Friday, January 7

AM

9:00 **Virginia Sheep Producers Association Board Meeting (Open to the public)**

11:00 **Virginia Sheep Industry Board Meeting (Open to the public)**

PM

1:00 **"Application of the FAMACHA System for Managing Parasites in Sheep"**
Dr. Anne Zajac, DVM, VA-MD Regional College of Veterinary Medicine

2:00 **"Making Sense Out of Mineral Nutrition"**
Dr. Mark Wahlberg, Dept of Animal & Poultry Sciences, Virginia Tech

3:00 **Break**

3:15 **"U.S. Animal Identification Program: Where are we?"**
Dr. Scott Greiner, Dept of Animal & Poultry Sciences, Virginia Tech

CONCURRENT SESSIONS

4:00 **"Proper Administration and Use of Dewormers"**
Dr. Kevin Pelzer, DVM, VA-MD Regional College of Veterinary Medicine

"Assessing Forage Quality and Using Results in Flock Nutrition"
Lawton Stewart, Dept of Animal & Poultry Sciences, Virginia Tech

"Lamb Quality Assurance - Injection Sites and Extra-label Drug Use"
Dr. Dee Whittier, DVM, VA-MD Regional College of Veterinary Medicine

"Preparing for the Lambing Season"
Susan Schoenian, Maryland Cooperative Extension Sheep & Goat Area Agent

6:30 **Lamb Dinner and Entertainment Alphin-Stuart Livestock Arena**

Saturday, January 8

AM

7:30 **Virginia Sheep Producers Association Annual Meeting (Breakfast)**
"National Issues and Their Impact for Mid-Atlantic Producers"
David Greene, ASI Region II Representative, White Hall, MD

"Update on Activities of the American Lamb Board"
Joe Harper, American Lamb Board, Seneca Rocks, WV

CONCURRENT SESSIONS

9:15 **"Live Lamb Evaluation" (corresponds with session in Meats Lab at 10:30)**
Dr. Scott Greiner, Dept of Animal & Poultry Sciences, Virginia Tech
Mike Carpenter, Virginia Dept of Agriculture and Consumer Services

"Ewe Body Condition Scoring and Winter Nutrition"
Dr. Mark McCann, Dept of Animal & Poultry Sciences, Virginia Tech

10:30 **"Lamb Carcass Evaluation and Fabrication"**
Virginia Tech Meats Laboratory (Campus)
Dr. Scott Greiner, Dept of Animal & Poultry Sciences, Virginia Tech
Dr. Mark Wahlberg, Dept of Animal & Poultry Sciences, Virginia Tech
Scott Daigle, Meats Lab Manager, Dept of Food Science, Virginia Tech

12:00 **Lunch at the Alphin-Stuart Livestock Arena available from the Virginia Junior Sheep Breeders**

PM

2:00 **5th ANNUAL VIRGINIA BRED COMMERCIAL EWE LAMB SALE Alphin-Stuart Livestock Arena**

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Presented By
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MANAGING WORMS IN YOUR SHEEP AND THE FAMACHA SYSTEM

Anne Zajac, DVM
Virginia-Maryland Regional College of Veterinary Medicine

Managing Worms in Your Sheep and the FAMACHA System

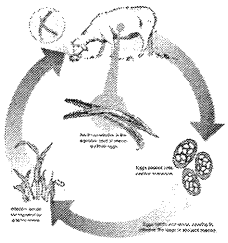
Anne Zajac
Virginia-Maryland Regional College of Veterinary Medicine
Virginia Tech

Parasites in Sheep

- Stomach and intestinal worms are the biggest health problem faced by producers in southeastern U.S.

Parasites in Sheep

- Most important is barber pole worm, *Haemonchus contortus*
  - Blood sucking parasite
    - Anemia (pale) and bottle jaw
  - Other parasites contribute but not usually a problem by themselves



Virginia Coop. Extension

Parasites in Sheep

- Worms in the stomach and intestine are biggest health problem in the southeastern U.S.
- Why?
  - Climate
  - Management
  - Drug resistance

Why Are Parasites a Problem Here?

- Climate
  - Long, warm, humid summers perfect for life cycle of *Haemonchus*
    - 300 worms→1.5 million eggs/day
  - All the common worms have the same life cycle
  - Sheep infected when ingest larvae on pasture

Why Are Parasites a Problem Here?

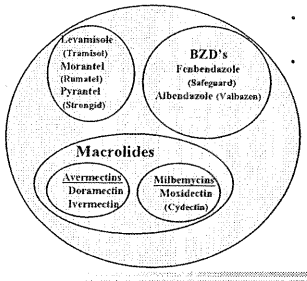
- Climate
- Management
  - High stocking density
  - Small flocks don't move much

Why Are Parasites a Problem Here?

- Climate
- Management
- We've had these for years, why is it worse now?

  – DRUG RESISTANCE

Drug Resistance



- Modern dewormers fall into 3 major groups
- Resistant barber pole worm can be found for all drug groups
  - Goats in Georgia
    - 90% of farms, resistance to BZD, macrolides
  - Sheep nearly as bad
  - Once resistant to 1 drug in a group, resistant to all

DRUG RESISTANCE

- What is it?
  - Hereditary ability of worm to withstand the effects of a drug

DRUG RESISTANCE

- What causes it?
  - A few worms have the genetic ability to resist a drug before you use it
    - Use of a drug gives those worms an advantage
    - Gradually the number of resistant worms increases

DRUG RESISTANCE

- What increases the number of resistant worms
  - Frequent treatments
  - Treating all animals at the same time
  - Sheep do not get full drug dose
    - Underdosing
    - Spit it out

DRUG RESISTANCE

- By the time you suspect it, most of the worms are resistant
- Not all apparent drug failures are resistance
  - Under and inappropriate dosing
  - Drug no longer good–too old, etc
  - So many worms present that effective drug only a drop in the bucket

DRUG RESISTANCE

- How do you know you have it?
  - Test for it
  - Fecal egg count reduction test
    - Fecal samples before and after treatment
    - Count eggs, look at percentage reduction
  - Drenchrite test
    - University of Georgia
    - More convenient for producer

WHAT CAN YOU DO TO SLOW RESISTANCE?

- Use drugs correctly
  - Rotation
  - Correct doing
- Don't bring in resistance
  - Deworm new sheep with drugs from 2 major groups and quarantine off pasture
- Reduce Number of Deworming Treatments

Reducing Deworming by Integrated Control Program

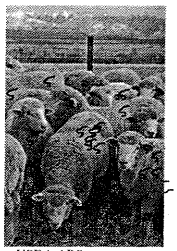
- Combine best elements for you
  - "Selective deworming"--deworm wormiest animals
    - FAMACHA program, for example
  - Others
    1. Good nutrition-- maximize immunity, blood cell production
    2. Put most susceptible animals on safest pasture
    3. Reduce stocking density
    4. Mixed or alternate grazing
    5. Cull highly susceptible animals

REDUCING DEPENDENCE ON DRUGS

- FAMACHA system used in a "selective deworming" program
- Opposite of previous recommendations to deworm all animals at the same time
- Not all worms exposed to drug treatment, slows development of resistance
  - Susceptible worms in untreated animals reproduce
  - Helps dilute out resistant worms

Why Does Selective Deworming Work?

- Usually parasite numbers are low in most sheep
  - 20-30% of the animals have most of the worms and deposit 80% of the eggs
  - Treat those sheep and most of the larvae on pasture go



USDA ARS

Selective Deworming

- Additional advantage to this type of program is that it slows down the development of resistance
- BUT, it doesn't "fix" resistance if it is already present

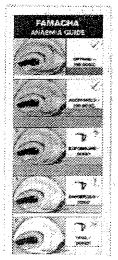
Who Do You Treat in a Selective Deworming System?

- Wormiest Sheep based on
  - Fecal Egg Counts
  - Inspection of eye membranes, treat if pale
    - The FAMACHA© system
      - Assessment of *Haemonchus contortus* and need for treatment
      - Developed in South Africa by Dr. Francois "Faffa" Malan
        - » FAffa MAlan CHArt
        - » Dr. Jan van Wyk, Prof. Gareth Bath, Dr. Adriano Vatta, Dr. Tami Krecek, Dr. Jørgen Hansen (FAO)

FAMACHA System

- Works only where *H. contortus* is the predominant parasite
  - Anemia the principal sign caused by *Haemonchus*
  - Indirectly measure number of *Haemonchus* (and treatment need) by measuring anemia

The FAMACHA© System



- Eye color chart with five color categories
- Compare chart with color of mucous membranes of sheep or goat
- Classification into one of five color categories:
  - 1 - not anemic
  - 5 - severely anemic

Using FAMACHA

- General criteria for deworming
  - Score 1 or 2-- don't deworm
  - Score 4 or 5--deworm
  - Score 3-?
    - If lambs--deworm
    - Adults--it depends
      - Lactating or stressed or high parasite challenge--consider deworming
      - Consider deworming if want maximum effect on egg production
  - Score based on lowest eye score

FAMACHA SYSTEM

- WHAT IT WILL DO
  - Slow accumulation of resistant worms
  - Save money on dewormers
  - Allow you to identify and cull susceptible sheep
  - Keep you looking at your sheep
- WHAT IT WON'T DO
  - Be the answer to parasite problems by itself
  - Make drug resistant worms go away
  - Free up time for you to lounge by the pool

