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2010 VA-NC Shepherds' Symposium
Presented By
Virginia Sheep Producers Association

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Virginia Sheep Producers Association
Dept of Animal & Poultry Sciences
Virginia Tech
Blacksburg, VA 24061
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Friday, January 8

AM

9:00-5:00 **Sheep Management 101 Workshop**

All day hands-on clinic for beginning shepherds covering topics related to basic sheep production and lambing management

(Limited to first 30 participants registered, additional registration fee)

PM ***Alphin-Stuart Livestock Arena***

4:00 **Virginia Sheep Industry Board Meeting (Open to the public)**

6:00 **Virginia Sheep Producers Association Board Meeting (Open to the public)**

Saturday, January 9

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8:00 **Registration and Commercial Exhibits**

9:00 **"Keys to a Successful Lambing Season"**
Dr. Dee Whittier, VA-MD Regional College of Veterinary medicine

9:50 **"Strategies for Genetic Improvement of Parasite Resistance in Sheep"**
Dr. Dave Notter, Dept of Animal & Poultry Sciences, Virginia Tech

10:40 **Break and Commercial Exhibits**

11:00 **"Practical Solutions for On-Farm Mortality Disposal"**
Dr. Allen Harper, Tidewater AREC, Virginia Tech

11:30 ***Roy Meek Outstanding Sheep Producer Award Presentation***
Sheep Industry Virginia Livestock Hall of Fame Recognition
Virginia Sheep Producers Association Annual Meeting

12:15 **Lunch –** *will be provided*
Update from American Sheep Industry Association & American Lamb Board

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1:30 **"Making the Most of Lamb Marketing"**
Mr. Mike Carpenter, VDACS Livestock Marketing, and Producer Panel

1:30 ***Concurrent Youth Educational Session***

2:00 **"Ewe Nutrition and Management Do's and Don'ts"**
Dr. Mark McCann, Dept of Animal & Poultry Sciences, Virginia Tech

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Mr. Mark Stevenson, Dept of Animal & Poultry Sciences, Virginia Tech

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PRE-REGISTRATION INFORMATION

Received by January 1, 2010

FRIDAY ONLY

_____ **$25.00 SHEEP MGMT 101 REGISTRATION**

SATURDAY SYMPOSIUM

_____ **$25.00 FULL REGISTRATION (includes lunch, breaks, and materials)**

_____ **$10.00 YOUTH FULL REGISTRATION (includes lunch, breaks, and materials)**

_____ **TOTAL**

❖ ❖ ❖ ❖ ❖ ❖ ❖ ❖ ❖

ON-SITE REGISTRATION

After January 1, 2010

FRIDAY ONLY

No On-Site Registration for Sheep Mgmt

SATURDAY SYMPOSIUM

_____ **$30.00 FULL REGISTRATION (includes lunch, breaks, and materials)**

_____ **$15.00 YOUTH FULL REGISTRATION (includes lunch, breaks, and materials)**

_____ **TOTAL**

VIRGINIA-NORTH CAROLINA SHEPHERDS' SYMPOSIUM PRE-REGISTRATION

DEADLINE – JANUARY 1, 2010

Complete separate form for each participant only if different addresses.

NAME _____

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CITY _____

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Phone: (540) 231-9163
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LOCATION:

Alphin-Stuart Livestock Arena
Plantation Road
Blacksburg, VA

The Virginia-North Carolina Shepherds' Symposium is open to all sheep producers from the Mid-Atlantic Region. It provides in-service training opportunities for extension personnel, educators and other professionals in sheep and related agribusiness industries. Youth are an important segment of the sheep industry and are invited to attend.

MOTEL RESERVATIONS:

Holiday Inn – (540) 552-7001
900 Prices Fork Rd, Blacksburg (~1 mile) (next to University Mall area) ($89+tax)

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Hilton Garden Inn – (540) 552-5005
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Blocks of rooms have been reserved at the hotels listed above. These rooms will be <u>held until December 31, 2009.</u>

Please state you are with the ***Virginia Sheep Producers*** *when making reservations.*

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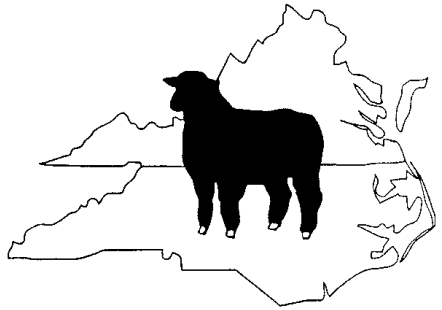
VIRGINIA-NORTH CAROLINA SHEPHERDS' SYMPOSIUM



January 8 - 9, 2010

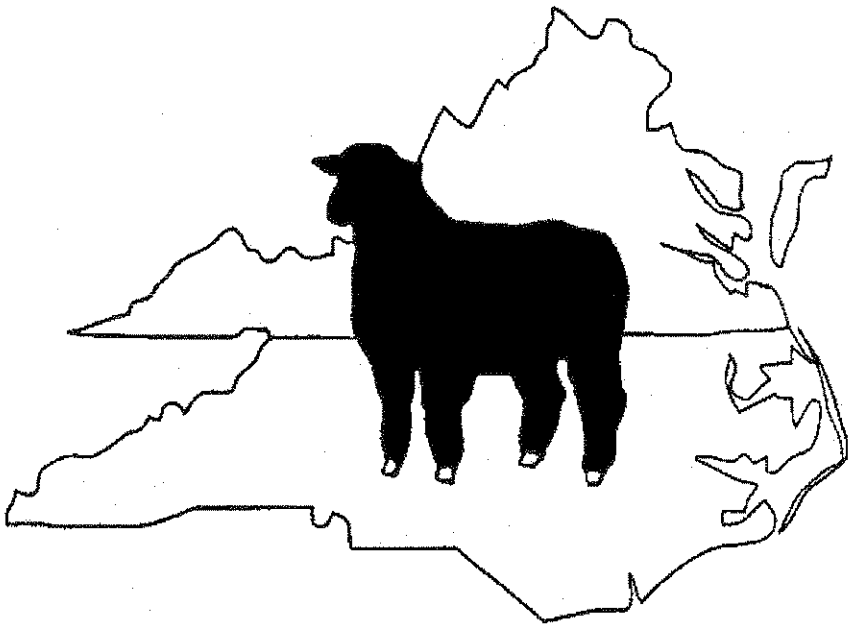
Alphin-Stuart Livestock Arena
Plantation Road
Blacksburg, Virginia

Pre-Registration Deadline
January 1, 2010

Proceedings

2010

VIRGINIA-NORTH CAROLINA SHEPHERDS' SYMPOSIUM



January 9, 2010

ALPHIN-STUART LIVESTOCK ARENA
PLANTATION ROAD
BLACKSBURG, VIRGINIA

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KEYS TO SUCCESSFUL LAMBING SEASON

Dr. W. Dee Whittier
Department of Large Animal Clinical Sciences
VA-MD Regional College of Veterinary Medicine
Virginia Tech, Blacksburg, VA 24061-0442

Lamb Starvation

Lamb starvation, the number one killer of lambs, often is associated with lack of shepherding. Contributing causes are:

- The lamb doesn't get started (gets no colostrum). Seventy-five percent of lambs that don't get colostrum die for one reason or another.
- The ewe won't claim the lamb.
- Mastitis.
- The teat is too big or is too near the ground and the lamb doesn't find it.
- Sore mouth.
- The ewe can't feed two or three lambs (mastitis, too little feed, etc.).
- Joint injury or illness.
- Pneumonia, which may be associated with lambs that received no colostrum and therefore lack antibodies.
- Difficult lambing.
- A "genetic will to die." Actually, a number of lambs die for no apparent reason. A genetically related lack of vitality may well be the cause.

Hypothermia (Chilling)/Hypoglycemia (Low Blood Sugar)

Clinical Signs and Causes. Rectal temperature is the primary guide to identification and treatment of hypothermia in lambs. Mild to moderate hypothermia is characterized by a body temperature between 98° and 102°F; severe hypothermia occurs when the body temperature is below 98°F. Hypothermia is caused by excessive body heat loss coupled with reduced heat production. Newborn lambs are unable to regulate their body temperature for the first 36 hours after birth so environment and management practices greatly affect how much body heat newborn lambs may lose. Energy from body fat, colostrum, and milk is required by lambs to generate heat. Starvation depletes stored energy sources quickly and then limits the intake of adequate amounts of high-energy nutrients. Common, but not necessarily routine, findings on necropsy that suggest starvation include: the absence of milk in the stomach and intestine, a change in the color and consistency of fat around the kidneys from light tan and firm to purple and gelatinous, and a complete absence of fat in the abdomen.

Prevention and Treatment of Hypothermia/ Hypoglycemia. Husbandry practices intended to prevent losses from hypothermia/hypoglycemia/ starvation include:

(1) providing shelter to ewes with newborn lambs to reduce body heat loss, especially during times of severe weather stress,

(2) shearing or crutching ewes before lambing so lambs are not hindered from nursing, and ewes are less likely to lamb in exposed areas,

(3) confining ewes and their newborns for one to two days to promote bonding and to check ewes for adequate milk production,
(4) helping lambs with suckling during their first 24 hours to assure adequate intake of colostrum,
(5) grafting extra lambs to ewes that lost their lambs, and
(6) culling ewes with poor milk production.

A common ratio of lambing pens (jugs) to ewes is 1:10. If severe winter weather is expected during lambing, a ratio of one jug for every eight ewes is probably a better and safer estimate of jug requirements.

Adequate nutrition of the late gestation and early lactation ewe is another critical factor in preventing hypothermia and starvation in lambs. Ewes with an energy deficiency are prone to low milk production and pregnancy toxemia. Both conditions contribute directly to starvation in lambs.

