-2A labor program plays in the sheep industry

ASI Supports USDA Wildlife Services

- An incident with a M-44 coyote getter in Idaho spawned a half mile from residence policy for placement of this important coyote control tool. The policy resulted in removal of all devices in West Virginia and 90 % in Virginia, likely 40% in Texas.
- Animal rights activists immediately moved in the media and congress and courts to attack the tool and the entire Wildlife Services protection of livestock
- ASI pushed back with accurate facts in livestock publications and calls to action in those 18 states to contact their state and federal officials to support use of the second most effective coyote control tool
- USDA to issue analysis of the tool in September

ASI Defends U.S. Sheep Experiment Station

- Celebrated 100th Anniversary in 2016.
- Anti-grazing activist groups and Wild Sheep Foundation continue to oppose sheep research on the nation's only sheep research station
- Congress put the station on the 'do not close list" due to attempt in 2014 to abandon the facility rather than defend it against the legal bullying of activists such as Western Watersheds Project
- 2017 Omnibus Bill includes more than $2 million for continued funding of the station

ASI Testifies on Farm Bill priorities for sheep

- ASI provided the U.S. House of Representatives Committee on Agriculture the official requests for sheep producers in the 2018 Farm bill
- Fund the minor species animal drug approval program ie: parasite control products for sheep
- Update the wool loan deficiency program for a safety net
- Authorize the National Sheep Improvement Center grant fund
- Create a Foot & Mouth Disease Vaccine bank

ASI fights for changes in Mandatory Price Reporting

USDA Market News
Compete Smarter

- ASI developed a report on needed updates with the sheep industry in 2013
- U.S. Congress reauthorized Mandatory Livestock Price reporting in September of 2014, per support of a coalition led by ASI
- USDA took comment on two additional changes but did not implement. Analysis on confidentiality issues of packers was provided in the fall of 2017 with the possibility of a meeting with lamb industry stakeholders.
- Lamb producers will want to have priorities for Congress to decide for lamb reporting when legislation is due again in 2019.

Price Reporting and Lamb Insurance top Priorities of ASI

- Resolution of Mountain States Rosen prices being included in the National Price Report is critical
  - Their information has been mostly absent since February 2016 even though the coop supports reporting their data to USDA
- ASI worked with USDA to develop new reports that have allowed for the return of LRP-Lamb Insurance in spring 2017

ASI Coalition on Agriculture Workers

- ASI updated the membership of a coalition with Western Range Association and Mountain Plains Ag Service to review draft legislation in the U.S. House of Representatives Judiciary Committee regarding foreign agriculture workers. The group met in August and agreed on key sheepherder and sheepshearer provisions to protect in future legislation. The Committee includes most of the sheep requests in the legislation that is under consideration this fall.
- Several issues are not perfected in the overall bill yet but many steps remain before any new H-2A or similar program becomes law.
- The sheep industry is aggressive in staking out benchmarks that must be included in any legislation to change the worker program that is critical to fully one-third of sheep in America that are cared by an H-2A herder

ASI Wins Country of Origin Labeling of Lamb

COUNTRY OF ORIGIN

AMERICAN Lamb HOMEGROWN

ASI succeeded in retaining mandatory country of Origin labeling for lamb

American Wool Logo Rebranded

- American Wool Council launched a new logo in June 2016
- Rebranded logo captures the strength and refinement of wool
- Designed for consumers to be able to recognize products made from American Wool
- Two Logos -- One for products made in American with American Wool
  -- One for products made elsewhere using American Wool

AMERICAN WOOL

MADE IN AMERICA WITH AMERICAN WOOL

American Wool Military Tour

- The American wool council hosted members of the US Armed Services in October with an educational tour of wool processing mills
- Nearly a dozen officials that are responsible for textile procurement for American service men and women participated in tours and discussions with wool company officials and sheep ranchers about wool and potential increased use in government purchases.
- Scouring, carding, combing, spinning, fabric and sock production were are part of the education
- The military is the largest single customer of American wool annually