Precautions

- Only properly trained persons should apply the FAMACHA© system
  - In U.S. must attend a workshop with hands on exposure to sheep with different eye colors to get card
  - The card is an AID in the control of *Haemonchus* only
- Only part of a parasite control program, remember other management strategies
- Best used by producers with back-up assistance from a veterinarian

FAMACHA and Parasite Control Information

- Southern Consortium for Small Ruminant Parasite Control

  www.scsrpc.com

- Provides information on parasite control, FAMACHA workshops

FAMACHA

- Used as guide to determine which animals to treat
  - Significantly reduces number of treatments given compared to standard deworming practices
  - Should significantly decrease the rate of development of anthelmintic resistance
  - Trial at Virginia Tech in 2004

Other Recommendations for Proper Use

- Check both eyes in direct light
- Pale membranes may have other causes
  - Nutritional deficiencies
  - Other diseases
  - Other parasites
- Red membranes have other causes
  - Environmental conditions
  - Other diseases
  - Infectious eye diseases

Other Recommendations for Proper Use

- Keep records !!!!
  - Record numbers of animals in each category on the block histogram sheet provided
  - Keep treatment records

Using FAMACHA

- Get used to it before depending on it
- Intervals for checking depend on time of year, geographic location
  - Every 2-3 weeks at the start of worm season, maybe weekly at peak transmission season
  - If more than 10% 4's and 5's recheck in 1 week, may also consider treating 3's

Using FAMACHA

- Always score animals with the help of the chart, not from memory
- Replace card each year--it fades
- Be prepared to be flexible
  - Weather will determine length and intensity of parasite season, will vary form year to year

Using FAMACHA in Breeding

- Base selection decisions based on scores
- Sheep that have consistent high FAMACHA scores should be removed from flock

USING THE FAMACHA SYSTEM

- FAMACHA is only part of an integrated control program
- Maintain standard worm control measures:
  - Monitoring of fecal egg counts
  - Rotational grazing
  - Resting pastures (3 or more months)
  - Alternation of sheep with cattle or horses
  - Use of broad deworming treatments taking into consideration the danger of selecting for resistance

REDUCING DRUG DEPENDENCE

- What is in the future?
  - Probably not not drugs!
  - Predatory fungus
  - Vaccine--not anytime soon
  - Plant tannins--maybe
  - Copper
  - Nothing new will be a complete fix

Easy parasite control is over for the forseeable future

Acknowledgement

- Dr. Adriano Vatta
  - Onderstepoort Veterinary Institute, Pretoria, South Africa
- Dr. Ray Kaplan,
  - College of Veterinary Medicine,University of Georgia

MINERALS AND VITAMINS FOR SHEEP

Mark L. Wahlberg, Extension Animal Scientist
Prepared for VA-NC Shepherds' Symposium, January, 2004

Proper animal nutrition means giving the animals the proper amount of all nutrients necessary for optimum production. This involves knowledge of the nutrients themselves, factors that affect the requirements of animals, and the feeds used to deliver those nutrients. Cost is always a consideration for profit-motivated producers. This interplay of factors can become very intricate, but it need not be.

For the ewe flock, proper nutrition involves giving animals all the good quality forage they want, and supplementing that with nutrients that may be deficient. So the basics of animal nutrition are good forage management, such as proper fertilization, a mixture of grasses and legumes, maintaining forage at a nutritious stage of growth, and providing forage in adequate quantities. That's another talk for another day, so let's now focus on the supplementation side of this issue.

Supplements are just that – sources of nutrition that are given to animals in addition to their basic ration, with the intent of increasing the intake of that critical nutrient. Thus, we can't properly supplement without knowing the requirements of animals, or without knowing the amount of nutrition provided by the basal ration.

In Table 1 are shown the various minerals and vitamins of concern, levels found in good forage, and the requirements for these nutrients by various classes of sheep. The requirements are based upon the Nutrient Requirements of Sheep, Sixth Edition (1985), and the forage values based upon pasture samples taken in southwest Virginia over the last several years.

Table 1. Minerals and Vitamins in Forage and Required by Sheep

		Class of Sheep and Their Requirements (in diet Dry Matter)		
		Mature Ewe		Young Lamb
Nutrient	Good Forage	Early Pregnancy	Nursing Twins	Fast Gain
Calcium, %	.45	.25	.4	.55
Phosphorous, %	.40	.2	.3	.25
Potassium, %	2.0	.5	.8	.6
Magnesium, %	.25	.12	.18	.12
Sulfur, %	.25	.15	.25	.15
Sodium, %	.0005	.10	.15	.10
Iron, PPM	100	40	40	40
Copper, PPM	8	10	10	10
Manganese, PPM	70	40	40	40
Zinc, PPM	30	30	30	30
Selenium, PPM	.15	.3	.3	.3
Vit A, IU/lb DM	50,000	1000	1200	500
Vit D, IU/lb DM	500	100	100	100
Vit E, IU/lb DM	10	7	7	7

Macrominerals

There are many minerals that are required in the diet of sheep. Macrominerals are required in larger amounts, with that requirement expressed as a % of the diet or as grams per head per day. In table 1, above, they are shown on the first 6 rows of the table. Some of these are already in sufficient quantity

in forages, so supplementation is not needed. Others are never in adequate amounts, so must always be in a supplement. Finally, there are those that are marginal, meaning amount in the forage and amount needed are close to each other, thus supplementation is sometimes needed, and sometimes not.

- **Adequate** Potassium
- **Deficient** Sodium (when combined with Chlorine, makes salt)
- **Marginal** Calcium, Magnesium, Phosphorous, Sulfur

Calcium is often in adequate amounts in forages, and legumes have higher levels than do grasses. Grains and grain crop silages have very low levels of Calcium. Phosphorous is just the opposite. It is high in grains and low in forages, often because soils are low in phosphorous fertility levels. Because Phosphorous is important to reproduction and growth, it is often included in minerals for the ewe flock year around. Magnesium is often low in lush forage growing in early spring or when spring-like conditions occur. A deficiency of Magnesium causes grass tetany, a problem in cows that rarely occurs with ewes.

Microminerals

Minerals needed in very small quantities are called microminerals, or trace minerals. The requirement by animals for these minerals is expressed in milligrams per head per day or in parts per million. Just as with the Macrominerals, some are adequate, others are deficient, and several are marginal.

- **Adequate** Manganese, Iron
- **Deficient** Selenium
- **Marginal** Zinc, Copper

Iron is often added to minerals (iron oxide or ferric oxide on the tag), even though the required amount is included in the forage that is consumed in the basal diet. The reason it is added is to give minerals the typical reddish-brown color. However, iron can interfere with the uptake of other minerals that are not in large amounts, such as zinc. Thus, it is recommended that iron not be included/added to complete minerals for ruminants.

Zinc, Copper, and Selenium are all important in many physiological functions, including the immune response and disease-fighting ability. Our soils are often deficient in Selenium, making forage grown on those soils also deficient. Consequently, it is strongly recommended to include Selenium in mineral mixtures for sheep of all ages.

The Food and Drug Administration (FDA) oversees Selenium (Se) in livestock feeds, since it is a cancer-causing element at high levels. They have established rules for inclusion of supplemental Se, and expressed those in 3 different ways. Those rules, indicating maximum levels of Se for sheep, are:

- 0.3 Parts per Million (PPM) in the total diet
- 0.7 mg per head per day
- 90 PPM in a free-choice mineral mixture

Because Se is not stored in the body for very long, frequent intake or dosing of Se is critical. A good sheep mineral needs to be available at all times that contains at least 50 or 60 PPM of Se. Assume Se is **not** included in a mineral product. If it is included, the amount must be stated on the label of the product. It often is stated as a percent. To convert % to PPM, move the decimal 4 places to the right. Thus, a product with 60 PPM would be stated to include 0.006% Se.

Copper (Cu) can be toxic to sheep. Although there is an important function of Cu in the body, and thus it is a required mineral, excess amounts are concentrated in the liver rather than being excreted. Over time, this excess of Cu can destroy liver tissue, resulting in death of the animal. Our soils, and

thus the forages grown on them, contain Cu levels that are close to the animals' requirements. Consequently, sheep minerals for the mid-Atlantic region should not have any Cu added to them. **Note – These levels are too low for cattle and goats, thus properly formulated minerals for these species always have Cu added to them. Mineral mixtures formulated for cattle and for sheep can be toxic to sheep if used for a long time.

Vitamins

Sheep, with their ruminant digestive system, can make vitamins from the raw materials consumed in their diet. They do this very well with all of the B-Vitamins; thus these are not any concern with sheep. Vitamins A and E are made from compounds found in green forage. Vitamin A can be stored in the liver for 2 or 3 months after sheep have been eating green forage for several months. Consequently, when eating fresh pasture or well-made hay no supplemental vitamins are needed.

However, when sheep are eating forage that is old, weathered, mature, or otherwise low in Vitamin A precursor, then this Vitamin should be added to the mineral mixture. Other feeds that will result in inadequate Vitamin A levels are corn silage, corn stalks, and straw.

Vitamin D is made from exposure to sunshine. For sheep housed indoors for more than 2 to 4 weeks, such as lambs being finished in confinement, Vitamin D should be included in the diet.