Hypothermic lambs do not get better on their own. For treatment of hypothermia, the following steps are recommended:

1. Move ewe and lambs to shelter or, if the hypothermia is severe, remove lambs from the ewe.
2. PRIOR TO WARMING, lambs more than five hours old with severe hypothermia (< 37°C, 98°F) should be given an intraperitoneal injection of a warm 20-25 percent dextrose (glucose) solution at a dose of four to five milliliters (CC's) per pound of body weight. The injection can be given by the following procedure: (1) hold the lamb by the back legs in a hanging position, (2) disinfect the injection site that is located one inch either side and one inch behind the navel, (3) slowly insert a 20-gauge, one inch sterile needle, with the syringe containing the dextrose attached, into the abdomen, and 4) direct the injection toward the rump.
3. Towel-dry wet lambs. Supplement with heat or warm in a warming box using dry heat, e.g., a hand-held hair dryer or heat lamp. Temperature in the box should not exceed 103°F. Avoid overheating lambs by affixing a thermometer to the inside of the box and checking the lambs and the box thermometer regularly, at least every 30 minutes. Lambs should be warmed to 99°F.
4. Tube feed colostrum at the rate of 20 to 25 milliliters per pound of body weight per feeding after the lamb has been warmed (30 milliliters is approximately equal to one fluid ounce). Lambs unable to nurse on their own should receive this amount of colostrum by stomach tube three to four times during the first day of life.
5. Return the lambs to the ewe when rectal temperature is normal (usually one to three hours), and they can stand and nurse on their own. If lambs are still weak after treatment, they should be fed regularly by stomach tube until they are strong enough to join their mother.
6. If only one of a set of twin lambs is involved, remove both lambs from the ewe while warming is taking place and return both lambs simultaneously. Observe lambs frequently to check for relapses.

The procedures outlined are useful for lambs showing these signs no matter what the production system. However, these procedures are labor-intensive and can most easily be justified in intensive management systems in which large lamb drops are occurring. However, if the need to use these less natural procedures to assure lamb survival is not taken into account when selecting replacement animals, then it is likely that sheep will become even more dependent on man for survival.

Colostrum. Many infectious diseases occurring in the first few days of life result because the lamb did not get any or enough colostrum during the first 12 hours after birth. The newborn lamb, unlike the human baby, is born without protective proteins, called antibodies, in the blood. Antibodies are necessary to protect the lamb from bacteria and viruses that gain entrance into the body by various means. The first milk of the ewe, called colostrum, contains antibodies necessary for lamb survival. Vaccinating the ewe a month before lambing can increase colostrum antibodies against some diseases, such as the clostridial diseases. The antibodies consumed by the lamb pass from the intestines into the blood stream. However, a gradual closure of the intestine to the passage of antibodies occurs and is completed by approximately 12 hours after birth. Therefore, it is extremely important for the lamb to get colostrum as soon after birth as possible. Colostrum also contains concentrated levels of energy, protein, vitamins, and other nutrients needed by the lamb. To ensure survival, the lamb should consume an amount of colostrum equal to five percent of its body weight. For example, a 10-pound (160 oz.) lamb should receive eight ounces of colostrum within the first few hours after birth, four ounces immediately, and an additional four ounces within the next 12 hours. It is easier, quicker, and more effective to use a stomach tube rather than a bottle to feed colostrum to a weak lamb.
A supply of colostrum should be kept on hand in case colostrum supplementation is necessary. Hypothermic lambs, orphaned lambs, and rejected lambs all may need colostrum supplementation. Fresh ewe colostrum is best, but stored colostrum can be used for up to two days if chilled properly. Alternatively, if frozen, colostrum can be good for a year or more. Frozen colostrum should be stored in small quantities (e.g., use Styrofoam or paper cups or ice cube trays) because thawing and refreezing will destroy antibodies. Colostrum can be thawed to room temperature with a water bath such as a double boiler. Microwave oven thawing is dangerous because overheating colostrum increases the risk of destroying antibodies.
If ewe colostrum is not available, cow and goat colostrum are good alternatives. There are also colostrum supplements available commercially. None of the alternatives is as good as ewe colostrum, but all are better than none. Cow colostrum is less concentrated than ewe colostrum so the lamb's nutrient needs will require about 30 percent more cow colostrum. Also, bovine colostrum can transmit Johne's disease from cattle to sheep as well as occasionally cause hemolytic anemia in lambs. Pooling colostrum from several cows will help minimize both of these risks. Goat colostrum can contain CAE virus or other disease agents that are infectious to sheep. Flock owners should ask about the disease status of the goat or cow herd before obtaining colostrum from that farm.

Pneumonia

Pneumonia, the number one lamb disease, occurs because of a lack of colostrum, because of "mastitis milk", because of poor ventilation or because ewes are heavily infected with Pasteurella (One study showed a 99 percent infection rate, so the organism is frequently present). A lamb

contracts pneumonia because it can't stand such stresses as too little milk, draft, dampness, and ammonia off a manure pack.

Early diagnosis of sick, unthrifty young lambs is crucial. Guessing the cause is relatively simple, because 90 percent of the time they are either starving or have pneumonia. Strive for early detection and start antibiotic treatment before the lungs have been permanently damaged. Treatment for pneumonia is to inject the lamb with antibiotics. Adequate selenium and vitamin E help the lamb withstand pneumonia. Keep the lamb strong!

Baby Lamb Scours

Scours are due to one of many bacteria or viruses. To minimize the problem, an adequate intake of colostrum (10-15% of body weight means 6 to 20 ounces of either ewe or cow colostrum depending on the size of the lamb) must be given in the first 12 hours of life.

Scours may hit the lamb the first day of life. The lamb succumbs due to added stress (draft, ammonia, and poor ventilation). *Clostridium perfringens* type C or *E. coli* may be the cause of baby lamb scours. Vaccination of the ewe four weeks prelambing may prevent it.

Treat scours with calf-scour electrolytes at the rate of 3% of body weight 2-6 times per day. Because these lambs often get pneumonia the injection of an antibiotic is often recommended. If *E. coli* is the cause, preventive vaccines of the similar disease in cattle have been given to ewes before lambing. Sanitation is a more important preventive measure than any vaccine or antibiotic!

White Muscle Disease

The cause of white muscle disease (muscular dystrophy) is a lack of selenium or vitamin E or both. In Virginia, a lack of selenium in ewe diets is historically common. Signs are lambs born dead or weak or lambs that are unable to rise or walk or that do so stiffly. It may affect six- to eight-week-old lambs as well. Very often the fastest gaining lambs are affected.

To prevent white muscle disease, feed salt containing 90 ppm selenium, feed salt fortified with 100,000 I.U. vitamin E per 100 pounds salt, and injecting young lambs with selenium and vitamin E on day 1 of life.

The Influence of Vitamin E Supplementation During Late Pregnancy On Lamb Mortality and Ewe Productivity

R.W. Kott1, V.M. Thomas1, P.G. Hatfield1, T. Evans2 and K.C. Davis
Montana State Univ., Bozeman, MT Roche Vitamins & Fine Chemicals, Nutley, NJ.2

ABSTRACT

Mature Rambouillet and Targhee ewes over a three year period (approximately 430 ewes per year) were randomly allocated within breed and age to either a vitamin E supplemented group or a control group receiving no supplemental vitamin E. Beginning approximately three weeks prior to the first expected lambing date all ewes were fed 2.3 kg/d of alfalfa-grass hay and .23 kg/d of a barley based supplemental pellet. The pellet with added vitamin E contained 1450 mg of d-l-

alpha tocopherol acetate/kg and provided an additional 330 IU/hd/d of vitamin E. Selenium was incorporated into a trace mineral salt and fed free choice to all ewes throughout pregnancy. In ewes lambing in the early part of the lambing season, vitamin E supplementation reduced ($P<.05$) lamb mortality (**17 vs. 12 percent** lamb mortality for untreated vs. vitamin E supplemented ewes, respectively). Consequently, these ewes weaned 2.9 kg more lamb per ewe lambing ($P<.05$). No differences were observed ($P>.05$) in lamb mortality or kg of lamb weaned per ewe lambing among ewes lambing during the late lambing period.

Entropion

Entropion, or turned under eyelids, occurs most frequently in and is most damaging to lambs. It is an inherited condition and appears in most breeds. One treatment is to re-move a small section of the skin about 3/8 inch below the bottom eyelid, which will draw down the eyelid when the skin heals. The eyelid also can be clipped or drawn down with thread. Still another treatment is to inject ½ cc Penicillin into the lower lid in such a way as to fold the lid out. This treatment is less certain than the others described but can be done very quickly. Failure to correct the condition will lead to an unthrifty lamb that may remain blind.

Polyarthritis (Navel Ill)

Polyarthritis is arthritis involving one or more leg joints. It may or may not produce pus about the joint. Bacteria causing it include *Corynebacterium pseudotuberculosis* (the same bacteria that cause caseous lymphadenitis in ewes), *Erysipelothrix insidiosa* (swine erysipelas) as well as E coli and Staph organisms that are found in all environments. The organism enters the body through the umbilicus (navel) or through docking or castrating wounds. To prevent polyarthritis, disinfect the navel cord frequently and disinfect and do all possible to keep docking and castrating wounds clean. Keeping newborn lambs in as clean an environment as possible is crucial. Treatment with antibiotics is only moderately successful as a treatment.

Tetanus: Tetanus is caused by *Clostridium tetani*, which persists in the soil of most farms. Next to horses, sheep are the most susceptible farm animal. The bacteria are anaerobic, so wounds in which air contact is limited are most susceptible to tetanus. Docking and castrating with rubber bands increase the incidence of infection. Dis-infecting docking and castrating wounds will minimize it. Infected sheep become stiff, move with a straddled gait, and usually die. Vaccinating ewes and/or lambs with tetanus toxoid and/or tetanus anti-toxin prior to docking is effective.

Infectious Causes of Stillborn, Weak, or Dead Lambs at Birth: A variety of bacterial, viral, and protozoal disease agents in sheep cause stillbirths and weak lambs. Bacterial causes include Brucella ovis, Chlamydia spp., Campylobacter spp. (Vibriosis), and Coxiella burnetti (Q fever). The two main viral causes are border disease virus (hairy shaker disease) and Cache Valley virus. The primary protozoal cause of stillbirths and weak lambs is toxoplasmosis. In each case, these agents also cause other disease signs such as abortion, pneumonia, and diarrhea. However, a higher than expected number of either stillborn or weak lambs may be the "red-flag" that prompts a flock owner to evaluate and investigate the disease status of the flock. Communication among the flock owner, attending flock veterinarian, and diagnostic laboratory personnel is

critical for developing a systematic approach to identifying infectious causes of stillbirths and weak lambs.