ASI Let's Grow Program

LET'S GROW thru change

Round 1	Round 2	Round 3	Round 4
• Funded May 2015 • 11 of 43 grants funded • Nearly $260,000 back to industry	• Funded Dec. 2015 • 15 of 27 grants funded • More than $200,000 back to industry	• Funded May 2016 • 10 of 28 grants funded • Nearly $185,000 back to industry	• Funded Dec. 2016 • 14 of 27 grants funded • More than $200,000 back to industry

Round 5
Funded May 2017
7 of 17 grants funded
Nearly $80,000 to promote a profitable sheep business!

Let's Grow Program

State Mentor Program

- 2018 – 17 states approved for a $1000 apiece to assist new sheep producers in their state
- **Lets Grow Webinar Series**

- April 25th webinar on lamb meat quality was attended by 217 people from 43 states.
- August edition had 262 participants on sheep parasites topics. All webinars can be viewed at the Website www.growourflock.org

ASI publishes How To Handle Sheep Video Series

- PERC Council Spearheaded
- Featuring Dr. Temple Grandin, Colorado State University
- Supported by ASI, LMIC and CSU
- To provide an education video for anyone who handles sheep to assure the highest level of animal welfare
- 3-part Animal Handling Video
  - General Principles for Handling Sheep
  - Handling Sheep in Market Facilities
  - Handling Sheep in Processing Facilities
- Available on www.sheepusa.org

ASI supports Scrapie Eradication Rule

- ASI issued comments that are available at www.sheepusa.org/IssuesPrograms_AnimalHealth_Scrapie
- Items recommended for amendment:
  - change risk groups/categories for individual animals/flocks
  - increase use of genetic testing for assigning risk levels
  - reduce movement restrictions for animals found to be genetically less susceptible or resistant to scrapie
  - Specify eartag placement and propose use of plastic tags

Awaiting final rule from USDA and ASI seeking funds to keep id tags free

Working Dog Insurance

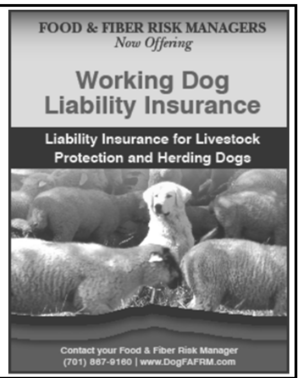
WHY?
- Liability

WHO?
- Producers Using Dogs

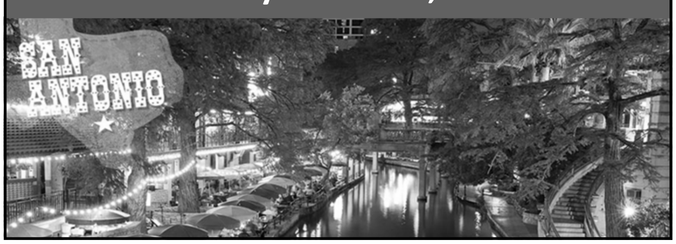
COVERS WHAT?
- Claims Defense
- $50,000 per incident / $100,000 annual

HOW MUCH?
- As low as $100 first dog / $25 each additional

HOW?
- www.DogFAFRM.com
- 701-867-9160



2018 ASI Annual Convention
San Antonio, Texas
January 31-Feb. 3, 2018



Ewe Nutrition & Nutrient Requirements

Scott P. Greiner, Ph.D.
Extension Animal Scientist, Sheep
Virginia Tech

Ewe nutrition is a very important aspect of total flock management. Proper nutrition of the ewe is necessary to optimize productivity. Feed costs are the largest single cost of maintaining ewes and must be controlled for the flock to perform at an economical level.

