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SUPPLEMENT TO THE SHEPHERD MAGAZINE

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Caring for Sheep • Wool Care & Shearing • Guardian Animals*



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A SPECIAL PUBLICATION OF THE SHEPHERD MAGAZINE

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Welcome to the Shepherd's Guide!

Every month, The Shepherd produces a magazine packed full of information every sheep producer needs, complimented by images of sheep breeds and production systems from one side of the country to another. That's why it was so hard to pick some of our favorite articles from the magazine to include in this special Shepherd's Guide – there is just so much to pick from!

We've selected a range of pieces that address common issues each sheep producer must deal with, whether new to sheep, or the more seasoned shepherd:

- Scheduling when to do what;
- Knowing small ruminant nutrition and mineral requirements;
- Learning how to manage for optimal breeding and lambing;
- Addressing routine care; and
- Dealing with problems.

In addition, we've added sections on guardian animals, and wool care and handling.

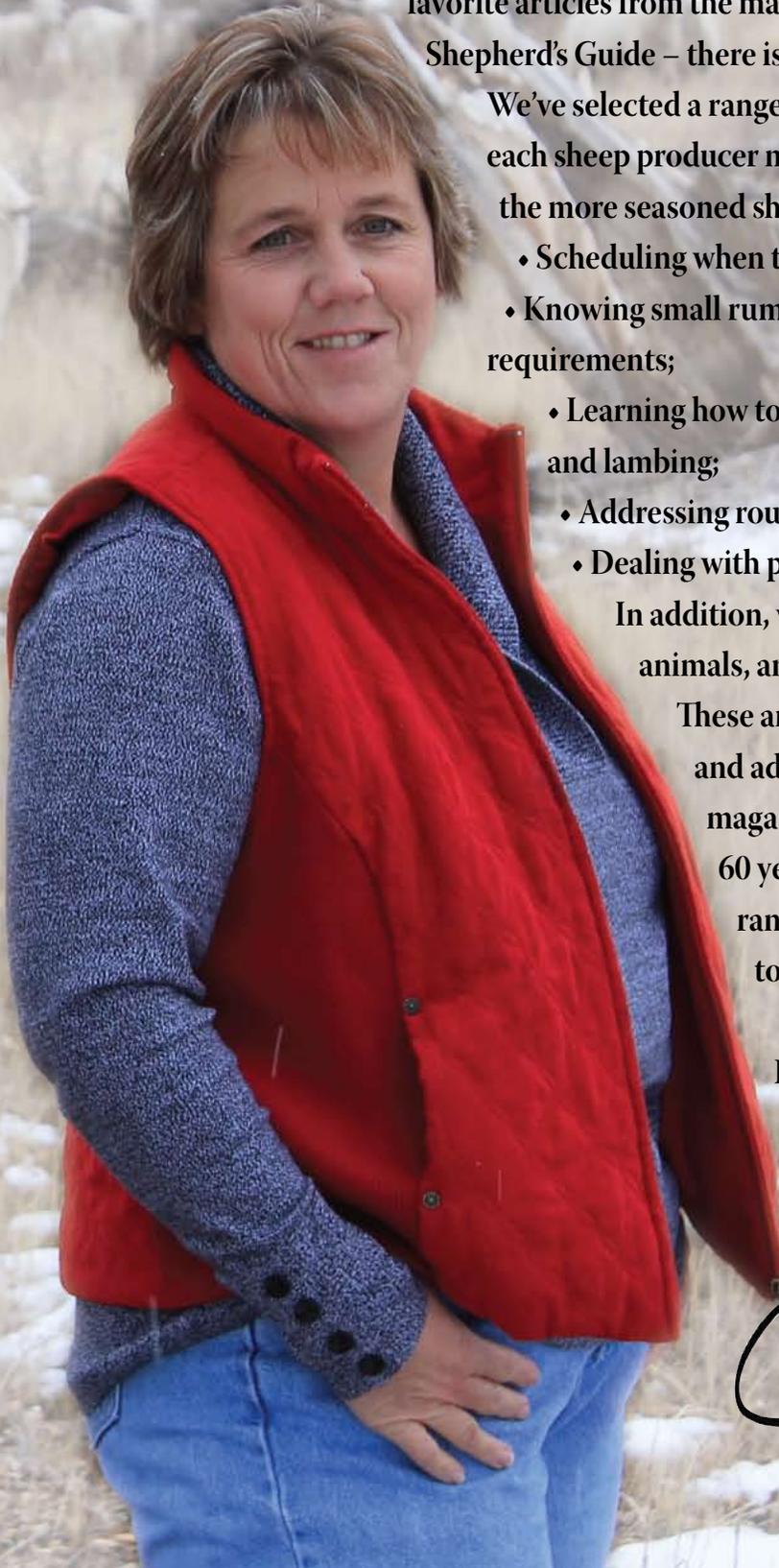
These are some of the issues that we address and add to each month in the pages of the magazine – and have done so for more than 60 years. From small farm flocks to large range operations, sheep producers turn to the pages of The Shepherd for information.