Border Disease (Hairy Shaker Disease)
Clinical Signs and Cause. Border disease (BD), which was first recognized in the border region between England and Wales, is now recognized as a disease of sheep worldwide. The hallmark signs of BD are newborn lambs with a hairy rather than wooly birthcoat that exhibit muscle tremors (hence the alternate name of hairy shaker disease). Other characteristics of a BD lamb are small size, low birth weight, weakness, a dome-shaped skull, and a short, blocky appearance. BD lambs have a low chance for survival. If they do survive, the muscle tremors may disappear, but BD lambs will grow at a slow rate and are highly susceptible to other diseases.
A virus closely related to bovine viral diarrhea (BVD) virus causes BD. The effects of BD virus on a fetus depend upon the age of the animal at the time of infection. During the first 90 days of gestation, a fetus exposed to BD virus may suffer a variety of consequences. It may be resorbed, die and become mummified, aborted, or continue its development and be delivered full-term. After 90 days of gestation, a fetus exposed to BD virus can overcome the infection with no detectable signs of disease. Some lambs infected with BD virus in utero and born alive may not develop the hallmark signs of BD. Instead, they may appear normal, but are persistently infected with the virus. The virus lives in cells throughout these lambs. A lamb with a persistent infection is an important reservoir of infection within the flock, because it will shed high numbers of the virus throughout its life every time it sneezes, coughs, defecates, urinates, or bleeds.

Diagnosis. Border disease should be suspected in a flock if any of the previously mentioned clinical signs are observed. Testing serum samples from a group of animals for antibodies to BVD virus can detect if exposure to BD virus has occurred in the flock. A diagnosis of BD is confirmed by isolating the virus from tissue samples sent to a diagnostic laboratory. Most persistently infected animals do not develop antibodies to BD virus so a negative serological test on an individual animal would not rule out the possibility that it has BD. In a flock with a known high prevalence of exposure to BD virus, an animal without a BVD titer should be considered suspicious for persistent infection. Blood from a suspect BD virus shedder (now called "Persistently Infected or PI) can be cultured for the presence of the virus.

Prevention. There is no specific treatment for BD, nor is there any USDA-approved vaccine for its prevention. BVD vaccines for cattle have been tried in sheep to control BD; results have been mixed. The extra-label use of a BVD vaccine, or any other vaccine or drug, can only be prescribed by a licensed veterinarian in the context of a valid veterinarian-client-patient relationship. Efforts to control BD should focus on preventing or minimizing the exposure of susceptible pregnant ewes to the virus. Methods of control include maintaining a closed flock, testing flock additions for exposure to BVD virus before they are allowed to mix with the flock, and identifying and removing persistently infected animals.

Sudden Death: A young lamb that dies rapidly or is found dead with no apparent prior signs of illness is a major frustration to producers. Individual reactions to this event range from panic to unconditional acceptance. Instead of either extreme, a sound approach should be developed to determine the extent of the problem, its cause, and the source of exposure. Then, specific corrective measures can be formulated and implemented to prevent future problems. Like most

disease signs, sudden death has a variety of possible causes. The most common causes include infectious diseases and trauma

Infectious Disease Causes of Sudden Death
The most common infectious disease causes of sudden death in lambs less than three weeks of age are bacteria and the toxins they produce. The bacterial agents include Clostridium spp., Escherichia coli, Salmonella spp., and Pasteurella hemolytica. Since these agents are pervasive in the environment and are normal inhabitants of the respiratory or digestive tracts of animals, lambs will be exposed. But the chances for disease and death are reduced greatly if the lamb consumes adequate quantities of good quality colostrum during the first day of life. In addition, producers should pay close attention to the cleanliness of lambing sites, avoid permanent lambing sites, and disinfect the navel of newborn lambs with a strong iodine solution as soon after birth as possible to avoid problems associated with these agents. The role of colostrum in preventing disease as well as the disease agents *C. perfringens type C, C. tetani, and E. coli* is crucial.

Pregnancy Toxemia in Ewes
Pregnancy toxemia occurs in ewes in late pregnancy. With awareness this can be prevented. Early treatment of affected animals will save many of them.

Pregnancy toxemia in ewes is a metabolic disorder which develops when the body's energy requirements are not being met. In the final two months of a ewe's pregnancy, 70% of the lamb's growth is taking place. It is also an important time for udder development and inadequate nutrition at this stage can detrimentally affect milk production after parturition.

It is therefore a very important phase in the pregnancy and it is very important that the ewe receives adequate nutrition. Though twin carrying ewes are affected more often, single carrying ewes are not exempt.

At a time of increasing energy needs, the enlarging uterus is taking up space in the abdomen, making it more difficult for the ewe to eat enough, especially if her food consists mostly of poor quality roughage. Any stressful event such as sudden cold periods, worm infections, feet or mouth problems, changes in rations or transport can bring on pregnancy toxemia.

Signs
- Separation from the flock, lagging behind the flock when it moves
- Standing still when approached
- Drowsiness
- Standing in water lapping
- Apparent blindness
- Death 2 -6 days after first signs
- Stumbling into objects when moved
- Head pulled back or sideways
- Thick yellow discharge from the nose
- Tremors and spasms of head, face and neck muscles

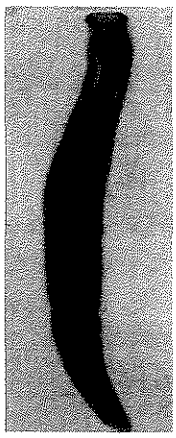
Treatment
Early treatment is necessary for success. Once individual ewes are affected, it is an indication that the rest of the flock is also in trouble and feeding may be inadequate. In the short term they can be helped by providing them with propylene glycol. In the longer term they may need to receive a higher quantity or quality of concentrate and better quality hay.

Treatment options for affected animals:

- Propylene glycol given orally 100ml (30 ml) twice daily,
- Glucose: 20ml of sterile 50% solution given under the skin or intravenously daily to correct the hypoglycemia
- Dose with "Fresh cow drench"

Provide good quality hay and limited grain. TLC is important. Getting ewes to eat is crucial and sometime very challenging.

Ultimately lambing helps the problem a lot…but inducing lambing often results in immature, dead lambs.

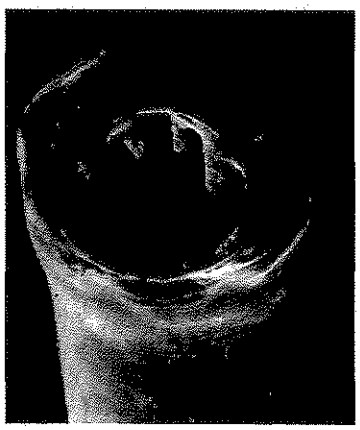


STRATEGIES FOR GENETIC IMPROVEMENT OF PARASITE RESISTANCE IN SHEEP

David R. Notter

Department of Animal & Poultry Sciences

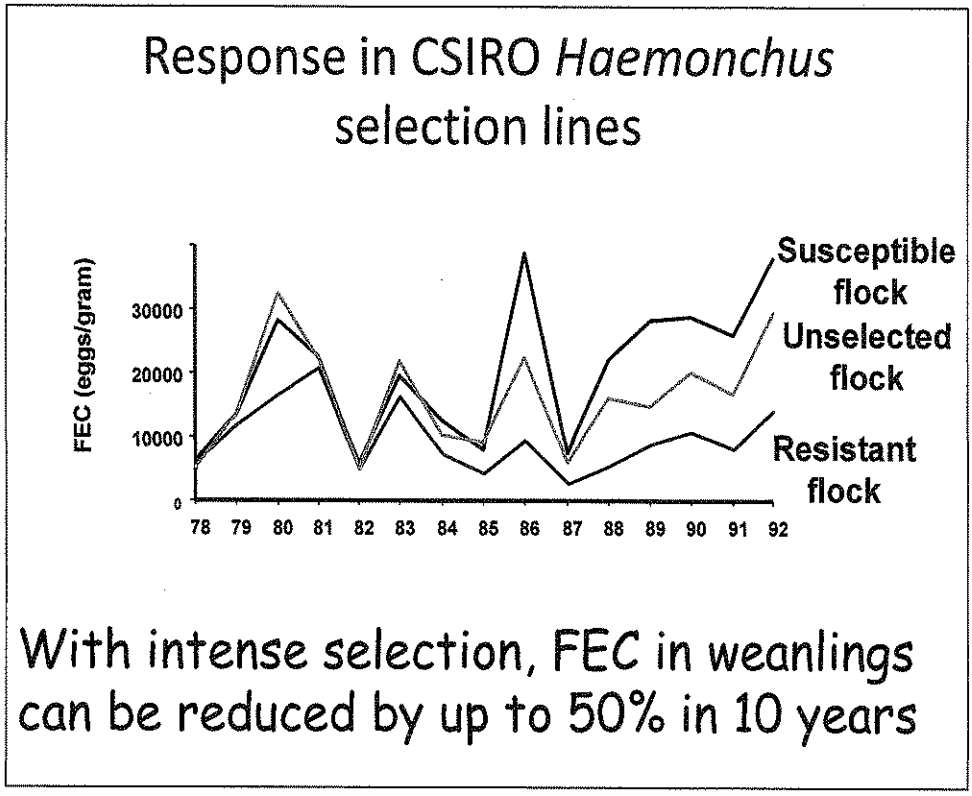
Virginia Tech



MANAGEMENT OF INTERNAL PARASITES IN SHEEP & GOATS
• Parasites are rapidly becoming resistant to ALL available dewormers • Direct marketing of "natural" or organic products is becoming more important, and more profitable • "Easy-care" philosophy is beginning to take hold in small ruminant production • Commodity lamb is becoming rare in the East

STRATEGIES FOR MANAGEMENT OF INTERNAL PARASITES INCLUDE:
• Pasture rotation/use of clean pastures • Strategic deworming, on demand, to reduce development of resistance to dewormers, often involving the FAMACHA system • Alternative dewormers such as copper oxide or tannin-rich forages • Adequate protein during early lactation to allow ewes to better cope with the periparturient rise during lambing and early gestation • Use of genetically resistance sheep types