There are several factors that affect the nutritional needs of the ewe, the primary factors include: 1) age, 2) size, 3) body condition, and 4) stage of production (maintenance, gestation, or lactation). Additionally, health status (including parasite load), weather, activity level, and other environmental factors may also influence nutritional requirements and management. However, the answers to such questions as Is the ewe pregnant? If so, which stage of pregnancy is she in? If lactating, how many lambs is she nursing? When will the lambs be weaned? should provide the shepherd the information necessary to make decisions relative to nutritional management.

To determine when and how much to feed the flock, we must know the animals' requirements. These requirements are affected by size (body weight) and stage of production, and are found in Table 1. The remaining portion of this paper will examine these stages of production. For the purpose of this discussion, we will assume a ewe body weight of 175 pounds.

Maintenance

The animal's requirements for maintenance are the amounts of dietary nutrients it must consume daily to neither gain or lose weight. Maintenance is generally associated with the dry period, or period between weaning and the breeding season. Maintenance requirements for three weights of ewes are found in Table 1. These weights are to be reflective of pre-breeding weights for ewes in average body condition. The measure of energy that will be used in this paper is Total Digestible Nutrients (TDN). A 175 lb. ewe has a maintenance requirement of 2.9 lb. TDN/day, and maintenance protein requirement of .25 lb./day. Normally, ewes would be grazing pastures during this stage of production and would have no trouble meeting these requirements. In fact, during spring and early summer, grazing lush pastures would allow the ewe to far exceed their maintenance requirement and result in some weight gain. This weight gain is desired and necessary, since most ewes will lose body condition during lactation.

Flushing

Flushing is the practice of increasing energy intake, and therefore body condition, during the 10-14 prior to breeding. This practice has been shown to be effective in increasing ovulation rates, and thereby increasing lambing percentage by 10-20%. The response to flushing is affected by several factors, including the body condition of the ewe. Ewes that are in poor body condition will respond most favorably to the increase in energy, whereas fat ewes will show little if any response. With ewes on pasture, flushing is most easily accomplished through providing .75 to 1.25 lb. corn or barley per head per day from 2 weeks pre-breeding through 4 weeks into the breeding season. Since corn grain is approximately 80% TDN, providing 1 lb./day would provide .8 lb. of additional energy to the ewe (1 lb. corn x 80% TDN = .8 lb. TDN). This additional energy would approach the additional energy requirement shown in Table 1. Flushing should not continue for an excessively long period, as overfeeding is costly. Additionally, ewes that become very fat and then are placed on a lower plane of nutrition following flushing may be subject to increased prenatal mortality and lower lambing rates.

Early Gestation

Table 1 shows that there is a relatively small increase in ewe nutrient requirements for the first 15 weeks of gestation compared to maintenance. It is during this time that winter and spring-lambing ewes will make the transition from pasture to a diet of harvested feedstuffs. While on fall pastures, ewes should consume enough forage to meet their nutritional requirements during this early gestation stage. When feeding hay becomes necessary, it is important that the quality and quantity of hay being fed be closely considered. Assuming the available hay is 50% TDN and 12% crude protein on as as-fed basis, a 175 lb. ewe eating 3.3 lbs./day of this hay would consume 1.7 lb. TDN and .40 lb. crude protein. The requirements for this ewe in Table 1 are 1.8 lb. TDN and ..31 lb. protein daily. Note that her protein intake exceeds the requirement. Additionally, a ewe given the opportunity to consume as much of this hay as she desired would consume considerable more than 3.3 lb. per day (ewes can consume 3.5% of their body weight), and easily meet her requirements. This emphasizes the importance of utilizing poorer to average quality hays during the early gestation period, when ewe nutrient requirements are low compared to late gestation and lactation. If high quality hays, such as alfalfa, are fed during this period it is important to limit intakes. Overfeeding during this period is costly, and may also result in over-conditioned ewes leading to complications later in the production cycle.