Most commercial minerals for sheep designed for free-choice feeding will contain added Vitamins A, D, and E. When making a total mixed ration, vitamin premixes can be added to the formulation if a free-choice mineral is not going to be fed.

Intake of Mineral

Sheep do not eat the same amount of mineral throughout the year. They have a craving for salt, and consume a complete mineral to get salt. Some ingredients, such as dicalcium phosphate and especially magnesium oxide, are not very palatable; thus intake may be lower when these ingredients are included. Often grain products or artificial flavor enhancers are added to mineral mixes to encourage higher intake.

Intake is higher when consuming lush fresh forage, such as in the early spring. During the dry summer months intake is lower, this is also the case when sheep are eating hay. If a water source is nearby intake is higher than when water is a great distance away. In addition to nearby water, intake is higher if mineral feeders are located in shady areas or along paths frequently traveled by sheep.

Producers should monitor intake periodically. Put out a known amount of mineral and keep track of the number of days a group of sheep takes to consume it. Divide by the number of head to calculate the intake per head per day. This should be an average of ½ to 2 ounces per day.

Composition of Minerals (Feed Tag Information)

By law the tag on a mineral product must contain certain information. It must contain guarantees of various minerals included in the product. The minimum information to be stated is:

- Minimum and Maximum Calcium
- Minimum Phosphorous
- Minimum and Maximum Salt
- Minimum and Maximum Copper (if added, or if it exceeds 20 PPM)

- Minimum Selenium
- Minimum Vitamin A

Information about other minerals included may be displayed on the label.

If a product contains a feed additive, it will say "Medicated" on the label, and the FDA-approved purpose for that additive will be stated.

A list of ingredients will be displayed. They are not necessarily in order of amount used. Complete mineral products often have non-mineral products included. These are often added to increase consumption, and thus are such products as grains, molasses products, or flavorings. Grains do not have to be specifically identified (i.e. corn), but a general ingredient may be shown instead. Approved general ingredient items are:

- Forage Products
- Grain Products
- Plant Protein Products
- Processed Grain Byproducts
- Roughage Products
- Molasses Products

Specific grains, flavorings, or one of the general ingredient categories shown above may constitute a significant amount of the total product in the bag. Minerals that include these items usually cost less per pound or per bag, because grains and byproducts are less expensive than are the mineral products. However, their use dilutes the mineral content of the product. They also stimulate intake by the animal, resulting in higher consumption per head per day. So the reduced cost per pound may be offset by the higher intake per head per day, resulting in little or no savings.

Form of Mineral Supplement

Minerals and salt products are available in loose, granular form and in block form. Because blocks are hard enough to shed rainwater, it is sometimes difficult for sheep to get enough mineral from licking them. In addition, sheep have broken their teeth on blocks. Finally, few if any complete minerals are in block form. Loose minerals must be put in a covered feeder of some type to keep rain out so they don't cake and become hard. Loose mineral mixes are the recommended form of mineral for sheep.

Types of Mineral Supplements

Sheep producers with forage-based feeding programs normally provide minerals in a self-feeder to their animals. They normally do not mix minerals with other feeds that are fed each day, as is the case with pigs, poultry, dairy, and beef feedlots. There are several types of free-choice mineral mixtures available to sheep. These are:

White Salt — The only minerals this contains are Sodium and Chlorine. This is not an adequate mineral supplement. Often contains Iodine, and is therefore called Iodized Salt.

Trace Mineral Salt (TMS) — TMS is White Salt with added Trace Minerals. No macrominerals are included. Often colored red from the Iron compounds added. Unless specifically stated, TMS contains no added Selenium, although there are some TMS products that do. TMS with added Selenium is considered to be the minimum acceptable mineral supplement for sheep, and only then sheep consuming high quality pasture.

Complete Mineral — A mixture containing salt, the macrominerals Calcium and Phosphorous, and trace minerals. May or may not have added Selenium. May have added Magnesium, but perhaps not enough to prevent grass tetany. Often the ratio of Calcium to Phosphorous is in the product name, such as 2:1 or 4:1. Because Phosphorous is the needed item and Calcium is normally adequate, a lower ratio is more appropriate for forage-based feeding programs. A higher ratio just dilutes the Phosphorous with Calcium-containing ingredients.

Feed Additives

Free-choice mixtures are sometimes medicated with feed additives. Although there is a much longer list of approved products for cattle, there are several helpful products included in minerals for sheep. Probably the most helpful are those products that help combat Coccidiosis, which is a gut disorder caused by a protozoa parasite. It must be said that animals develop resistance, perhaps even immunity, to coccidia with exposure. Because coccidiosis is a sanitation disease, many producers do not include a coccidian control product in the mineral consumed by ewes and young lambs, and focus on good management and sanitation to prevent major outbreaks. This allows lambs to become exposed to limited numbers of coccidia without experiencing major problems.

FDA-approved coccidia control products are led by Lasalocid (brand name Bovatec) which is to be fed at between 15 and 70 mg per head per day in a complete feed. Monensin (brand name Rumensin) is not approved for sheep, but is approved for goats in a complete feed at the rate of 20 g/ton. Decoquinate (brand name Deccox) is approved for both sheep and goats at the rate of 22.7 mg/100 pounds of bodyweight.

A major problem with additives to feeds is the lack of precise dosing to the animal. Intake of the feed determines intake of the medication in the feed. The variability in intake of free-choice minerals has already been addressed. More precise dosing occurs when additives are included in a grain supplement that is hand fed each day. Even more precision occurs when these products are included in a total mixed ration, although few sheep producers feed their sheep in this way.

Because of problems with intake, and thus correct dosing of feed additives, plus the limited number of additives approved by FDA for use in sheep, medicated mineral products should not be used with sheep. The only exception to this recommendation is for coccidia control, when it is appropriate.

Lambs fed a high-grain diet

The rapidly growing lamb fed a high grain diet can experience many nutritionally related problems. One of these is called urinary calculi, a blockage of the urinary tract caused by "stones" that develop. An unsupplemented high grain ration contains an excess of Phosphorous and negligible amounts of Calcium. The requirement (table 1) is for Calcium in higher amounts than Phosphorous. This reversal of Ca:P ratio results in a change in the pH of the urine and the development of mineral-based precipitates in the urinary tract.

One solution to this problem is to use ammonium chloride in the ration. This changes the pH of the urine back towards normal, thus preventing the precipitates from forming. However, the Ca:P imbalance still persists. This is best fixed by feeding the lamb a mineral supplement that provides lots of Ca and little or no P. Ground limestone (feed grade) added to a complete ration at the rate of 1% of the mixture is recommended. In this way the diet will contain the recommended Ca:P ratio of at least 2:1, even though the actual amounts of both Ca and P will greatly exceed the animal's requirements

for these minerals. Many lamb feeders use added limestone plus ammonium chloride in the same feed.

Chelated minerals are minerals which are formed into a chemical compound with some organic product, often an amino acid. Some of these include Zinc-Methionine and Copper-Lysine. The benefit of chelated minerals, or organic minerals, is the higher availability (digestibility) by the animal. This comes at a noticeably higher price, however. Under conditions of high stress, or extremely high levels of production, these products may have a positive cost:benefit ratio. These would include extremely high producing dairy cows, or feeder calves that are abruptly separated from their dams and immediately transported, sold, and put into a feedlot. Sheep producers in the east rarely impose such conditions on their animals, thus the use of chelated or organic minerals is not necessary, and not cost effective.

Summary

High quality forages consisting of mixtures of grasses and legumes provide the basis for good sheep nutrition in the mid-Atlantic region. These forages also provide many of the needed minerals and vitamins for sheep. However, several minerals will likely be deficient, thus mineral supplements must be offered. These supplements should be in loose form, fed in a feeder to keep out the weather. Free-choice minerals for sheep must contain added Selenium, and should not have any Copper added to them. The basic ingredient is salt.

Special attention must be paid to the grow-finish lamb receiving a high grain ration. The imbalance in Calcium:Phosphorous must be rectified to reduce the incidence of urinary calculi.

Mineral supplementation need not be complicated or expensive. Intake of minerals by sheep needs to be monitored to ensure that amounts adequate to meet the needs are consumed. Excessive intake is costly and does not result in higher production.

By focusing on forage production and quality first, then providing minerals that are likely to be deficient, producers can cost effectively meet the mineral needs of their sheep.

Disclaimer: Mention of specific brand names is for information only. No recommendation or endorsement is stated or implied.

DEWORMING AGENTS

Kevin D. Pelzer DVM, MPVM
Associate Professor
Virginia-Maryland Regional College of Veterinary Medicine

There are only three approved dewormers for sheep, Valbazen, Ivomec Drench, Prohibit or Tramisol Drench. Many other cattle deworming agents are used in sheep production as extra-label medications. Medications that are not given as described on that medication's label are considered an Extra-label medication. If the medication is given to an animal or at a different dose, a different route, or for a condition that is not written on the label, that medication is being given in an extra-label manner. It is illegal to use medications in an extra-label fashion unless prescribed by a veterinarian. The veterinarian needs to be familiar with the animals being treated, the conditions that the animals may have, and must give an appropriate withdraw time to avoid the occurrence of meat and milk residues.