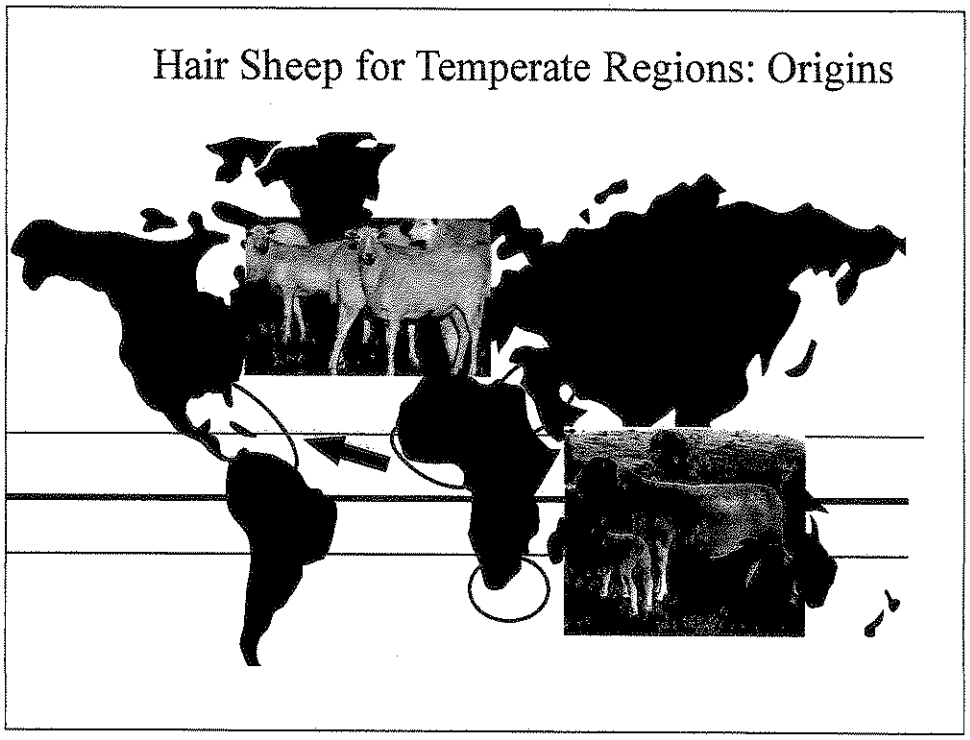
Opportunities to Enhance Parasite Resistance
• Parasite resistance is commonly associated with hair sheep • But that is clearly not the whole story. • Parasite resistance is a quantitative performance trait—no different from weaning weight or loin eye area—and will respond to selection in any breed. • However, innate levels of parasite resistance are highest in Caribbean hair breeds such as the St. Croix and Barbados Blackbelly and in naturally selected wool breeds such as the Gulf Coast and Florida Natives • The Katahdin breed shares some of that genetically mediated resistance • Also, with regard to parasite resistance, all hair sheep are NOT created equal • Breeds of Caribbean origin have generally high levels of resistance • Dorper is much less resistant, as expected from its origins as an arid-lands breed.



This slide shows results of 14 years of intensive, single-trait selection for reduced worm egg counts in Australian Merino sheep. All animals received a large artificially administered challenge dose of infective larvae of *Haemonchus contortus*, the barber-pole worm, which accounts for the very high observed worm egg counts. Animals selected for breeding were those with the lowest resulting worm egg counts, corresponding to the animals with the greatest resistance to infection.

Animals were tested at approximately 14 months of age, which is appropriate for the Australian Merino, who are bred to lamb for the first time at 2 years of age. However, similar results to those shown above would be anticipated from testing and selection of lambs at 4 to 6 months of age in U.S. flocks.

The Australian Merino is typically highly susceptible to internal parasites. This graph shows that there was little measurable response to selection in the first 5 years of the project (to 1982). Some divergence began to be observed by 1983-85, but a clear differentiation among the lines was not observed until after 1987; i.e., until after 9 years of selection. This is probably close to the anticipated result for selection for worm resistance in a highly susceptible breed.



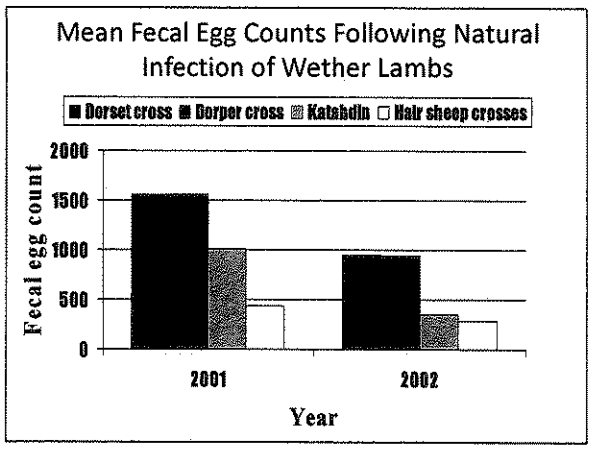
- The ancestors of the Caribbean breeds, such as the St. Croix, came from the bulge of West Africa, a region with a hot, humid climate that is ideal for growth and development of internal parasites. The development of resistance to these parasites was mandatory for survival of sheep in these regions.
- The West African hair sheep were then transported to the Caribbean, often in association with the slave trade. In the subtropical climate of the Caribbean, they again benefited from the parasite resistance they had developed in their home climate and maintained that resistance when eventually imported to the U.S.
- In contrast, the hair sheep ancestor of the Dorper is the Blackheaded Persian, which originated in the Middle East, an environment characterized by an arid climate that was not particularly well suited for development of internal parasites.
- The Blackheaded Persian later migrated down the west coast of Africa, through Ethiopia, Somalia, and Kenya and eventually into South Africa. All these are generally arid regions, where high levels of parasite resistance were again not required.
- Development of the Dorper involved crossing of the Blackheaded Persian with Dorsets in South Africa and their continued use and further development in mostly arid regions of that country.
- Thus the Dorper does not share the same history of intense natural selection for parasite resistance experienced by the Caribbean hair sheep breeds, and is correspondingly considerably less parasite resistant.

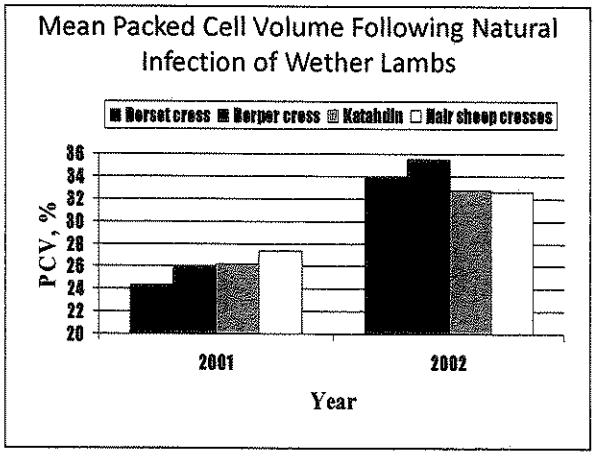
These two charts show the results of a comparison of Dorper crosses, Dorset crosses, Katahdin, and Hair Sheep lambs at the Southwest Virginia Agricultural Research and Extension Center at Glade Spring, VA. Dorset and Dorper crosses were sired by Dorset or Dorper rams and out of crossbred, Polypay-type wool sheep ewes, Katahdin lambs were purebred Katahdins, and the hair sheep crosses were mainly of St. Croix breeding, but with some infusion (perhaps up to one eighth) of Barbados Blackbelly ancestry.

Fecal egg counts did not differ between the Dorset and Dorper crosses, but were significantly lower for the Katahdin lambs, and much lower for the hair sheep crosses. Thus these data show that the Dorper crosses were not more parasite resistant than Dorset crossbreds, and that Katahdin lambs were approximately intermediate to their wool and hair sheep ancestors in worm egg counts.

However, the picture is somewhat different for packed cell volume, out best measure of anemia in the lambs. In 2001 (with high worm burdens), the breeds ranked the same for both PCV and FEC, but PCV for Dorper crosses was considerably higher than for Dorset crosses, even thought the two types had nearly identical FEC. And in 2002, when worm challenge was relatively low, the Dorpers had the highest mean PCV (i.e., were least anemic), even though they had the highest FEC. The Dorper crosses thus appear to have innately higher levels for PCV and to be better able to maintain hemoglobin levels despite parasite infection. This result would explain why Dorpers continue to do well with regard to parasites in regions of mild to moderate parasite challenge, but do not perform well when parasite levels are high.

These charts likewise demonstrate the difference between parasite ***resistance*** and parasite ***resilience***. Caribbean hair sheep are parasite ***resistant***; they are capable of limiting infection and keeping worm numbers (and therefore FEC) low, even in areas of high parasite challenge. In contrast, Dorpers appear to not be parasite resistant (as evidenced by their high mean FEC) but are ***resilient***, in that they can maintain reasonably high hemoglobin levels (and presumably performance levels) despite the presence of worms in the gut. But there is a limit to the protection provided by resilience, in that it can be overcome by high parasite challenge. Also, resistant types shed fewer eggs and have the ability to limit pasture contamination whereas nonresistant, but resilient, types such as the Dorper continue to contaminate their pastures. Pasture contamination can be a particular problem if the ewes are producing crossbred lambs that are both parasite susceptible and lack some of the resilience of their purebred dams.





STRATEGIES FOR MEASUREMENT AND GENETIC EVALUATION OF PARASITE RESISTANCE

Possible indicators of parasite susceptibility include both direct measurements of parasitism such as:

- Fecal egg counts
- Packed cell volume (hematocrit)
- FAMACHA scores

As well as indirect measurements such as:

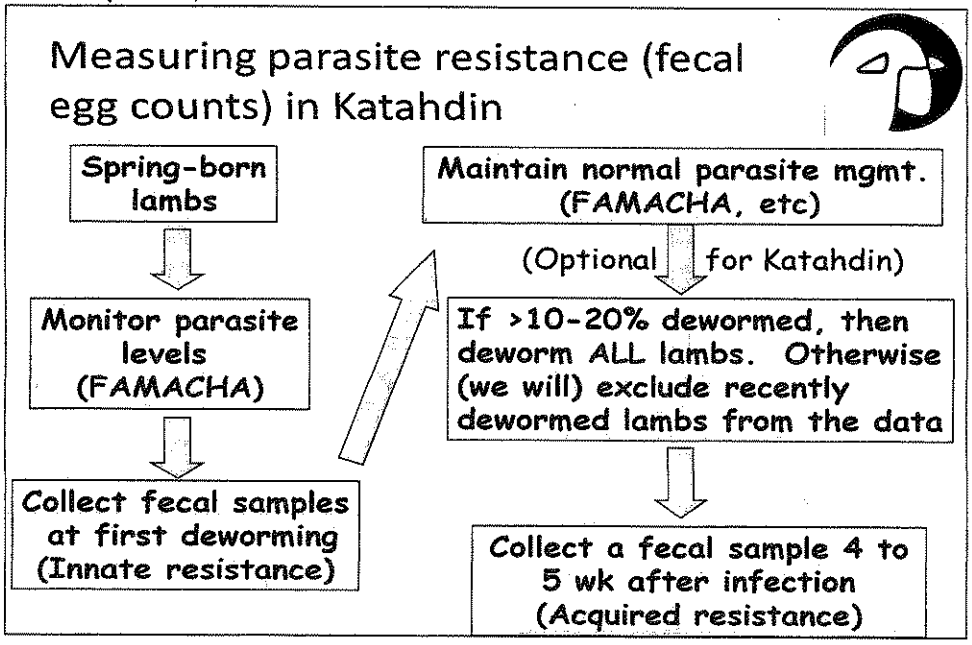
- Summer growth
- Body weight and condition

There have also been several efforts to find DNA markers for parasite resistance. While there has been some success in this search, no clearly useful markers have yet been discovered and adequate validation of potential markers has not yet occurred.