Late Gestation

Approximately 2/3 of the birth weight of a developing fetus is gained during the last six weeks of gestation. As a result, the nutritional requirement of the ewe for both energy and protein increases. Table 2 shows that TDN requirements increase to 57-66%, compared to 55% for maintenance and early gestation. Similarly, protein requirement increases to around 11% compared to 9% for maintenance. The most critical difference is the increase in energy requirement. Inadequate nutrition during this period may result in pregnancy ketosis, light birth weights, weak lambs, and lower milk production Supplementation of 1 to 2 lb. corn/ewe/day, in combination with average to good quality hay (> 11% CP) should provide adequate nutrition. An important consideration during this period is the number of fetuses the ewes are carrying (see Table 1). As the ewes approach lambing, the size of the uterus increases and limits intake. Therefore, feeding nutrient-dense rations in important to ensure adequate nutrition. Although corn silage is an excellent feed for sheep, its high moisture content and bulkiness prevents it from being the sole roughage source during late gestation. Additionally, corn silage is low in protein and calcium and requires additional sources of these nutrients be added to the diet for balanced nutrition.

Lactation

Growth rate of lambs from birth to weaning is largely determined by milk production of the ewe, which emphasizes the importance for good nutritional management during this period. Lactation is also a period in which there is opportunity to control feed costs by feeding ewes according to the number of lambs nursing. During lactation, the ewe’s nutritional requirements for both energy and protein increase significantly compared to gestation. As mentioned previously, the highest quality hays should be utilized during this time. Alfalfa hay is an excellent feedstuff during lactation due to its relatively high energy and protein density relative to other forages. In most cases, a grain-protein supplement (such as corn-soybean meal) will also need to be fed in addition to the highest quality hay available. The needed protein content of this grain mix will vary depending on quality of the hay utilized. Generally, total rations should be formulated to contain 70% TDN and 14% protein for lactation. Table 1 demonstrates the significant differences in nutrient requirements of ewes nursing single vs. twins vs. triplets. Splitting ewes by number of lambs nursing is an excellent management technique to minimize feed costs. Ewes rearing single lambs will require less grain supplementation than twin-rearing ewes. Similarly, triplet-rearing ewes could be provided the extra nutrition needed, if separated from other ewes. When all ewes are fed together, single-rearing ewes are likely being overfed which can be costly. Of course, facilities and labor will dictate feasibility of this management practice. As mentioned previously, milk production of the ewe is influenced by nutrition. Research has shown that feed intake is a critical nutritional factor affecting milk production. Therefore, diets that are nutrient-dense and highly palatable will enhance milk production.

Ewe Lambs

Ewe lambs require special nutritional consideration during all stages of production. In addition to the requirements for pregnancy and lactation, ewe lambs also require additional nutrition as they have not yet reached mature body size and are still growing. Daily nutrient requirements of ewe lambs are presented in Table 3. Since ewe lambs are frequently managed as a separate group from the mature ewes, providing extra nutrition during gestation is easily attainable. Maintaining ewe lambs as a separate management group during lactation is also critical. This is especially important for ewe lambs nursing multiple births so they can receive proper nutrition to maintain adequate body condition for future growth and productivity.

Monitoring Body Condition

Body condition of the ewe is an important consideration in nutritional management. If ewes are getting fat, they are consuming more energy than they need, and are likely being overfed. On the other hand, if they are thin, they are not receiving adequate energy intake. Table 1 lists requirements for ewes in average body condition, and may be above or below the requirements for your flock. Proper body condition is essential for optimum productivity, and is most critical during the breeding season and late gestation. Ewes that need to improve body condition should be separated from the rest of the flock, and supplemented.

Forage Quality

An important aspect of nutritional management is knowing the quality of forages that will be utilized, most importantly hay. To properly balance rations and formulate diets, an accurate forage analysis should be conducted on all harvested feeds (hays and silage). There can be significant variation in hays harvested from the same field from one year to the next, and from one cutting to another. Having accurate feed analysis will may save feed costs and will certainly improve the ability to adequately manage the nutrition of the flock. The following list provides potential labs for forage testing. Consult with your local Extension agent for assistance in sampling your forages. Don't guess, forage test!