Valbazen:
Chemical name: albendazole
Class: benzimidazole
Approved drug for sheep
Dosage: 7.5 mg/kg or 0.75ml/25 lbs body weight, given orally
Note: this is not the same dosage as for cattle.
Withdraw: do not slaughter for 7 days after the last treatment.
Warning: do not administer to ewes during the breeding season or for 30 days after removal of the ram.
Comments: Valbazen will kill flukes and tapeworms where as the other dewormers will not. If there is resistance to any other benzimidazole, such as Safeguard or Panacur, there will be resistance to Valbazen as well.

Ivomec Drench:
Chemical name: Ivermectin
Class: avermectin
Approved drug for sheep
Dosage: 200mcg/kg or 3 ml/26 lbs body weight, given orally
Withdraw: do not slaughter for 11 days after the last treatment.
Warning:
Comments: Use of injectable Ivomec in sheep is extra-label usage. The withdraw time for slaughter if injected is recommended to be 49 days. The use of pour – on products is not recommended because studies have shown that this route is not effective in sheep and there are no approved pour-on products for sheep. If there is resistance to Ivomec, the worms will also be resistant to Dectomax.

Prohibit or Tramisol, Levamisole Drench
Chemical name: Levamisole hydrochloride
Class: nicotinic
Approved drug for sheep

Dosage: see package label for mixing directions and give according to label.
Withdraw: do not slaughter for 72 hours or 3 days after the last treatment.
Warning: Overdosing may result in side affects.
Comments: Muzzle foam may be observed. In studies looking at resistance to deworming agents, levamisole has the least reported resistance.

Deworming agents reported to be used in sheep in an extra-label manner.

Cydectin:
Chemical name: Moxidectin
Class: milbemycin
Non-Approved drug for sheep
Dosage: Dosages have been reported to be 5 to 7.5 ml /100 lbs body weight given orally.
Withdraw: 6 months
The withdrawal period for cattle is 0 days. However, Cydectin is a pour-on product. I know personally of a residue violation occurring in a lamb that was slaughtered 75 days after the last oral administration of the product. The extension veterinarian at Ohio State University says that he has heard residue violations occurring out to 6 months after the use of cydectin in some lambs. Lambs are being checked for this compound at slaughter.
Comments: If resistance to Ivomec exists, development to resistance to Cydectin is not far off. Moxidectin, the chemical in Cydectin is also in Quest, a dewomer for horses.

Dectomax injection:
Chemical name: Doramectin
Class: avermectin
Non-Approved drug for sheep
Dosage: Dosages have been reported to be 1 ml /110 lbs body weight given orally or subcutaneously.
Withdraw: 35 days
Comments: This product, in my opinion, is no better than the Ivomec drench. Although some people may use this product to treat for lice, I have found that the avermectins have not been very effective in controlling lice in sheep. If there is resistance to Ivomec, the worms will also be resistant to Dectomax.

Panacur, Safegaurd:
Chemical name: Fenbendazole
Class: benzimidazole
Non-Approved drug for sheep
Dosage: Dosages have been reported to be 5 – 10 mg/kg or 2.5 to 5 ml /100 lbs body weight of the oral suspension given orally.
Withdraw: 8 days
Comments: The sheep dose is the same to 2 times more than the horse dose. At the 10 mg/kg or 5 ml/100lbs of body weight, Panacur is effective against tapeworms.

ASSESSING FORAGE QUALITY AND USING RESULTS IN FLOCK NUTRITION

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Virginia Tech

Throughout the production year nutrient requirements of sheep change significantly. Forages play a major role as part of a feed program both as pasture and conserved forages such as hay. Complicating the situation is the fact that forage quality changes drastically due to maturity at harvest and storage. Nutrition represents the single most expensive segment of production in a flock and proper feeding is vital for optimizing production. Matching nutritive value of forage to the changing nutrient requirement of your flock can drastically reduce the amount of additional supplement needed and improve your bottom line. The best way to start is to properly assess the nutritive value of your forage through proper testing.

Forage Sampling

Hay and pastures do not come with an ingredient tag so determining their nutritive value isn't as simple as for your supplement. No special equipment is needed to sample your pastures, but for sampling hay, your local extension office may have the proper equipment needed to sample hay. This equipment most commonly used is a mechanical coring probe which consists of a long tube (approximately 18" long; 1" diameter) with a cutting edge on one end and a shank on the other that can be connected to a hand driver or electric drill. Several labs are available for the analysis of your samples, one of which listed below.

Forage Testing Techniques:

1. To sample your pastures, walk a predetermined pattern through the field. This could be an 'X' or zig-zag pattern. While walking this pattern, stopped every 10-30 steps, depending on the size of the pasture cutting a handful of forage at a height of approximately four inches. This will allow you to collect a representative sample of the whole pasture. Mix the samples together for each pasture to be analyzed.

2. To correctly sample square bales, the bit is driven the full length of the tube into the long end of 6-8 bales per lot of hay to be tested. Compile the core samples and mix thoroughly to be sent for analysis.

3. For round bales, the samples should be taken from the rounded side of the bales. Samples should be taken from 4-6 bales per lot to be tested. If the outside of the bale is weathered, remove the outer 1-3 inches, or deeper depending on the depth of the weather damage and drill the entire length of the tube. Compile the core samples and mix thoroughly to be sent for analysis.

Forage Testing Lab:

Cumberland Valley Analytical Services Inc.
Mail: PO Box 669, Maugansville, MD 21767
UPS: 14515 Industry Drive, Hagerstown, MD 21742
Phone: 800-282-7522 (800-CVAS-LAB) Fax: 301-790-1981
http://www.foragelab.com

Each hay type and cutting, and pasture should be sampled separately. Forage quality of hay can change drastically between cuttings, therefore it is important to store your hay separately based on cutting and type and based on quality. It is also important to sample randomly so not to select for or against what 'looks good or bad', but to collect a representative sample of the forage present.

Interpreting the Analysis

Once your forage is analyzed, the two major constituents to consider are crude protein (CP) and total digestible nutrients (TDN). These are the major constituents when assessing forage quality and are listed below for varying qualities of hay. In table 1 below, a general guide for nutritive value of hay and the quality expected from it is given.

Table 1. Forage values as a percentage of dry matter.

Hay Quality	CP (%)	TDN (%)
Excellent	11.2 & up	56 & up
Good +	9.5-11.1	53-56
Moderate	8.2-9.5	50-53
Fair	7.3-8.2	47-50
Very Poor	Below 7.3	Below 47

Applying the results to your production system

Your ewe flock's nutrient requirement is at its lowest during the open period and the first 15 weeks of gestation. Their needs increase during flushing, a practice of increasing energy intake to increase ovulation rates, thus potentially increasing lambing percentage by 10-20%. Roughly 66% of the fetal development will occur during late gestation (approximately 6 weeks). During this time the ewe will gain up to 20 pounds, greatly increasing the nutrient requirement for both protein and energy. In addition, ewe lambs have similar changes in nutrient needs, but are still growing, so need addition nutrients on top of those required for the pregnancy and lactation. These can be critical points in the feed program. In the below tables, the nutrient requirement changes are

illustrated for both mature ewes (Table 2) and ewe lambs (Table 3). The variation in nutrient requirements of ewes in different production stages is apparent in these tables. Our goal now is to take the information from the analysis of our forage and apply it to the needs of the sheep.

Table 4 presents a comparison of several forage situations and production stages of ewes and the balance of nutrients (positive meaning excess nutrients available and negative meaning the forage is deficit). As we see from the table, a poor quality forage (TDN=45%; CP=6%) almost matches the requirements of a ewe in maintenance, but no other production stage. These are forages that mature over 6-8 weeks and/or allowed to develop seedheads. In addition to not meeting requirements, poor quality forages usually have a decreased passage rate through the animal's digestive system, decreasing intake and the ability of the forage to meet the animal's requirements. As we increase to the moderate quality forage (TDN=52%; CP=10%), we are now able to meet the nutrient requirements of an early gestation ewe with minimal supplementation to meet the energy requirement. This forage also meets the requirement of the maintenance ewe, but provides excess valuable nutrients that could be utilized in other production areas. As the ewe enters late gestation and lactation we see the only way we can meet or come close to meeting the ewes' requirements is by using the high quality forage (TDN=65%; CP=15%). High quality forages are those of less maturity often harvested at 4-5 weeks of growth and/or include legumes. High quality forage will meet the needs of lactating ewes with little or no supplementation and should be reserved for that purpose.