Enjoy this special issue, and consider subscribing to receive this type of information every month in your mail box.

Best,

Cat Urbigkit

Cat Urbigkit, Editor



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SHEEP BEST

Management Practices

Developed by Richard Brzozowski, Extension educator, University of Maine Cooperative Extension; Diane Schiviera, livestock specialist, Maine Organic Farmers and Gardeners Association; and Jean Noon, sheep producer, The Noon Family Sheep Farm, Springvale, Maine. April 2013.

O designates organic management.

MANAGEMENT

- Your primary goal is to reduce stress through good management, nutrition and proper health care.
- Observe animals daily by looking at their behavior and their movement – watch for any limpers (catch, examine and treat if necessary) and for animals hanging back or that don't get up to feed.
- Gently handle all sheep, refrain from yelling, yanking legs and horns and pulling wool.
- When handling sheep, squeeze them into a small space with a gate.
- Sheep typically move away from a rattle and a crook. There is no need to hit.
- Facilities should include an easy way to catch and restrain animals for observation or treatment.
- Provide adequate space for each animal based on its size, breed and other recommendations.
- Manage facilities with sanitation and disease prevention in mind.
- Clean out pens at least yearly.
- Provide dry pathways for sheep to move to and from pasture.
- O Provide daily outside access to a well drained area for sheep not on pasture (no mud).
- Move animals to new pasture based on the condition of the current pasture, its regrowth and parasite control. The average stocking density is five sheep per acre.
- Provide adequate fencing to keep sheep in and predators out.
- Permanently identify all animals with an ear tag or tattoo.
- If you plan to castrate ram lambs, do so before 14 days of age. If ram lambs are kept intact, separate rams from ewe lambs by 5 months of age.
- Dock (remove tails from) lambs before 14 days of age, if included in management system.
- Plan for breeding ewes based on your lamb market or your management system.
- Wean lambs at approximately 60 to 80 days of age.
- Consider checking ewes' pregnancy by ultrasound, if available.
- Dry ewes after weaning by feeding lower quality roughage, reducing water intake and not providing concentrate (grain).
- Observe or feel ewes' udders at weaning and daily for two weeks after weaning.
- Evaluate ewes with body condition scores two months before breeding and adjust feeding accordingly.
- Evaluate ewes with body condition scores after weaning and adjust feeding accordingly.
- Select replacement ewes from ewe lambs at 120 days of age, using records.
- Select replacement ewe lambs at 80 pounds.