Based on response to selection in Australian Merino and New Zealand Romney sheep, quantitative approaches involving selection for low FEC appears to be the most promising current strategy. The U.S. National Sheep Improvement Program currently provides EPDs for fecal egg counts in Katahdin sheep, providing an opportunity for further improvement in parasite resistance in this breed.

The recommended sampling strategy for measuring FEC in Katahdin sheep is shown below.

- Must measure resistance when worms are present—cannot just set a calendar date
- Must coordinate measurements with the deworming schedule and protocol
- Fecal egg counts appear to be the best measure of parasite resistance
    - Indicative of actual worm burden
    - Obtain by rectal fecal grab samples from each lamb
- How many samples are required and when should they be taken?
    - One or two samples on different days
    - Samples from previously infected lambs at 4-6 mo of age (acquired immunity) seem most reliable and consistent
    - But early measurements (innate or early acquired immunity) also have a genetic component, at least in Katahdins



Three sets of analyses have been conducted to assess genetic control of parasite resistance in Katahdin sheep.

I. Katahdin 2003-05 Fecal Egg Count EPD Pilot Study:

- Six participating flocks, each with at least 2 sires and a minimum of 10-12 lambs per sire
- Total of ~ 850 lambs by 26 sires over 3 years
- Average ages at sampling of ~8 and ~22 weeks
- Heritabilities for FEC
  - 0.48 at 8 wks
  - 0.54 at 22 weeks
  - genetic correlation of 0.50 between measurements at the two ages.

II. Ohio SARE On-Farm Research Project:

- A farmer-led project involving 10 flocks
- Measure FEC at approximately 8 wk (n = 244), 13 wk (n = 289), and 17 wk (n = 139)
- Heritabilities were again very high:
  - 0.41 at 8 weeks
  - 0.52 at 13 weeks
  - 0.54 at 17 weeks

III. Katahdin 2006-07 Fecal Egg Count EPD Analysis:

- Three different measurement ages:
  - Early-season FEC (innate resistance) at 35 to 92 days.
  - Mid-season FEC shortly after weaning at 65 to 127 days.
  - Late-season FEC at 92 to 184 days. All records, regardless of level of FEC
- Two different sets of lambs:
  - All lambs, regardless of level of FEC
  - Only groups with Mean FEC > 500 epg
  - Included or excluded ***entire group***, not individual lambs
  - Still had individual lambs with zero FECs, but only within groups with mean FEC > 500.
- Results are shown on the following page.

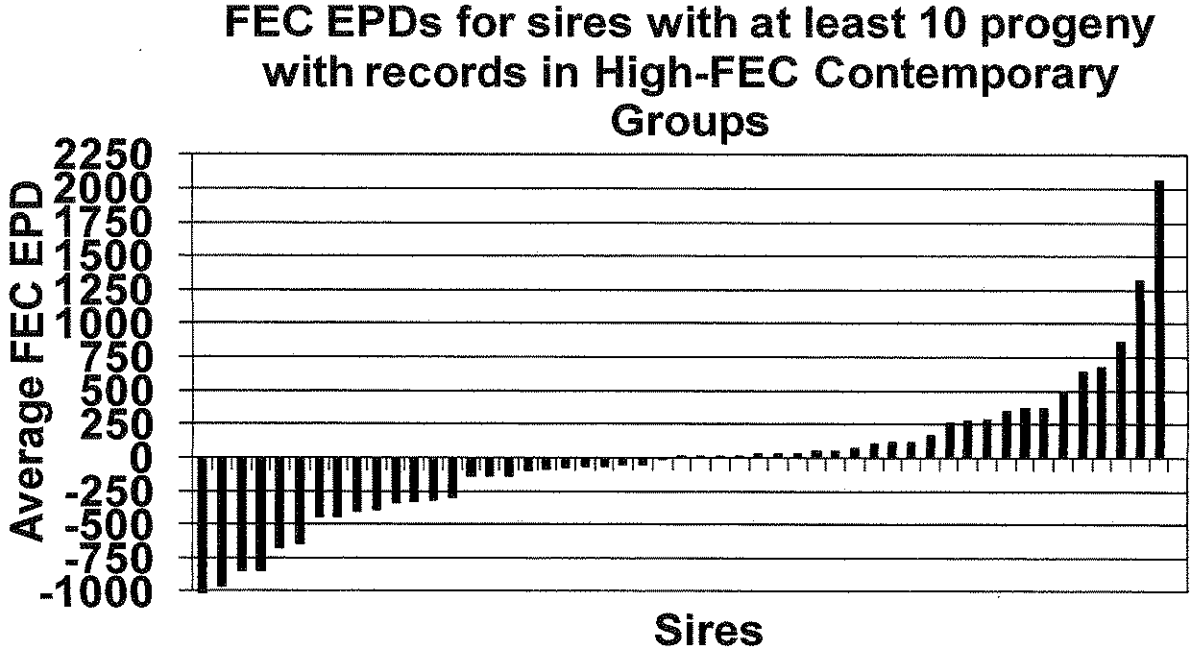
Heritabilities derived from all the data were somewhat lower than those obtained in previous studies and were more typical of those reported in the international scientific literature. However, heritabilities derived from only the high-FEC groups were again quite high, suggesting considerable potential for genetic improvement of parasite resistance in Katahdin sheep.

There was also a strong additional resemblance among littermates beyond that anticipated from their genetic relationship alone. The cause of this additional resemblance is not clear, but may involve antibodies provided by the ewe, effects of milk production on ability to cope with parasite infection, or common grazing sites (and therefore common levels of parasite exposure) for the littermate lambs.

	All Data			High FEC Data		
	Early	Mid-	Late	Early	Mid-	Late
Heritability	0.42	0.33	0.28	0.27	0.65	0.51
Litter (Maternal)	0.18	0.25	0.33	0.34	0.11	0.29

Genetic correlations among measurements taken at different ages were substantial, especially when data were restricted to high-FEC groups. Two particular results stand out: 1) the mid- and late-season measurements, taken at average ages of approximately 90 and 120 days, were almost perfectly correlated, suggesting that the Katahdin immune system is mature by around 90 days; 2) while the correlations involving the early-season FEC were somewhat lower than those involving later measurements, they were still very high (genetic correlations above 0.76, suggesting that selection based on FEC measurements taken at young ages (6 to 10 weeks) would be effective in improving overall parasite resistance.

Correlations	All data			High FEC Data		
	Early-Mid	Early-Late	Mid-Late	Early-Mid	Early-Late	Mid-Late
Genetic	0.79	0.30	0.76	0.85	0.76	0.99
Phenotypic	0.20	0.34	0.28	0.55	0.38	0.95



This chart shows fecal egg count EPDs for 51 Katahdin sires with at least 10 progeny in high-FEC groups. EPDs are indicators of genetic merit and predict differences among sires in the mean future performance levels (in this case, FEC) of their progeny. These FEC EPDs are adjusted to a flock mean for FEC of 2,000 eggs/gram of feces and show remarkably large differences among the sires in predicted progeny FEC, ranging from -1,000 to over +2,000 eggs/gram.

- Rapid genetic improvement generally requires:
  - Accurate animal evaluation = high heritability and/or progeny testing
  - Intense and timely selection: keep only the best and do not delay in choosing replacements
  - Variation within the population: the more variation that is present, the easier it is to identify the best
- However, all these characteristics rarely occur together:
  - Highly heritable traits generally are less variable that lowly heritable traits
  - Progeny testing increases accuracy but takes lots of time
  - Rapid turn-over of the flock limits the accuracy that can be achieved for an individual animal
- But all are present for FEC, suggesting that very rapid rates of genetic improvement may be possible:
  - Heritabilities are relatively high at 25% and appear to be very high (near 50%) in Katahdin
  - Very high levels of variation for FEC
  - Animals can be successfully evaluated early in life
  - In pedigree flocks with EPDs, progeny testing can occur along with the individual evaluations

PRACTICAL SOLUTIONS FOR ON-FARM MORTALITY DISPOSAL[1]

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Tidewater AREC, Virginia Tech

Introduction

Within any livestock enterprise some animals die before being processed or marketed. This is a fact of life for any species on large and small operations, including those that are well managed and those that are poorly managed (although death losses are typically greater on poorly managed farms). These death losses or "mortalities" may be broadly classified as catastrophic or routine. Catastrophic mortality events involve death losses of substantial magnitude as might result from a barn fire, hurricane or flood or entry of an epidemic disease. An extreme example is the Foot and Mouth Disease (FMD) epidemic that occurred in the United Kingdom in 2001. On 2,030 premises within in small geographic area this event resulted in the death or destruction of 3,297,385 sheep, 595,884 cattle, 144,931 pigs and 2,368 goats along with the necessity of associated carcass disposal (Scudamore and co-workers, 2002). Mortality disposal in catastrophic situations requires oversight and approval of agencies such as the state veterinarian office and health, environmental or regulatory agencies. The topic of this brief paper is disposal of routine mortality. These losses can be expected to occur and fluctuate throughout the course of production and may include stillborn lambs and afterbirth, nursing and weaned lamb mortalities and occasional breeding sheep losses.