Table 2. Daily nutrient requirement of mature ewes[a]

Stage of Production	Body Wt. (lb.)	Wt gain or loss (lb.)	DM intake/day (lb.)[b]	Energy TDN (lb.)	Protein (lb.)
Maintenance	110	0.02	2.2	0.55	0.21
	132	0.02	2.4	0.61	0.23
	154	0.02	2.6	0.66	0.25
	176	0.02	2.9	0.72	0.29
	198	0.02	3.1	0.78	0.29
Flushing--	110	0.22	3.5	2.1	0.33
2 wks pre-breeding	132	0.22	3.7	2.2	0.34
& 3 wks of breeding	154	0.22	4.0	2.3	0.36
	176	0.22	4.2	2.5	0.38
	198	0.22	4.4	2.6	0.39
1st 15 wks gestation	110	0.07	2.6	1.5	0.25
	132	0.07	2.9	1.6	0.27
	154	0.07	3.1	1.7	0.29
	176	0.07	3.3	1.8	0.31
	198	0.07	3.5	1.9	0.33
Last 4 wks	110	0.40	3.5	2.1	0.38
(130-150% lamb crop)	132	0.40	3.7	2.2	0.40
	154	0.40	4.0	2.3	0.42
	176	0.40	4.2	2.4	0.44
	198	0.40	4.4	2.5	0.47
(180-225% lamb crop)	110	0.50	3.7	2.4	0.43
	132	0.50	4.0	2.6	0.45
	154	0.50	4.2	2.8	0.47
	176	0.50	4.4	2.9	0.49
	198	0.50	4.6	3.0	0.51
Lactation (1st 8 wks)	110	-0.06	4.6	3.0	0.67
Nursing single	132	-0.06	5.1	3.3	0.70
	154	-0.06	5.5	3.6	0.73
	176	-0.06	5.7	3.7	0.76
	198	-0.06	5.9	3.8	0.79
Nursing twins	110	-0.13	5.3	3.4	0.86
	132	-0.13	5.7	3.7	0.89
	154	-0.13	6.2	4.0	0.92
	176	-0.13	6.6	4.3	0.96
	198	-0.13	7.0	4.6	0.99

[a] Values adopted from the National Research Council for Sheep (6th Ed.).
[b] To convert dry matter to as-fed, divide dry matter values by DM%.

Table 3. Daily nutrient requirement 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.)
Pre-breeding	66	.50	2.6	1.7	.41
	88	.40	3.1	2.0	.39
	110	.26	3.3	1.9	.30
	132	.22	3.3	1.9	.30
1st15 wk. gestation	110	.30	3.3	1.9	.35
	130	.30	3.5	2.0	.35
	155	.28	3.7	2.2	.36
Last 4 wk. gestation	110	.35	3.5	2.2	.42
(100-120% lamb crop)	130	.35	3.7	2.4	.42
	155	.33	4.0	2.5	.43
(135-175% lamb crop)	110	.50	3.5	2.4	.45
	130	.50	3.7	2.6	.46
	155	.47	4.0	2.7	.46
Lactation (1st8 wk.)	110	-.10	4.6	3.3	.62
Nursing single	130	-.10	5.1	3.6	.65
	155	-.10	5.5	3.8	.68
Nursing twins	110	-.22	5.1	3.7	.71
	130	-.22	5.5	4.0	.74
	155	-.22	6.0	4.3	.77

[a] Values adopted from the National Research Council for Sheep (6th Ed.).
[b] To convert dry matter to as-fed, divide dry matter values by DM%.

Table 4. Nutrient balance of three forage qualities for a 154 lb ewe throughout the production cycle[a].

	Forage Nutritive Value					
	Poor Quality		Moderate Quality		High Quality	
	TDN (%)	CP (%)	TDN (%)	CP (%)	TDN (%)	CP (%)
	45	6	52	10	65	15
Stage of Production	Nutrient Balance[b]					
Maintenance	0.51	-0.09	0.69	0.01	1.03	0.14
Flushing	-0.50	-0.12	-0.22	0.04	0.30	0.24
1st 15 wks gestation	-0.31	-0.10	-0.09	0.02	0.32	0.18
Last 4 wks						
(130-150% crop)	-0.50	-0.18	-0.22	-0.02	0.30	0.18
(180-225% crop)	-0.91	-0.22	-0.62	-0.05	-0.07	0.16
Lactation						
Nursing single	-1.13	-0.40	-0.74	-0.18	-0.02	0.10
Nursing twins	-1.21	-0.55	-0.78	-0.30	0.03	0.01

[a]Values from table 2.
[b]Nutrient balance = (intake * nutrient content) – requirement.

As discussed, the nutrient requirement of your flock will change throughout the production year. By taking the time to test your forages and separate hay based on forage quality, producers can more closely match the available nutrients to the changing needs of the flock. This can greatly reduce the need of additional supplement, decreasing the feed bill for producers.

LAMB QUALITY ASSURANCE

William Dee Whittier, DVM, MS, Professor
Virginia-Maryland Regional College of Veterinary Medicine

Lamb Quality Assurance

Wm. Dee Whittier, DVM, MS, Professor
Production Management Medicine
Virginia-Maryland Regional College of Veterinary Medicine

Sheep Deworming

Question:

Is the use of cattle dewormers in sheep illegal?

Answer:

We don't know for sure!

Sheep Deworming

Question:

Is the use of cattle dewormers in sheep illegal?

AMDUCA:

Animal Drugs may be used in an Extra-Label fashion if certain requirements are met.

Sheep Deworming

AMDUCA:

Animal Drugs may be used in an Extra-Label fashion if certain requirements are met:

- Vet involvement: Proper Vet/Client/ Patient relationship

- No approved product effective

- Residue avoidance rules (including "Exaggerated withdrawal times)

Sheep Deworming

Drug Residue Issue:

Previously - Dulaney Clause: Zero Tolerance

New Legislation:

- **Minimum Safe Levels**
- **Many products approved for no milk or slaughter withdrawal, even though there are some detectable levels of the product in animal tissues and products**

Warning: Resistance!!!

The theory:

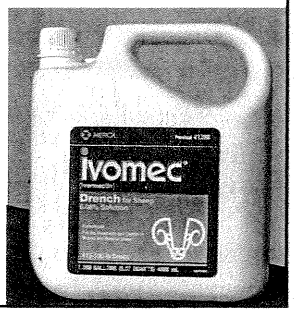
Drugs that are the most effective (kill the highest numbers of worms with a treatment) and "taper off" their effect for the longest time are the most likely to stimulate resistance!

Sheep Dewormers

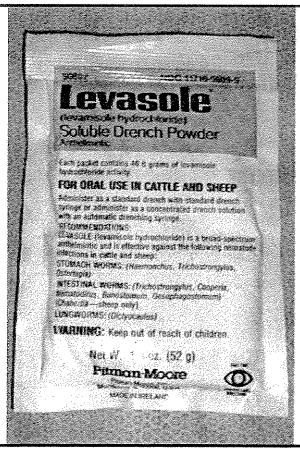
Approved Products:

- Ivomec™ Drench

Slaughter Withdrawal- 11 days



Sheep Dewormers



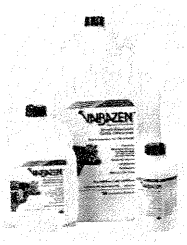
Approved Products:

- Levasole™ Drench

Slaughter Withdrawal – 72 hours

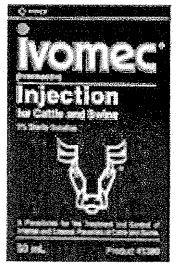
Sheep Dewormers

- **Albendazole-Valbazen**
- **7- Day Slaughter Withdrwal**

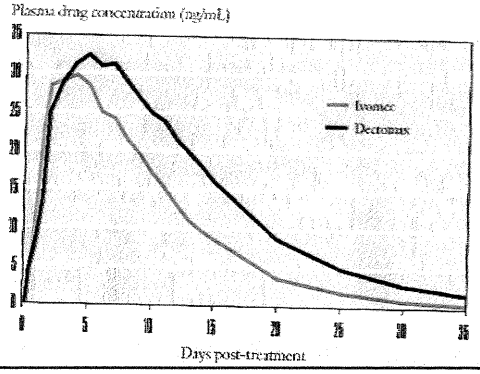


Sheep Deworming

- **Ivomec injection**
- **35-day slaughter withdrawal in cattle !!**



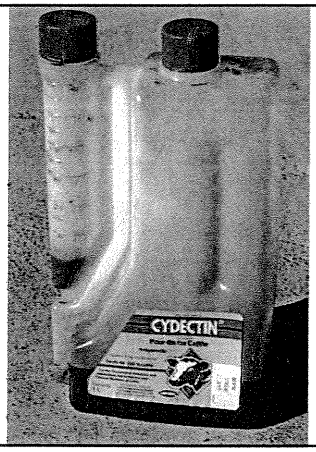
Deworming



Dectomax Injectable:

- "Stronger, Longer"

- 3 weeks persistent activity



Cydectin Pour-On:

- **Moxidectin is active ingredient**
- **Absorbed into fat**
- **Now no milk or meat withdrawals**

IN CATTLE

Quest Gel®

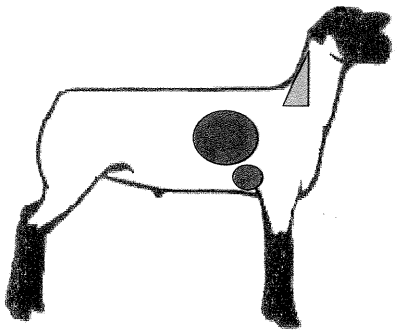
- **Oral dose of Moxidectin**
- **Very persistent activity – Week claim in horses**

Lamb Quality Assurance

Injection sites

IM: Neck

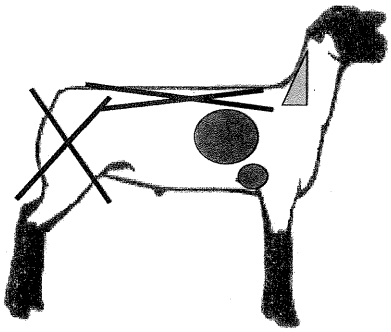
SubQ: Underarm, Neck, Over ribs



Lamb Quality Assurance

Injection sites

Never: Leg or Loin



PREPARING FOR THE LAMBING SEASON

Susan Schoenian
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(301) 432-2767 – sschoen@umd.edu
sheepandgoat.com – sheep101.info – sheepgoatmarketing.info

Lambing season is the most important time of the year for shepherds. With proper planning and preparation, it should go smoothly and be rewarding for the shepherd. The last third of pregnancy is most important because this is when the majority of fetal growth occurs and mammary tissue synthesis is beginning. This handout offers some general management recommendations pertaining to lambing. Recommendations for pasture lambing will vary somewhat.