HEALTH

- O Contact your certifier before using any product that is not included on your Organic System Plan (OSP).
- Have visitors use booties or foot baths to clean and disinfect footwear before entering barns or pastures.
- Provide a quarantine pen for at least three weeks for animals that are new to the farm. Be sure to trim and check all hooves of new sheep..
- Consider participating in the National Scrapie Eradication Program (www.aphis.usda.gov/animal_health/animal_diseases/scrapie/).
- Consider a vaccination program.
 - Vaccinate lambs for CD-T (clostridial diseases, including tetanus) two times, 21 to 28 days apart.
 - Vaccinate ewes with a CD-T booster annually.
 - Vaccinate with tetanus antitoxin before any surgery.
- Have a parasite management procedure in place.
 - Perform FAMACHA weekly or biweekly through the grazing season to check for parasite infection.
 - Keep sheep off feed for 12 hours before deworming with herbal or synthetic products.
 - Deworm sheep on a dry lot and keep them off new pasture for 24 hours.
 - Deworm only sheep that show signs of anemia.
- O Slaughter stock and breeding stock that are in the last third of

gestation cannot be treated with synthetic parasiticide.

- Rotate pasture to reduce contact with parasite larvae.
- Breed genetically resistant animals; cull susceptible animals.
- Trim hooves of all mature sheep one or two times per year, depending on growth. (Hooves are typically trimmed after shearing.)
- Give sheep a foot bath in 10 percent zinc sulfate solution weekly through the grazing season. Use junk wool or shavings in the foot bath to minimize splashing of solution. Protect your eyes by using safety glasses when mixing the foot bath solution.

NUTRITION

- Provide minerals formulated for sheep free choice.
 - Selenium must be provided.
 - Copper should not be part of a mineral mix as it is toxic to sheep.
- Provide fresh water, free choice, 24/7.
- Provide adequate roughage (hay, silage or pasture).
- Provide adequate nutrition (pasture, high quality forage or grains) to brood ewes during the last third of gestation and until their lambs are weaned.
- Provide adequate nutrition (pasture, high quality forage or grains) to growing lambs via creep.
 - Creep feed of 20 percent protein is recommended.
 - Start lambs on creep feed at 10 to 14 days of age.
- Secure your hay source well before the hay is needed.
 - Line up the source early in the season.
- Test the nutritional content with a forage test in order to balance the ration and save on grain purchases.

Lambing

- Provide protection to the hands and arms of human females of child-bearing age if they assist ewes at lambing.
- Allow ewes adequate space to move about freely during pregnancy.
- Check ewes regularly before, during and after lambing.
- Identify lambs with ear tags or tattoos at birth

See Best Sheep Practices page 7

THE SHEPHERD'S GUIDE

BEST SHEEP From page 6

- or soon after.
- Observe lambs daily, watching for robust activity, full bellies (not starving), pneumonia and scours. Listen for possible wheezing and coughing.
 - Provide colostrum in the first 12 hours at a rate of 5 percent of body weight – e.g., a 10-pound lamb should receive 8 ounces.
- Keep ewes with their lambs in jugs (pens) for two to five days.
- Check each ewe's udder to be sure lamb(s) are using both sides.
- Clip; dip; strip (clip umbilical cord about an inch from the belly; dip it in iodine by tipping a bottle against the stub; strip the ewe to be sure she has milk and to remove possible plugs).
- Consider giving lambs 1/2 cc BoSE (selenium) when ear tagging.
- Separate ewes raising single lambs from ewes raising multiple-birth lambs and feed accordingly.

BREEDING

- Flush ewes by providing a higher level of nutrition before and during breeding.
- Select rams based on soundness and traits sought.
- Evaluate rams for soundness 30 days before breeding.
- Turn in teaser ram two weeks before turning in ewes with breeding ram.
- Leave the breeding ram in with ewes for 36 days; every ewe will have cycled at least twice during that time span.
- Change the color of the breeding harness crayon or raddle every 18 days.