Importance of Proper Mortality Disposal

Within the past 10 to 15 years, disposal of routine livestock mortality has received greater attention for improvement. This period coincides with development of larger more intensive swine, dairy and poultry farms which may have made the problem more visible. In addition mortality management and disposal is not considered a profit center and does not create return on time and investment as do improvements in breeding efficiency, lambing rate, growth rate and carcass value. Regardless of farm size and despite the fact that mortality disposal is not a specific profit center, there are a number of reasons why mortality disposal is important and should be done well:

1. Farm bio-security and disease control.
2. Preventing attraction of predators and varmints.
3. Esthetics and public perception of the farm.
4. Morale of farm family members, employees and visitors.
5. Environmental protection.
6. Nuisance avoidance and regulatory compliance.

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[1] Prepared for the Virginia – North Carolina Shepherds' Symposium, January 8-9, 2010, Alphin-Stuart Livestock Arena, Plantation Road, Virginia Tech, Blacksburg, Virginia. Contact: Allen Harper, Virginia Tech Tidewater AREC, 6321 Holland Road, Suffolk, VA 23437; email: alharper@vt.edu; telephone 757-657-6450, ext. 410.

Methods of Disposal

There are strengths and limitations associated with the various methods of mortality disposal currently in use. The methods chosen for any given farm will depend on farm circumstances, regulatory requirements, operational costs and producer preferences. Some traditional methods such as burial are being discouraged or eliminated from a regulatory standpoint. Recently the Virginia Department of Environmental Quality (DEQ) has released a preference hierarchy for methods of animal mortality management indicating the agency's most preferred to least preferred methods (Table 1).

Table 1. Virginia Department of Environmental Quality animal mortality disposal method preference hierarchy (DEQ, 2009)*.

Preference level	Mortality Disposal Method:
1st	Rendering to recycle animal mortality to useful products of commerce
2nd	On-site composting to convert animal mortality back to stable soil nutrients
3rd	Concentrated animal composting at DEQ permitted composting facilities
4th	Incineration using a DEQ permitted incinerator to sanitarily dispose of mortality
5th	Landfill burial in a permitted sanitary landfill (if permitted by local landfill)
6th	On-site burial on the premise the animal mortality is generated

*Available at: http://townhall.virginia.gov/L/ViewGDoc.cfm?gdid=3969

Rendering. There are good reasons why DEQ would indicate rendering as the most preferred method of mortality disposal. Livestock mortality, a product that is essentially a valueless liability can be rendered into useful products that have commercial value such as rendered fat and meat and bone meals. Historically the process involved renderer pickup in specially designed trucks or producer delivery to a commercial rendering plant for processing of dead stock. This option was attractive to producers because renderer pick-up was typically at no cost and producer delivered material would actually result in small payments based on weight of dead stock.

However, developments over recent decades have made commercial rendering essentially nonexistent as a mortality disposal option for sheep producers and many other small livestock producers. In 1989 U.S. rendering plants began excluding sheep carcasses because of the potential for use of rendered sheep products infected with scrapie as feed ingredients to contribute to bovine spongiform encephalopathy (BSE or mad cow disease). In 1997 the US Food and Drug Administration (FDA) banned the feeding of most mammalian derived rendered proteins as feed supplements to ruminants, a ruling that still exists with some modifications. The net result has been a reduction in value of meat and bone meal and reduction or elimination of demand for dead stock by independent renderers.

Incineration. Incineration refers to the burning of material to the point that the resulting end products are heat, gaseous emissions, and residual ash. Burning mortality in open-air pyres is objectionable from an esthetic and environmental standpoint. In addition most state regulations, including Virginia's, prohibit open-air burning for mortality disposal. However,

fuel-assisted (diesel or LP gas) fixed-facility incinerators specifically designed for livestock and poultry mortality disposal are available and used effectively in the industry.

Commercial incineration units come in various models and capacities to accommodate different animal sizes and loading rates. Costs excluding delivery and hookup may range from $5,000 to $7,000 for a 700 lb. load capacity unit with larger models costing more and smaller models less. Addition of a secondary burn chamber or "afterburner" on any unit increases costs, but is required by Virginia law. A published estimate of fuel use is 1.35 gallons per 78 lbs. of mortality burned in units equipped with an afterburner (Henry and co-workers, 2001).

Use of a commercially installed incinerator has the advantage of bio-secure on-site disposal, but installation and operational costs associated with fuel use are potential drawbacks. In Virginia the greatest potential limitation, especially for small operations, is that operation of a solid waste incinerator requires obtaining and maintaining a specific permit from the Virginia DEQ air division.

Burial (on-farm and public landfill). Historically burial has been a commonly used method for the disposal of livestock mortality. But as viewed currently by DEQ and other environmental agencies, on-farm or public landfill burial are the least preferred methods of dead livestock disposal. This is mainly related to the potential for soil and groundwater contamination, a concern that has increased as some livestock and poultry operations have become concentrated on fewer but larger farms. Research is limited but there is evidence that burial of livestock mortality does pollute soil and groundwater at and near the site, and actual decomposition of the animal tissues within burial pits is slow (Glanville, 2000; Engel and co-workers, 2004).

On commercial farms burial typically involves using a backhoe to dig a narrow trench in which dead stock is placed and covered with compacted soil. Practical problems encountered may be water draining and pooling in the trench, particularly if it is built larger to accommodate future mortalities. There is also the difficulty of digging in frozen soil during winter months. Although Virginia DEQ discourages burial as a disposal method, the agency has issued a guidance document for burial (http://townhall.virginia.gov/L/ViewGDoc.cfm?gdid=3969). This is in response to the fact that some producers have limited options for mortality disposal. Table 2 provides a summary of DEQ burial criteria from the guidance document.

In some cases local landfills may accept livestock mortalities on a fee basis. Fees and acceptance and delivery conditions will vary across localities, so producers should contact local authorities to determine if transport to a landfill is a viable option for their situation.

On-farm composting. Mortality composting was originally developed as a means of disposing of dead birds on poultry farms. Subsequently the practice was adapted as a method of disposing of livestock mortality including hogs, sheep and cattle. When performed properly, composting converts dead animals into components of an organic residue that can be used as a soil amendment and fertilizer. If properly set-up and managed, composting units present minimal risk for air, soil or water contamination. The operative words here are *properly set-up*

and managed. A poor or inattentive approach to mortality composting will give the expected poor results and associated odor, leaching and fly problems.

Table 2. Virginia DEQ animal burial guidance document summary (DEQ, 2009)

Burial shall occur on the property which is used for the raising or husbandry of the livestock.
The carcass shall be buried within 48 hours of death and prior to creation of an open dump, hazard, or nuisance situation.
Each carcass shall be buried in a separate pit (i.e., one carcass per pit).
There must be at least two acres that are able to meet the site criteria for burial pits as follows. Burial pits shall not be within: • 50 ft. of the property boundary; • 100 ft. of any surface waters; • 200 ft. from any well used as a drinking water source; • 50 ft. from caves or sinkholes; • 50 ft. of rock outcrops; • a 25-year floodplain as defined by FEMA or local planning officials; • 2 ft. from the seasonal high water table (refers to the bottom of the burial pit); • areas where bedrock occurs at a depth of less than 5 ft.; • 200 ft. from any off-property residence, health care facility, school, recreation park, daycare or similar public institution; and • 25 ft. from all other buildings and structures.
The carcass shall be buried deep enough to cover the top of the carcass with at least two (2) ft. of compacted soil to keep other animals from unearthing the carcass.
Carcasses shall not be buried deeper than 6 ft. below grade.
On-site burial is limited to 2,000 lbs. of dead animals on any given acre per year.

Composting is a natural biological process of decomposition of organic materials in a predominantly aerobic environment. During the process, bacteria, fungi, and other microorganisms break down organic materials into a stable mixture called compost while consuming oxygen and releasing heat, water, carbon dioxide and other gases. Four variables are considered critical to successful composting: (1) moisture content (40 to 60%), (2) temperature (113 to 140° F), (3) oxygen concentration (10% desirable level), and (4) carbon: nitrogen ratio (20:1 to 30:1 desirable range). Temperatures of at least 131° F for a least 3 consecutive days are generally needed to kill pathogens; destruction of weed seeds that can make finished compost undesirable for agronomic purposes requires temperatures of at least 140° F.

When composting sheep or other livestock mortality, the carcasses, which are nitrogen-rich, are fully covered with and allowed to react with carbon-rich bulking materials such as coarse sawdust, wood chips, cotton gin trash, chopped straw, chopped hay, chopped corn stalks or similar material. Naturally occurring bacteria in the mixture then cause the conversion of these components into humic acids, bacterial biomass and compost.

In mortality composting, it is essential that each carcass be fully surrounded and covered with bulking material to allow for complete interaction of carbon- and nitrogen-rich materials and to absorb moisture and odors released by the carcasses. The bulking material also serves as

an insulator to retain the heat and moisture that is generated during the composting process. If mechanically chopped to reduce particle size, straw, corn stover and waste hay make suitable carbon-rich bulking (cover) material. However, in long form these materials tend to form mats that impede the composting process. Poultry litter has been used successfully as bulking material for mortality composting, but due to its high nitrogen content, it is best when blended with other more carbon-rich materials. When bulking materials are too dry when placing dead stock into a compost pile, it may be necessary to add water to promote the composting process. On the other extreme an excessively wet or water logged compost pile excludes air from within the pile restricting the composting process.

If properly located it is feasible to safely perform mortality composting in exposed piles on compacted earth. Round hay bales (Figure 1), tubular steel gate panels and old round bale feeders have been used to form pile enclosures for this method of mortality composting. However, the best managed compost units are those that have a dedicated structure with constructed bins that hold static piles of mortality compost in various stages of maturity. These permanent multi-bin structures are typically constructed on concrete surfaces to facilitate scooping, moving and turning of the material (Figure 2). Plumbing a water source to the compost unit is helpful to allow efficient application of water to the compost piles when necessary.