<u>One month before lambing</u>

1. Increase energy in ewes' ration.
    a. General recommendation is ½ to 1 lb. per ewe. Start by feeding ¼ lb. per head and increase gradually.
    b. Recommendation for high producing ewes is 1 lb. per fetus (Iowa State).
2. Continue feeding good quality sheep mineral fortified with selenium.
3. Start feeding coccidiostat (Bovatec, Deccox, Rumensin)
    a. Deccox or Rumensin may partially control abortions caused by *Toxoplasma gondii* (cat coccidiosis).
4. Vaccinate for CDT (*clostridium perfringins* type C & D and *clostridium tetani*)
    a. Annual booster for ewes previously vaccinated (don't forget rams).
    b. Two injections (2 to 4 weeks apart) if vaccination status is unknown or ewes have never been vaccinated for CDT
5. Deworm prior to lambing
    a. To counter peri-parturient rise in worm eggs and relaxed immunity
    b. Protein supplementation may improve immunity to worms.
6. Crutch or shear ewes
    a. Shear
        i. Cleaner environment for lambs.
        ii. Cleaner fleeces.

iii. To reduce moisture (humidity) in barn.
iv. Shorn ewes take up less space.
v. But, only if you have adequate facilities.
vi. Shorn sheep require more feed to compensate for heat loss.
vii. Shear at least a month before for highly productive ewes.

b. Crutching – shearing around the vulva and udder.
c. Shorn or crutched ewes will seek shelter for their lambs.

Supplies you should have on hand for lambing

- ❑ Disinfectant for dipping navels (iodine, betadine, chlorohexidine)
- ❑ Colostrum (frozen, ideally from your own flock, cow and goat colostrum better than commercial colostrum)
- ❑ Milk Replacer (lamb)
- ❑ Stomach Tube (for feeding small and weak lambs)
- ❑ Bottles and nipples
- ❑ Bearing retainers (for holding a prolapsed vagina in place)
- ❑ Lubricant (for delivering lambs)
- ❑ Nylon rope, snare, leg puller (for delivering lambs)
- ❑ Rubber gloves, protective sleeves, or latex gloves (for delivering lambs)
- ❑ Bucket and soap (for delivering lambs and washing udders and vulvas)
- ❑ Old towels (for drying off lambs)
- ❑ Heat lamp or warming box (for warming chilled lambs)
- ❑ 50 percent dextrose (for weak lambs)
- ❑ Vitamin E/Selenium injection (for white muscle disease)
- ❑ Thermometer
- ❑ Propylene glycol or molasses (for pregnancy toxemia)
- ❑ Calcium borogluconate (for milk fever)
- ❑ Mastitis treatment
- ❑ Antibiotic
- ❑ Castrating, docking, and ear tagging (or notching) equipment and supplies
- ❑ Scale
- ❑ Sling for weighing lambs
- ❑ Record book or sheets for recording lambing data

Preparing Lambing Quarters

- Provide enough space to prevent overcrowding. ~ 20 sq. ft. per ewe.
- Separate heavy ewes from ewes that will lamb later.
- Building should have plenty of ventilation but no drafts.
- Dry bedding
- Portable lambing pens/jugs (4 x 5, 5 x 5). Rule of thumb is to have 1 jug per 10 pregnant ewes, but it depends upon the concentration of lambing, number of multiple births, etc. Feeders and water buckets for lambing jugs.

Signs of Lambing

- Vulva swells, some mucous discharge
- Udder swells
- Hips sink in
- Ewe will prepare birthing area by smelling the ground, pawing the ground with her front feet, and going round and round.
- She'll get up and down a lot as birth pains build up.

The Birth process

Stage 1: uterine contractions and cervical dilation (12-14 hours)
Stage 3: actual labor and delivery, membranes rupture, water bag breaks (1-2 hours)
Stage 3: expulsion of fetal membranes and involution of uterus (< 8 hours)

- Observe ewes closely during the lambing period and give assistance when necessary.
- Check ewes at least four times daily.

After lambing

- If necessary, assist new lambs by cleaning membranes from around the nose and face.
- Place ewe and lambs in a clean jug
- Encourage ewe to lick lamb(s)
- Only use heat lamps if lambs are weak or chilled. Place heat lamb 3 ft. above ground in corner of jug to prevent overheating/fire.
- Check to see if the ewe has milk and the teat canals are open. Remove wax plug if necessary.
- See that ewe owns her lamb(s) and allows them to nurse
- Dip navels. Clip long navel cords.
- Make sure ewe passes afterbirth.
- Provide plenty of water and high quality hay.
- Gradually add grain to diet. Don't feed grain until the second day.
- Check on the health of ewes and lambs at least 3 times per day. Lambs that are lying down should be made to get up. Healthy lambs stretch when they get up. If necessary, check to make sure lambs' bellies are full.
- Move ewes and lambs to mixing pens in 1 to 3 days. Recommendation is to keep ewe and lamb(s) in jug one day for each lamb in litter.
- Clean and disinfect pens after removing ewes and lambs.
- Dock and castrate lambs 1 to 7 days.
- Introduce creep feed by 10 days.

LAMB CARCASS EVALUATION

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

The following will describe lamb carcass evaluation procedures, with emphasis on traits measured and their importance in determining lamb carcass value. Many of these traits can be evaluated in the live animal and serve as the basis for the various grades assigned to live lambs when marketed (Blue O, Red O, etc.).

Live and Carcass Weight

Lamb processors utilize and fabricate live lambs and carcasses of different weights in various ways depending on demand by the end-user. Carcass weights are typically taken immediately following harvest (hot carcass weight). The desirable weight for lamb carcasses is dependent on the end use of the carcass. Weight is an important factor when live lambs and carcasses are priced, as USDA reports prices for in weight increment categories. Generally, very light and very heavy carcasses receive a discount in price. Supply and demand changes throughout the year influence which carcass weights receive the highest prices.

Dressing Percentage

Dressing percentage reflects the proportion of a live lamb's weight that results in carcass weight, and is calculated by dividing carcass weight by live weight and multiplying by 100. Dressing percentage is influenced primarily by the amount of gut fill. Fleece length and weight (including presence of mud/manure), along with fat cover and muscling also influence dressing percentage. Typically, dressing percentages for lambs range from 48-56%, with 52% considered an average for shorn lambs.

Fat Thickness

Fat thickness is measured over the center of the ribeye muscle after the carcass has been ribbed (split) between the 12^{th} and 13^{th} ribs. This measurement may be adjusted (up or down) to reflect distribution of external fat over the entire carcass. The amount of fat thickness is a good indicator of the amount of fat that is trimmed away when the carcass is fabricated into retail cuts. Therefore, carcasses with excessive amounts of fat thickness are less desirable because this excess waste fat must be trimmed. Carcasses with more than 0.36 inches of fat thickness are commonly discounted in price. However, the industry also discriminates against carcasses that are very lean (less than 0.10 inches of fat thickness), due to increased dehydration and shrink during storage and transportation for these very lean carcasses. Fat thickness is also the determining factor in calculating lamb carcass yield grades. The goal is to produce carcasses that have at least .10 inches, but preferably not more than 0.30 inches of fat thickness. Within this range, carcasses meet the preferred minimum yet do not have an excess amount of waste.

Yield Grade (YG)

Yield grade is calculated by the equation: YG = .4 + (10 x fat thickness). Yield grades are used by the industry to categorize carcasses for their expected yield of boneless, closely trimmed retail cuts. Yield grades range from 1 to 5, with a yield grade 1 having the highest expected yield and 5 the lowest. Under normal circumstances, carcasses are yield graded a 1, 2, 3, 4, or 5. Since yield grades estimate the percentage of the carcass that is saleable retail cuts, they are an important aspect of carcass pricing. Yield grade 4 and 5 carcasses commonly receive a price discount because of their excess fat, and therefore lower yield of boneless, trimmed retail cuts. The following table shows the general relationship between yield grade and percentage boneless, retail cuts.

Yield Grade	% Retail Cuts
1.5	50.4
2.5	49.1
3.5	47.8
4.5	46.5
5.5	45.2

Body Wall Thickness (BW)

Body wall thickness (inches) is measured over the rib beyond the ribeye, five inches from the midline of the carcass. Differences in body wall thickness between carcasses are due primarily to fat. Carcasses that are similar over the ribeye for fat thickness (FT), may vary considerably in body wall thickness. The body wall thickness measurement is used in the equation to determine percentage boneless, closely trimmed retail cuts (% BCTRC).