- Waypoint Analytical, Richmond, VA; (804) 743-9401 www.waypointanalytical.com
- Brookside Laboratories, Inc., New Knoxville, OH; 419-977-2766 www.blinc.com
- Cumberland Valley Analytical Services, Waynesboro, PA; 301-790-1980 www.foragelab.com
- Dairy Lab Services, Dubuque, IA; (800) 747-7421 www.dairylab.com
- Dairy One Forage Lab Ithaca, NY; (800) 344-2697 www.dairyone.com

In summary, ewe flock nutrition is an important aspect of the profitability of the sheep enterprise. Efforts to provide adequate, cost-effective nutrition can be simplified when ewes are fed specifically for stage of production, matching the quality of available forages with requirements of the ewe.

Table 1. Daily Nutrient Requirements of Mature Ewes[a]

Stage of Production	Body Wt. (lb.)	Wt. gain or loss (lb.)	DM intake/day[b] (lb.)	Energy TDN (lb.)	Protein (lb.)	Ca (g)	P (g)	Vit. A (IU)	Vit. D (IU)	Vit. E (IU)
Maintenance	150	.02	2.6	1.5	.25	2.5	2.4	3290	378	18
	175	.02	2.9	1.6	.27	2.7	2.8	3760	441	20
	200	.02	3.1	1.7	.29	2.9	3.1	4230	505	22
Flushing	150	.22	4.0	2.3	.36	5.7	3.2	3290	378	27
(2 wk. prebreeding &	175	.22	4.2	2.5	.38	5.9	3.6	3760	441	28
1st 4 wk. breeding)	200	.22	4.4	2.6	.39	6.1	3.9	4230	505	29
1st 15 wk. gestation	150	.07	3.1	1.7	.29	3.5	2.9	3290	378	21
	175	.07	3.3	1.8	.31	3.8	3.3	3760	441	22
	200	.07	3.5	1.9	.33	4.1	3.6	4230	505	24
Last 4 wk. gestation	150	.40	4.0	2.3	.42	6.2	5.6	5950	378	27
(130-150% lamb crop)	175	.40	4.2	2.4	.44	6.3	6.1	6800	441	28
	200	.40	4.4	2.5	.77	6.4	6.5	7650	505	30
(180-225% lamb crop)	150	.50	4.2	2.8	.47	7.6	4.5	5950	378	28
	175	.50	4.4	2.9	.49	8.3	5.1	6800	441	30
	200	.50	4.6	3.0	.51	8.9	5.7	7650	505	32
Lactation (1st 8 wk.)	150	-.06	5.5	3.6	.73	9.3	7.0	5950	378	38
Nursing single	175	-.06	5.7	3.7	.76	9.5	7.4	6800	441	39
	200	-.06	5.9	3.8	.78	9.6	7.8	7650	505	40
Nursing twins	150	-.13	6.2	4.4	.94	11.2	8.4	7000	378	42
	175	-.13	6.6	4.7	.98	11.4	8.8	8000	441	45
	200	-.13	7.0	5.0	1.01	11.6	9.2	9000	505	48
Nursing triplets	150	-.20	6.5	4.9	1.04	12.2	9.0	8000	378	47
	175	-.20	7.2	5.2	1.08	12.4	9.4	9000	441	50
	200	-.20	8.0	5.5	1.11	12.6	9.6	10,000	505	53

[a]Values adopted from National Research Council for Sheep, 6th Ed.

[b]To convert dry matter to an as-fed basis, divide by percent dry matter.