The static-pile passively ventilated composting process has been described as using primary, secondary, and storage or curing phases. Early definitions of these phases were based on the observation that initial carcass decomposition was accompanied by moistening, weakening, and compaction of the cover materials, leading to decreased diffusion of oxygen into the pile and declining temperatures and decomposition rates. At this stage, it became necessary to turn the pile to break up wet zones and to introduce more oxygen and moisture, if needed, in order to reactivate aerobic microbial activity and stimulate a "secondary" cycle of heat production. After completion of the secondary heating cycle, soft tissue decomposition generally was complete and the compost was sufficiently stable to be stockpiled before land application. In practice, most livestock mortality compost is turned only one or two times. Turning speeds carcass decay, but research has shown that turning is not essential if the carbon material used to cover the carcasses is sufficiently permeable for oxygen diffusion into the pile (Harper and co-workers, 2008).

As static pile and windrow pile composting has caught on some livestock farms, commercial companies have developed mechanical systems to facilitate and speed up the mortality composting process. These include forced air systems in which fan-driven air is forced through compost piles using a system of PVC pipes below the piles, and elongated rotating drum systems in which mortalities and carbon material are placed in one end of the drum and composted material is removed from the opposite end after the process is complete. These commercial systems are being installed on some large livestock farms, but high initial costs make them less feasible on small operations.

It is feasible to recycle some secondary phase or cured mortality compost back into new mortality compost piles. Experience indicates that recycled mortality compost should make up no more than half of the cover material when new piles or bins are being loaded with fresh mortalities. At some point cured or stockpiled mature mortality compost must be land applied. Although quite variable from batch to batch, livestock mortality has a nutrient and soil

amendment properties similar to poultry litter. The material can be applied using standard dry manure application equipment and is an effective source of plant nutrients when applied to forage and crop land at agronomic rates. A compost nutrient analysis coupled with soil testing enhance the ability to utilize the material effectively.

Regulatory personnel at DEQ have indicated that, when it is performed properly, composting to dispose of routine livestock mortality is exempt from permit requirements under an agricultural exemption. As for burial, the agency has published guidelines for mortality composting which can be viewed at http://townhall.virginia.gov/L/ViewGDoc.cfm?gdid=3968.

Summary

Even on well managed livestock farms some animals will die before being processed or marketed. This is true for operations running small sheep flocks as well as for very large hog or dairy operations. Regardless of operation size or type, it is critical that routine livestock mortalities be disposed of properly for many reasons including human and animal health, prevention of predators, esthetics and public perception, morale of personnel, environmental protection, nuisance avoidance and regulatory compliance. Delivery to rendering plants, once a viable option, is essentially nonexistent as a mortality disposal option for sheep producers today. Incineration using fuel-fired commercial units can be quite effective but has the requirement for a DEQ air division permit and significant fixed and operational costs. On-farm burial is another traditionally used mortality disposal method. But, due to soil and groundwater protection concerns, DEQ and other agencies discourage this method. The DEQ does recognize that small farm operators have limited disposal options and has issued a set of guidelines for burial when other methods are not feasible. Public landfill burial may be available in some localities but producers must check with local agencies to determine the feasibility of this option. Composting, when performed properly, can be an effective option for mortality disposal on sheep and other livestock farms. Like any management practice, certain procedures and guidelines must be followed for good results with mortality composting. Although directed at swine mortality disposal, a source for mortality composting procedures and guidelines is Virginia Cooperative Extension publication 414-020, *Composting for Mortality Disposal on Hog Farms* (http://pubs.ext.vt.edu/414/414-020/414-020.html).

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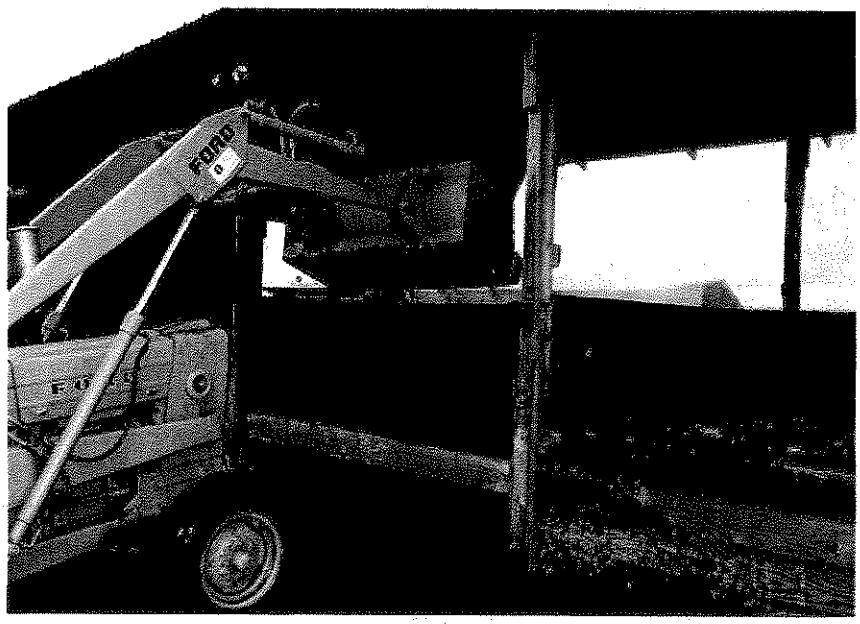
Figure 1. Old round hay bales being used to form an enclosure for mortality composting.

Figure 2. A pole-type multi-bin mortality composting shed.



Outstanding Sheep Producer Award Recipients

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

MAKING THE MOST OF LAMB MARKETING

Mike Carpenter
VDACS Livestock Marketing

As we look back at 2009, lamb (and goat) prices were certainly the bright spot in the livestock industry. We saw some upper $90's during the summer and spent the rest of the year over $100/cwt. Compare this to: slaughter cattle prices in the low to mid $80's and feedlots losing $100-200 per head at times; hog prices in the $30's most of the summer (they are now around $48); milk prices below production costs for most of the year which forced many producers out of business and others deep in debt. So let's be thankful that we have a product that is in demand in these economic times. Lamb production is at historic lows and it is a simple supply – demand situation that producers are on the good side of. What is driving this demand? Many of the Ethnics (people from different cultures around the world who move here) are lamb and goat eaters. They are the first and second generation to live here and they bring their culture with them. Eating lamb and goat is a high priority for them and they will sacrifice in other areas of living if they need to. Other ethnics who have been here for 3-4-5 generations get Americanized and eat more like the natives. Their kids get to know our kids, go to school together, and begin to take on more of our tendencies. Can you imagine the curious looks someone gets if they buy a lamb or goat at the market, put it in the back seat or trunk of their car, and drive off? How many generations will continue to do this?

There were two periods of peak prices, the highest coming in February-March when lamb numbers were extremely low. Many butcher shops were losing money on lamb, but paid the high prices (up to $180/cwt) for a short while just to keep some lamb in the meat case. The high prices also caused some cuts to be sold rather than the whole carcass. The second peak came in November-December. Eid-ul-Adha (Eid) is the highest demand holiday for those who follow Islam. In November at special sales here in Virginia, 90-110 pound lambs brought $111-133/cwt with a few up to $140. 70-90 pound lambs brought $120-144, with a top of $156 paid for a group of ram lambs (with tails and horns) at Madison. Prices were the same here in Virginia as they were in New Holland. Prices in New Holland were actually higher the Monday after Eid. Why? November 23rd there were 7,000 lambs and goats for sale. November 30th there were 1,000 – not enough to supply normal market channels. We have seen this trend as more people target the 1-2 week window before big holidays and this leaves a large void in numbers after the holiday. We also saw this at Christmas. Monitor these changes as opportunists will react.

So rather than making the best of a bad situation, how do we make the most of good prices?

1. Get Informants.

   Find someone knowledgeable about the market place and find out what may be the best time or times to sell what you have. They could be a trucker, livestock market operator, VDACS personnel, other producers, order buyers, butchers, or your neighbor – particularly if they are part of the Ethnic community. Hispanics, Muslims, Jamaicans, Africans, Ethiopians, Poles, other eastern Europeans, Middle Easterners – almost any recent immigrants may be a potential customer.

2. Know the peak demand and low supply periods.

   See the Ethnic Holiday Calendar for important dates. Notice that the Muslim holidays get 10 days earlier each year. Eid-ul-Adha offers the highest demand from the Muslim community. Not all holidays cause an increase in demand. The Jewish holidays in September may cause lower prices because the slaughter plants may be closed for 2-3 days per week for 3-4 weeks. For the foreseeable future, we will have low numbers in the February-March period, which should translate into higher prices. As more opportunists realize this, it may change. Consider fall lambing – work the prices into your production systems and feed supply situations. It may still be profitable with higher production costs. Fall born club lambs are in short supply.

3. Know what is in demand for the different holidays.

   Hothouse lambs for Christmas and Easter need to be young, milk-fed, and look fresh when they enter the sale ring. Because of this, some buyers want them as close to the holiday as possible. Greek Easter wants a 50-60 pound lamb. Eid is definitely a good time to sell cull ewes and rams. The most desired weight of lambs for Eid is 90-120 pounds. Some of the lighter lambs sold this past November actually went on feed. When you look at most of the year, the highest returns per head are for the heavier lambs.

4. Identify your wether and ram lambs.

   Certain buyers have a year-round preference for male lambs and are willing to pay more for them. At special sales in November, the highest prices were for the ram lambs. Groups of wethers were next and $10-20 more than ewe lambs. At one sale a group of mixed ewe and wether lambs were the cheapest of any group – the buyers who wanted only male lambs would not bid on them. Identify by tagging in different ears, ear notching, or some other system that works for you.

5. Properly manage tails and intact males.

   If you choose to leave tails on, you will need to control parasites so they don't get messy rear ends – which can lead to price discounts. If ram lambs become sexually active and you separate them from the ewe lambs, keep them at a distance, not in the adjoining field. One producer monitored weight on a group of ram lambs pastured next to a group of ewe lambs. They rams didn't gain because they spent a lot of time walking the fence.

If you send lambs to New Holland you will need more than an informant. You will need someone to look after the animals, to ensure they get hay and water to minimize weight loss. Someone who knows the best time to get them there. I wouldn't recommend just sending them without making some arrangements and phone calls.

I have mentioned a couple of times how conditions have changed. They will continue to change. That's why it's important to stay connected and don't assume that this year will be like the last. A small amount of research can pay big dividends.