Ribeye Area (Loin Muscle Area)

Ribeye area is used as an indicator of total amount of muscle mass in the carcass. Ribeye measurements are taken by using a grid to determine the cross-sectional area (in square inches) of the loin muscle at the 12^{th}-13^{th} rib. The ribeye muscle is a primary muscle in the carcass, and therefore is fairly reflective of total carcass muscling. The ribeye is also the major muscle in the loin, which is the most valuable wholesale cut in the carcass. The size of the ribeye is related to carcass weight. Heavier carcasses should have larger ribeyes.

Leg Score

Leg score is a visual estimate of the amount of muscle in the leg of the carcass. Leg scores are expressed numerically with 15 (Prime +) being the heaviest muscled and 10 (Choice -) being relatively light muscled. The scores are assigned by evaluating the muscle expression, shape, and fullness to the leg relative to carcass weight. Leg scores are not used to calculate percentage of retail cuts (%BCTRC), but are included as a component in determining quality grades.

Percentage Boneless Closely-Trimmed Retail Cuts (%BCTRC)

The percentage of boneless, closely trimmed retail cuts is very meaningful as it represents the predicted proportion of the carcass that is saleable retail product. The formula to predict %BCTRC uses carcass weight, fat thickness, body wall thickness, and ribeye area as follows:

$$\%BCTRC = 49.936 - (.0848 \times HCW) - (4.376 \times FT) - (3.530 \times BW) + (2.456 \times REA)$$

This percentage varies greatly, with very high yielding carcass being greater than 50% BCTRC and low yielding carcasses less than 45% BCTRC. The two measurements of waste fat, fat thickness (FT) and body wall thickness (BW), have the largest impact on %BCTRC. Lambs with more waste fat will have lower %BCTRC. Muscling also influences the value. Larger ribeyes relative to carcass weight will increase %BCTRC. Although yield grades estimate percentage of boneless retail cuts, %BCTRC is more precise because in includes body wall thickness and also accounts for differences in muscle between carcasses. %BCTRC is commonly used in lamb carcass contests to rank.

Quality Grade

Quality grades are an estimation of the palatability characteristics (tenderness, juiciness, and flavor) of the carcass. Final quality grade is determined by a combination of three factors: maturity, flank streaking, and conformation. Carcasses qualify for lamb maturity with the presence of a break joint on at least one front shank, which is present in most sheep less than 14 months of age. Mutton carcasses (yearlings and older) are characterized by spool joints on the front shanks. Flank streakings are the fat deposits on the flank muscles. Since lamb carcasses are normally not ribbed, flank streaking is used to estimate marbling. Marbling is the small specs of fat found within the ribeye muscle, and is related to flavor and juiciness. The final component is conformation (muscling), which is primarily determined by leg score. These factors are combined to arrive at a final quality grade. The majority of lamb carcasses quality grade Choice and Prime. Prime is the highest quality grade, followed by Choice. Each quality grade is further subdivided into thirds: Prime+, Prime, Prime-, Choice+, Choice, and Choice-, from highest to lowest in quality, respectively. Carcasses that do not qualify for Choice-quality grade, are commonly referred to as "no rolls" (NR) in the industry. These carcasses are usually from lightweight, underfinished lambs. Due to their inferior quality, no roll carcasses are frequently discounted in price.

Carcass Pricing

Lamb carcass prices are differentiated based on carcass weight, quality grade, and yield grade. Slaughter lambs are most frequently traded on a live weight basis as opposed to a carcass merit system, although pricing of lambs based on carcass parameters is available through some processors. In a carcass value system, total value of the carcass is calculated by multiplying carcass price/lb. by hot carcass weight. Carcass price per pound may vary according to weight, yield grade, and/or quality grade. An equivalent live price/lb. can be determined by dividing total carcass value by live weight at the time of harvest. Differences between lambs in live value and carcass value reflect differences in dressing percentage and carcass merit (yield and/or quality grade).

LAMB GRADING AND EVALUATION

Mike Carpenter, VDACS

When evaluating live lambs for their potential slaughter grade, the most important factor is determining the amount of finish (fat thickness) a lamb has. We move our fingers back and forth across the lamb's backbone and ribs to determine if the lamb has enough fat cover to grade Choice (minimum is about .07 inch). The preferred area to evaluate fat thickness is in the middle of the back. With your finger find the last rib, then place your thumb on the lamb's backbone at this mid-point of the body. Now move your fingers forward and while applying moderate pressure, move your fingers across the ribs and your thumb across the backbone to determine fat thickness. It's important to use the tips of your fingers to penetrate the wool. With practice and follow-up you can become fairly accurate at estimating fat thickness. To give you some idea of what various amounts of fat thickness may feel like, try the following exercise. Make a tight fist with one hand. Now rub the index finger of the other hand across the back of your hand. If a lamb is this smooth, it is too fat. (Yield Grade 4 or 5). Now rub the index finger across the row of knuckles. This is what a lamb's backbone will feel like if it does not have enough finish. Now rub your finger across the row of the first joints of your fingers. This is what adequate finish would feel like on a lamb - approximately .1 - .25 inch of fat thickness.

USDA Choice is the preferred slaughter grade. There are no premiums for Prime lambs (as there are for Prime cattle) and Prime lambs are usually too fat.

USDA LAMB STANDARDS

USDA Quality Grades for slaughter lambs are:
PRIME, CHOICE, GOOD, UTILITY

The two factors that influence quality grades are:
Conformation - thickness of muscling
Quality - amount and distribution of fat, maturity

To be eligible for Choice or Prime, lambs must have a minimum of about .07 inch covering of fat.

USDA YIELD GRADES

Fat Thickness Plus .04 Times 10 = Final Yield Grade
(Example) .15 plus .04 * 10 = 1.9 yield grade

Y.G. 1	0.00 - .15 INCH
Y.G. 2	.16 - .25 INCH
Y.G. 3	.26 - .35 INCH
Y.G. 4	.36 - .45 INCH

FEEDER LAMB STANDARDS:

FRAME SIZE	EXPECTED SLAUGHTER WEIGHT AT OR ABOUT .2 IN. FAT
SMALL FRAME	100 LBS. AND DOWN
MEDIUM FRAME	100 – 120 LBS.
LARGE FRAME	OVER 120 LBS.

MUSCLING SPECIFICATIONS FOR FEEDER LAMBS

No. 1 Thrifty animals that are thick throughout. Lambs that are thick and full in the forearm and leg, showing a rounded appearance through the back and loin. Lambs which are wide between the legs, both front and rear.

No. 2 Lambs that are thrifty and are slightly thick through the forequarter and the middle part of the leg. The forearm and leg are slightly thick and the back and loin have a slightly thick appearance. The legs are set slightly wide, both front and rear.

No. 3 Feeder lambs included here are thrifty animals which have less thickness that the minimum requirements specified for the No. 2

Inferior: Animals that are unthrifty.

VIRGINIA LAMB GRADING SPECIFICATIONS

Lambs with a blue mark will be expected to grade USDA Choice or Prime and a red mark will indicate a feeder lamb or USDA Good grade slaughter lamb.

Lambs must have a minimum of about .07 inch backfat to grade Choice or Prime.

BLUE O LAMB: Choice, Few Prime, Yield Grade 1 2, Few 3
May be sorted into different weight groups;
90-100 lbs., 100-125 lbs., 125 lbs. and up

DOUBLE BLUE O LAMB: Choice & Prime, Yield Grade 3-4
Weighing 130 lbs and up

RAM LAMBS: Will be marked with a blue mark on the rump in addition to slaughter grade mark.

RED O LAMB: Heavy feeder lamb, or Good and Low Choice lamb weighing 85-100 lbs.

RED SHOULDER: Large and medium framed feeder lambs weighing 70-85 lbs. expected to finish at 100 lbs and up.

BLUE SHOULDER: Small framed feeder lambs weighing 70-85 lbs, expected to finish at less that 100 lbs. Many of these lambs may have enough fat thickness to grade Choice.

RED BACK: Large and Medium framed feeder lambs weighing 60-70 lbs., expected to finish at 100 lbs and up.

BLUE BACK: Small framed feeder lambs weighing 60-70 lbs. Expected to finish at less that 100 lbs.

RED TAIL: Large and Medium framed feeder lambs weighing 50-60 lbs. expected to finish at 100 lbs. and up.

BLUE TAIL: Small framed feeder lambs weighing less than 60 lbs. expected to finish at less that 100 lbs.

Ram lambs will be marked with red mark on the rump, in addition to feeder classification, i.e. Red Shoulder Buck Lambs.

BODY CONDITION SCORING EWES AND LATE GESTATION NUTRITION

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An affordable management tool available to all sheep producers is the scoring of ewes for their body condition or body fatness. Being aware that ewes are too fat, too thin, or just right can be a helpful barometer of one's flock management throughout the year. Body condition scoring describes the condition of a ewe, is convenient, and is much more accurate than a simple eye appraisal.

A body condition score estimates body fatness with scores ranging from 1, very thin to 5, obese (Figure 1). The scoring is based on feeling by hand the degree of muscling fullness and fat cover over and around the vertebrae in the loin region (last rib to the hip bone). Ewes should be standing level and be relaxed when be scored. If handling over the spine feels very sharp, checking over the forerib for condition can confirm whether the ewe is a 2 or 3. If ewe are in full fleece be sure that you are handling through the wool and not being biased by the fleece.