Table 2. Daily Nutrient Concentrations in Diets for Mature Ewes[a] (175 lb. body weight)

Stage of Production	DM intake/day[b] (lb.)	Energy TDN (%)	Protein (%)	Ca (%)	P (%)
Maintenance	2.9	55	9.3	.19	.21
Flushing	4.2	60	9.0	.31	.19
1st 15 wk. gestation	3.3	55	9.4	.25	.21
Last 4 wk. gestation					
(130-150% lamb crop)	4.2	57	10.5	.33	.32
(180-225% lamb crop)	4.4	66	11.1	.41	.25
Lactation (1st 8 wk.)					
Nursing single	5.7	65	13.3	.37	.28
Nursing twins	6.6	71	14.8	.38	.29
Nursing triplets	7.2	72	15.0	.38	.29

[a]Values adopted from National Research Council for Sheep, 6th Ed. Values converted from Table 1 by dividing requiremet by DM intake.
[b]To convert dry matter to an as-fed basis, divide by percent dry matter.

Table 3. Daily Nutrient Requirements of Ewe Lambs[a]

Stage of Production	Body Wt. (lb.)	Wt. gain or loss (lb.)	DM intake/day[b] (lb.)	Energy TDN (lb.)	Protein (lb.)	Ca (g)	P (g)	Vit. A (IU)	Vit. D (IU)	Vit. E (IU)
1st 15 wk. gestation	110	.30	3.3	1.9	.35	5.2	3.1	2350	277	22
	130	.30	3.5	2.0	.35	5.5	3.4	2820	333	24
	155	.28	3.7	2.2	.36	5.5	3.7	3290	389	26
Last 4 wk. gestation	110	.35	3.5	2.2	.42	6.3	3.4	4250	277	24
(100-120% lamb crop)	130	.35	3.7	2.4	.42	6.6	3.8	5100	333	26
	155	.33	4.0	2.5	.43	6.8	4.2	5950	389	27
(135-175% lamb crop)	110	.50	3.5	2.4	.45	7.8	3.9	4250	277	24
	130	.50	3.7	2.6	.46	8.1	4.3	5200	333	26
	155	.47	4.0	2.7	.46	8.2	4.7	5950	389	27
Lactation (1st 8 wk.)	110	-.10	4.6	3.3	.62	6.5	4.7	4250	277	32
Nursing single	130	-.10	5.1	3.6	.65	6.8	5.1	5200	333	34
	155	-.10	5.5	3.8	.68	7.1	5.6	5950	389	38
Nursing twins	110	-.22	5.1	3.7	.71	8.7	6.0	5000	277	34
	130	-.22	5.5	4.0	.74	9.0	6.4	6000	333	38
	155	-.22	6.0	4.3	.77	9.3	6.9	7000	389	40

[a]Values adopted from National Research Council for Sheep, 6th Ed.
[b]To convert dry matter to an as-fed basis, divide by percent dry matter.

"Marketing Lambs and Wool Opportunities and Challenges" -

Gary W. Hornbaker
Berryville, VA
Diamond H, LLC

Basic marketing concerns:

- Time
- Marketing fees & commissions
- Targeting a market or specific sale date
- Producing what is in demand
- Facilities and equipment
- Taxes and sales fees
- Product knowledge
- Promotion or advertising
- Regulations

Targeting A Market

- Stockyard sales
- Freezer lamb market
- Ethnic/Religious market
- Retail food store market
- Restaurants
- Club lambs
- Breeding stock
- Specialty products

Direct Marketing Opportunities

- freezer lambs
- feeder or club lambs
- breeding stock (rams/ewes, purebred/commercial)
- research animals
- wool
- pelts/skins
- manure
- specialty products (sausage, “rent a sheep”, grazing, rodeo, exhibitions)

How much time, effort, and money can you afford to devote to marketing for a increased return?