Ethnic Holiday Calendar 2008-2012

Holiday	2008	2009	2010	2011	2012
Eid ul-Adha Festival of Sacrifice	December 9	November 27	November 16	November 6	October 25
Muharramn/ Islamic New Year	December 29	December 18	December 7	November 26	November 15
Mawlid al-Nabi Prophet's Birthday	March 20	March 9	March 20	February 15	February 4
Start of Ramadan Month of Fasting	September 2	August 22	August 11	August 1	July 20
Eid ul-Fitr Festival of Fast Breaking	October 2	September 20	September 10	August 31	August 19
Passover/Pesach	April 20-27	April 9-16	March 30-April 6	April 19-26	April 7-14
Rosh Hashanah	September 30	September 19-20	September 9-10	September 29-30	September 17-18
Chanukkah	December 22-29	December 12-19	December 2-9	December 21-28	December 9-16
Western Roman Easter	March 23	April 12	April 4	April 24	April 8
Eastern Orthodox Easter	April 27	April 19	April 4	April 24	April 15
Christmas	December 25				

Source of dates: Interfaith Calendar

Explanation of Holidays

Muslim Holidays

Ramadan is the ninth month of the year in the Islamic calendar. A fast, held from sunrise to sunset, is carried out during this period.
Eid-al-Fitr is a festival that ends the fast of Ramadan. In Arabic "Eid" means "festival" or "festivity."
Eid-al-Adha is second in the series of Eid festivals that Muslims celebrate. It concludes the Hajj and is a three-day festival recalling Abraham's willingness to sacrifice his son in obedience to Allah (God).
Muharram is the first month fo the Muslim year. Its first day is celebrated as New year's Day.
Mawlid al-Nabi is a celebration of the birthday of the Prophet Muhammad, the founder of Islam.

While the two Eid Festivals are always on the same day of the Islamic calendar, the date on the Western calendar (the Gregorian calendar) varies from year to year due to differences between the two calendars, as the Islamic calendar is a lunar calendar and the Gregorian calendar is a solar calendar. Furthermore, the method used to determine when each Islamic month begins varies from country to country. Future dates listed are only estimates.

Jewish Holidays

Passover is a holiday beginning on the 14th of Nisan (first month of the religious calendar, corresponding to March–April) and traditionally continuing for eight days, commemorating the exodus of the Hebrews from Egypt. Also called *Pesach.*
Rosh Hashanah is the Jewish New Year. It is marked by solemnity as well as festivity.
Chanukkah is the Jewish festival of rededication, also known as the festival of lights. It is an eight day festival beginning on the 25th day of the Jewish month of Kislev.

Jewish holidays are celebrated on the same day of the Jewish calendar every year, but the Jewish year is not the same length as a solar year on the Gregorian calendar used by most of the western world, so the date shifts on the Gregorian calendar.

Christian Holidays

Easter is a Christian feast commemorating the Resurrection of Jesus after his crucifixion. The Orthodox Eastern Church calculates Easter somewhat differently, so that the Orthodox Easter usually comes several weeks after that of the West.

Eastern Orthodox Christians come from a variety of ethnic backgrounds: Greek, Russian, Egyptian, Romanian, Serbian, Ukrainian, Armenian, Bulgarian, Georgian, Albanian, Ethiopian, Syrian, and American.

Recommended Links

www.timeanddate.com
www.sheepgoatmarketing.info
Interfaith Calendar
What is Your Religion . . . If Any?

Last updated 13-Nov-2008 by Susan Schoenian.

Return to the Maryland Small Ruminant Page.

EWE NUTRITION AND MANAGEMENT; DO'S AND DON'TS

Dr. Mark A. McCann
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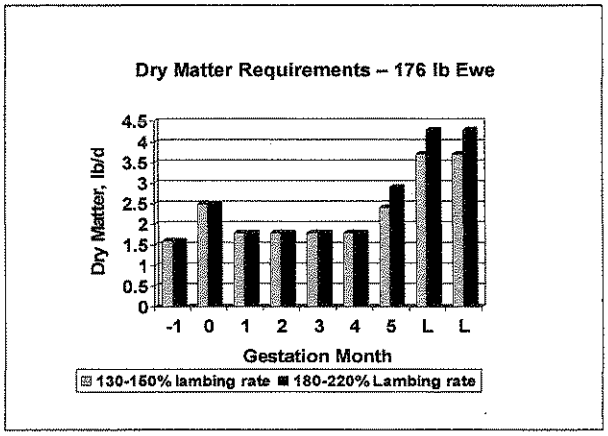
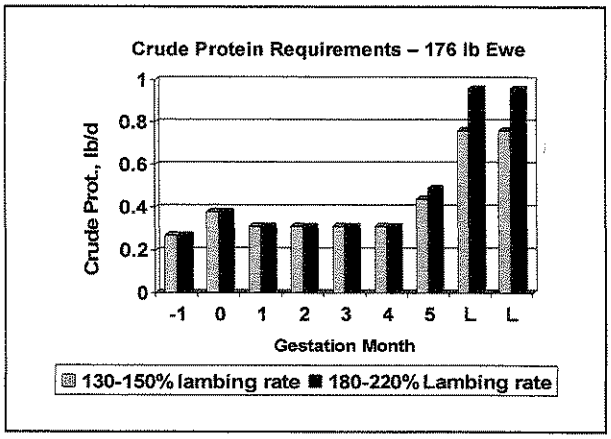
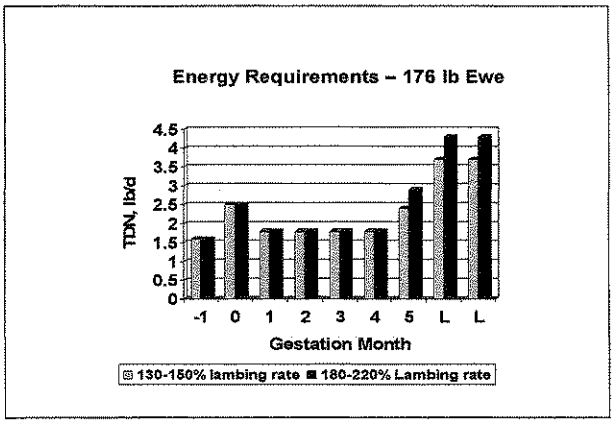
Ewe nutrition and management play critical roles in both the performance and profitability of a sheep enterprise. Incorrect assumptions or errors can negatively impact ewe and lamb performance while overcompensation with supplements can reduce the chance of profitability. The following is offered as recommendations to prevent either occurrence.

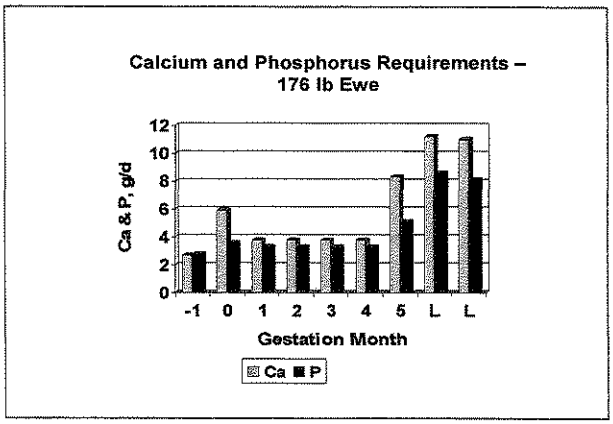
The fundamental issue of ewe nutrition is well documented and it is important to begin with the basics. The following figures document ewe requirements for dry matter, crude protein, TDN and calcium and phosphorus by month of gestation and lactation. It is essential to be aware of the ewe's nutrient requirements as you map out a strategy to meet them. Research and experience have demonstrated that underfeeding is false economy and can lead to reduced lambing rate, low birth weight, poor lamb vigor and reduced milk production. On the other hand, being too quick to supplement can result in fat ewes and thin wallets.

- Do make a proactive strategy of meeting ewe nutrient needs
  - Matching forage resources to ewe needs
  - Group as possible by nutrient need (age, TOB)









Grazed or stored forages are the foundation of any ewe nutrition program. Table 1 provides supplementation recommendations related to the TDN and crude protein content of hay. Spring lambing flocks can take advantage of new pasture growth which is very digestible and high in protein. Generally, this will meet the nutrient needs of ewes nursing singles. Ewes nursing twins will respond to low levels (1-1.5lb/d) of energy supplementation.

- Do forage test stored hay
- Do maximize grazed forages while minimizing hay needs
- Do consider lambing season in view of quality pasture

Table 1. Forage Quality and Supplementation (176 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 -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

** Note 1.5lbs of corn gluten feed can replace 1.0 lb corn and .5 lb soybean meal

- Do monitor body condition of the ewe to determine if your nutrition program is on target.

Stage of Production	Suggested Body Condition Score
Maintenance	2
Breeding	3
Early Gestation	2+
Late Gestation	3
Lambing	3+
Weaning	2

- Do manage pregnant ewe lambs differently
  - Manage and feed the ewe lambs separately from the older ewes
  - 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 shortchange them 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.

- Don't underfeed during gestation
  - Short periods of nutrient restriction or longer periods of mild nutrient restriction during early gestation can reduce placenta growth and ultimately limit lamb birth weight.
  - In late pregnancy the ewe's requirements for energy and protein increase rapidly, 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.
  - Nutrient restriction during last third of gestation can also reduce colostrum quality and quantity. Coupled with the impact on birth weight, late gestation is critical to lamb vigor and survival.
  - The timing of late gestation supplementation is impacted by fetus number-
    5-6 weeks pre-lambing for ewes carrying triplets
    3-4 weeks pre-lambing for ewes carrying twins
    1-2 weeks pre-lambing ewes carrying singles

- Do feed supplemental energy as needed to avoid pregnancy disease

- Don't neglect Se and Vitamin E supplementation
  - Selenium and Vitamin E are both critical micro nutrients for lamb survival. Se can be added to sheep feeds at .3 ppm (2.0 ppm is toxic). Selenium crosses the

placenta so newborn lamb Se status is a reflection of their dam's. Vitamin E does not cross the placenta, so the only source for newborns is ewe's milk or injection. Vitamin E is not toxic so feeding 50-100 IU per day is recommended.

- Don't increase feed level to ewes while in the lambing pen

- Don't use cattle mineral mixes or trace mineral salt. Copper levels are too high and are toxic to sheep.

- Do stop supplementation of the flock 7-14 d before weaning. 48 hr feed and 24 hr water removal at weaning is effective in drying ewes up and reducing mastitis.