The nutritional adequacy of ewes during the first 90 days of pregnancy can be assessed by tracking changes in body weight and body condition. During the first month after breeding, ewes should, if possible, maintain their weight and body condition. Short periods of either severe underfeeding or excessively high levels of feeding at this time can adversely affect embryo survival. In many cases, it is not possible to prevent some loss of weight and condition following breeding, but it is important that any losses are gradual and don't exceed 3 to 4 percent of the ewe's weight at breeding.

During the second and third months of pregnancy, a change in a ewe's weight becomes more difficult to interpret because of the increase in her weight due to fetal products (fetus, uterine wall, placenta, fluid, etc.). For example, at 90 days of pregnancy a 150 pound ewe carrying twins would have 10 to 11 pounds of fetal product included in her body weight or 6 to 7 percent. Taking into account this increase in weight due to the uterus and its contents, an acceptable body weight change during the second and third months of pregnancy would be a net loss of between 4.5 to 9 pounds (3-6% of ewe's body weight). Losses greater than this are likely to affect fetal growth and hence birth weight and lamb vigor may become adversely affected. Identifying thin ewes in early or mid gestation can allow you alter your feeding program to move the condition to 3 or 3.5 by lambing.

In late pregnancy (last 60 days), the rapid growth of the fetus makes changes in body weight difficult to interpret. The ewe's requirements for energy and protein increase rapidly during this period and especially during the final few weeks of pregnancy. Approximately 70% of the fetal growth occurs during the final six weeks. The difference in a ewe's weight between a single fetus and twin fetuses over this short period can be over 6.5 pounds. Although a ewe will generally be drawing on some body reserves during this time, her tissue weight loss should be more than offset by the increase in weight of the fetus or fetuses plus the uterine

fluid weight. As a general rule, a satisfactory level of feeding in late pregnancy should result in a body weight increase over the final eight weeks of about 10% in single-bearing ewes and 18% in ewes carrying twins. A 150 pound ewe carrying twins should increase her body weight by 27 pounds.

Body condition is a more meaningful way than body weight change of assessing the adequacy of nutrition during late pregnancy because its evaluation is independent of number of fetuses. Identifying thin ewes in late gestation will allow you to make a nutrition or management change that should improve the ewe's nutritional status. However, do not expect to significantly change body condition of the ewe in late gestation by increased feeding. The development of the fetuses take priority in late gestation and overfeeding now will only increase lamb birth weight and not ewe condition. Thus, for thin ewes in late gestation, make a moderate change in their supplementation and ewes will produce heavier, more vigorous lambs and produce more milk in early lactation.

Poor Nutrition during Late Pregnancy

The importance of ewe nutrition in late gestation cannot be emphasized enough. Poor nutrition during this period can have the following results:

1) An increase of ketosis (pregnancy disease).
2) An increase chance of losing ewes from pneumonia or starvation, especially older ewes.
3) An increase in light-weight lambs. In itself, light-weight lambs are not bad because you have fewer difficult births. However, some of these light lambs will be weak lambs as well and if weather conditions are rough, these lambs will be the first to die or will require more special care.
4) Milk production of the ewes will be reduced as will lamb gains.

Managing Pregnant Ewe Lambs

- Ewe lambs should be fed to gain 35 to 40 pounds during gestation.
- Feed for growth as well as pregnancy. Be especially careful not to cheat her on energy during late pregnancy.
- Remember her calcium and phosphorous requirements are higher than an older ewe. A free-choice mineral supplement containing calcium, phosphorous, and a trace-mineralized salt should be made available.
- Feed high quality feedstuffs to the ewe lambs. Avoid low quality roughage.
- Manage and feed the ewe lambs separately from the older ewes.
- Avoid mixing them with older ewes.

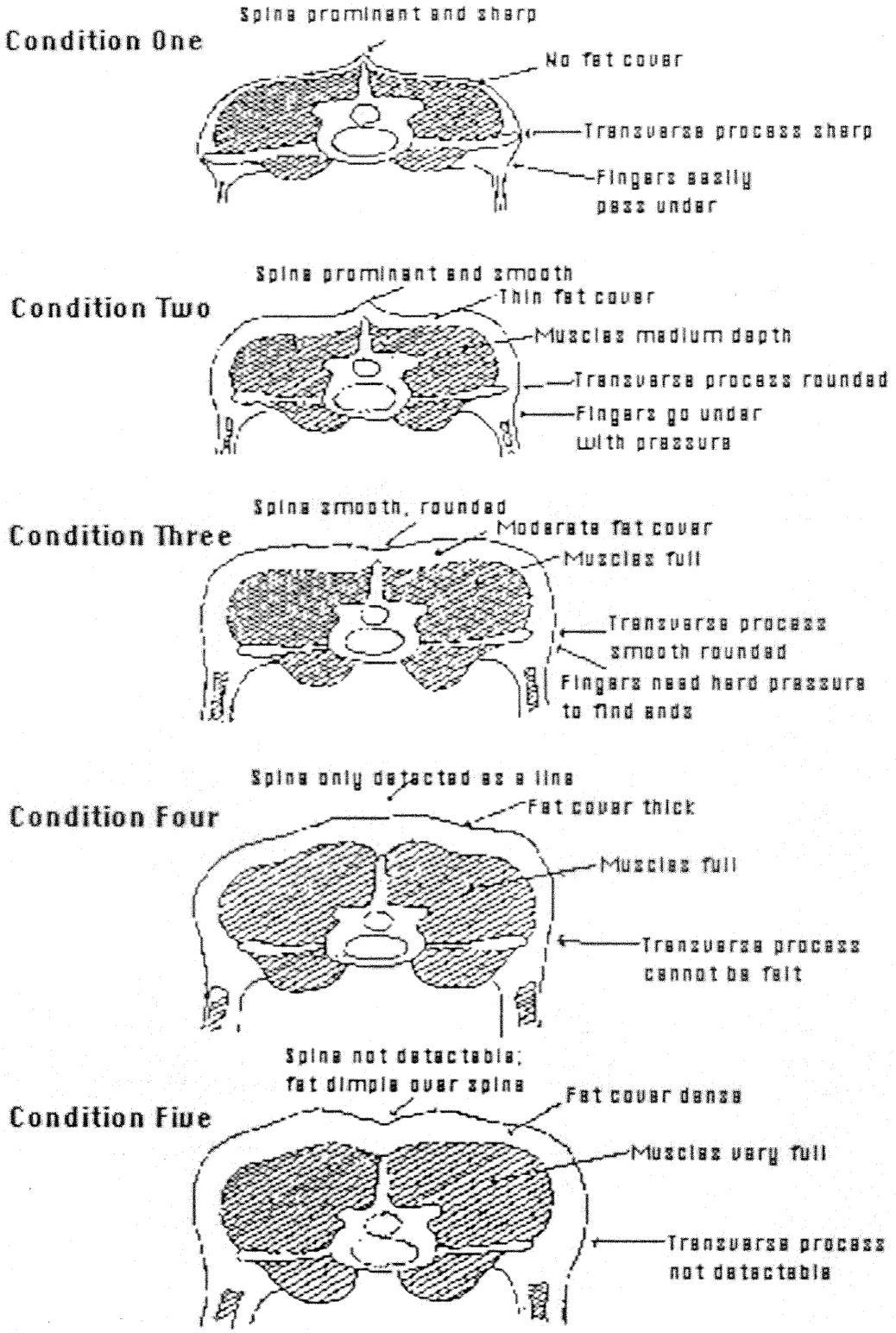

Figure 1. Body condition score examples

Supplementation table (180 lb ewe)[1]

Forage Analysis									
CP % of DM	TDN % of DM	Early[2] Gestation		Late[3] Gestation		Early[4] Lactation		Late[5] Lactation	
		Lbs SBM	Lbs Corn	Lbs SBM	Lbs Corn	Lbs SBM	Lbs Corn	Lbs SBM	Lbs Corn
11.2 & over	56 & over	-	-	-	.75	.5	2.5	.3	1.5
9.5 - 11.1	56 & over	-	-	.15	.75	.8	2.5	.45	1.5
	53 - 56	-	-	.15	.85	.8	2.7	.45	1.65
	50 - 53	-	-	.15	1.0	.8	2.9	.45	1.80
8.2 - 9.5	54 - 56	-	-	.25	.8	1.0	2.5	.55	1.5
	51 - 54	-	.2	.25	1.0	1.0	2.75	.55	1.75
	50 & under	-	.4	.25	1.2	1.0	3.0	.55	2.0
7.3 - 8.2	53 – 55	.1	-	.4	.8	1.1	2.5	.6	1.5
	51 – 53	.1	.2	.4	1.0	1.1	2.75	.6	1.75
	50 & under	.1	.4	.4	1.2	1.1	3.0	.6	2.0
Under 7.3	Under 48	.2 - .3	.5 – 1.0	.4 - .5	1.0 -1.5	1.2 -1.5	2.5 -3.5	.7 - .8	2.0 -3.0

[1] Recommendations are made on basis of 44 % soybean meal and ground shelled corn. Other supplements can be used to deliver the same amount of energy and protein.

[2] Dry ewes in the first 15 weeks

[3] Last 4 weeks of pregnancy (200% lambing rate expected).

[4] First 6-8 weeks of lactation suckling twins

[5] Last 4- 6 weeks suckling twins.