Pricing

www.vdacs.virginia.gov/markets-and-finance-market-news-livestock-sheep.shtml

www.ams.usda.gov/mnreports/ln_ls322.txt

www.ams.usda.gov/mnreports/sa_ls320.txt

Know when lambs are in demand

For 2018

- Easter April 1st
- Orthodox Easter April 8th
- Eid al-Fitr (end of Ramadon) June 15th
- Eid al-Adha (feast of sacrifice) August 21st
- Christmas / New Years
- Club lambs for spring shows

Facilities & Equipment

- Self assessment of operation -
  - slaughter facilities
  - disposal of offal
  - sorting and holding pens
  - loading facilities
  - storage areas
  - display area (farm or shows)
  - computer
  - truck and/or trailer
  - fax machine
  - ***SCALES***

Product Knowledge

- Do you know your true cost of production?
- Do you know your price?
- Do you know the grades or standards of your product?
- Do you have standard charges? Do they change?
- How do you handle money collections?
- Do you have guarantees or a satisfaction policy?
- Do you know what processing is available and what it cost?

Collection of Taxes and Fees

Virginia Sheep Industry Board Act-

Code of Virginia - Chap. 43, Sec 3.1

Lamb check off fee

- $.50 / head
- Paid to Tax Commissioner each quarter
- Maintain records for 3 years

- **Virginia Retail Sales Tax Collection**
  - ***Code of Virginia Section 58.1 - 630***
  - A farmer regularly engaged in selling tangible personal property at retail must register as a dealer and collect and pay the tax due on retail sales. The tax applies to regular or recurring sales of farm products by farmers or peddlers or at a public market, roadside stand, farm or any other place

Regulations

- Specific Products
- Slaughter inspections under the *Wholesome Meat Act (Pub.L. No 90-201, 81 Stat. 585 (1967))*
  - federally inspected
  - state inspected
  - custom processing
    - products must be marked "Not for Sale"
  - home slaughter and usage

Words of Advise:

Sell animals by the head or products by the piece.

Get paid up front.

Do not assist with slaughtering, handling, or transporting meat.

Have a plan for marketing and disposal.

Try new ways of education, promotion, and communications.

Network with other producers

Promote the sheep industry --- get involved

Direct marketing is a challenging on-going process that isn't for everyone, **if it were easy everybody would be doing it.** Sometimes what might sound like a tremendous price or opportunity **really isn't** !!!

Outstanding Sheep Producer Award Recipients

2016 – Cecil King, Pulaski County
2015 – Larry & Lisa Weeks, Augusta County
2014 – Jeff Lawson, Augusta County
2013 – Laura Begoon, Rockingham County
2012 – Sonny and Ashley Balsley, Augusta County
2011 – Leo Tammi, Augusta County
2010 – Bobbi Hefner, Highland County
2009 – Mac Swortzel, Augusta County
2008 – David Shiflett, Augusta County
2007 – Doug Riley, Augusta County
2006 – Mike Carpenter, VDACS
2005 – Jim Wolford, Wythe County
2004 – Martha Mewbourne, Scott County
2004 – David Redwine, Scott County
2003 – Martha Polkey, Loudoun County
2002 – Carlton Truxell, Augusta County
2001 – Corey Childs, Clarke County
2000 – John Sponaugle, Rockingham County
1999 – Bill Stephenson, Page County
1998 – Gary Hornbaker, Clarke County
1997 – Bruce Shiley, Clarke County
1996 - Weldon Dean, Rockingham County
1995 - Bill Wade, Augusta County
1994 - John Henry Smith, Russell County
1993 - Robin Freeman, Chesapeake
1992 - Courtland Spotts, Pulaski County
1991 - Ted Bennett, Halifax County
1990 - Clinton Bell, Tazewell County
1989 - Rex Wightman, Shenandoah County
1988 - Tim Sutphin, Pulaski County
1987 - Zan Stuart, Russell County
1986 - J. W. Riley, Augusta County
1985 - John Bauserman, Fauquier County
1984 - Roy Meek, Pulaski County
1983 - Jonathan May, Rockingham County