WOOL AND SHEARING

- Shear sheep at least once per year. Some breeds are shorn twice annually.
- Have shearer disinfect equipment, electrical cords, cutter and combs before shearing.
- Have shearer wear clean clothing before handling and shearing your sheep.
- Keep sheep off feed for 12 hours before shearing.
- If you see any lumps on sheep while shearing, be sure to disinfect machinery before the next sheep, then cull that sheep. Lumps could indicate Caseous Lymphadenitis (CL), a contagious bacterial infection.
- Shear all white sheep first, then colored.
- Avoid second cuts when shearing.
- Skirt fleeces as they are removed from the sheep.
- Label wool to distinguish it from others (using sheep ewe tag numbers).
- Store wool in appropriate containers in a dry place.

Record Keeping

- Keep production records for each ewe.
 - Percent of lambs marketed per ewe, concep-

tion rate, lambing rate, lambing percentage (lambs born per ewe lambing), lamb survival rate

- Keep records of ewes' performance before, during and after lambing.
 - Mark and record ID numbers of ewes. Specify those that are poor mothers – those lacking milk, having damaged udders, or "poor doers" (generally doing poorly). Cull these ewes and possibly their lambs.
- Record lamb weights at birth, at 30, 60 and 90 days and at weaning.
- **O** Maintain records of flock member, ra-

tion, pasture use, outside access/temporary confinement, field history, health care/treatment.

- Record weights of wool harvested from each sheep, if applicable.

PROCESSING SLAUGHTER STOCK

- Keep slaughter lambs off feed for 24 hours before slaughter.
- Provide water to lambs before slaughter.
- Arrange for slaughter of animals with the abattoir well in advance.

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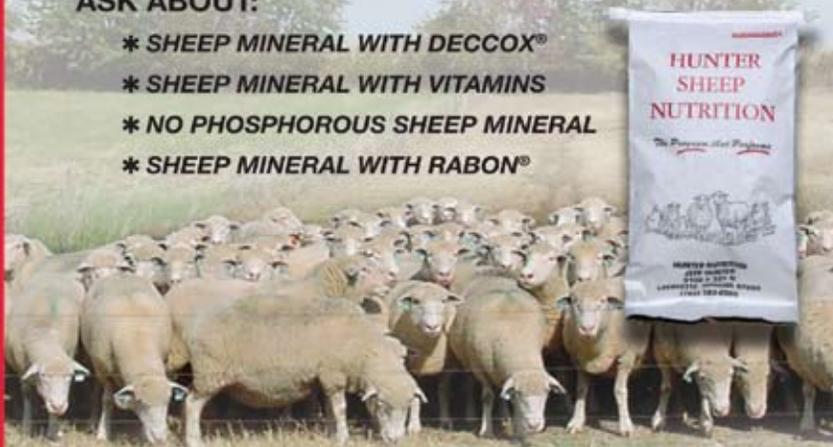
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Flock Calendar Outline

From the Hettinger Research Extension Center, Department of Animal Science North Dakota State University

The following guidelines are neither inclusive nor intended to fit every sheep operation. Each operation is different, therefore, each “calendar event” should be tailored to each flock’s needs.

PRIOR TO BREEDING

1. Bag and mouth ewes and cull those that are not sound.
2. Replace culled ewes with top-end yearlings or ewe lambs.
3. Keep replacement ewe lambs on growing rations.
4. Evaluate sires:
 - A. Be sure they are vigorous, healthy and in good breeding condition.
 - B. Rams should be conditioned at least a month before breeding season. Flush rams in poor condition.
 - C. Allow at least two mature rams (preferably three) or four buck lambs per 100 ewes.



5. Flush ewes:
 - A. One pound grain/day two to five weeks before breeding (usually 17 days).
 - B. If ewes are over-conditioned, the effect of flushing will be lessened.

6. Vaccinate ewes for vibriosis and enzootic abortion (EAE).
7. Identify all ewes and rams with ear tags, paint brands or tattoos.

BREEDING

1. The ovulation rate of a ewe tends to be lower at the first part of the breeding season. Vasectomized or teaser rams run with ewes through the first heat period tend to stimulate then and increase the ovulation rate at the second heat period.
2. Use a ram marking harness or painted brisket to monitor breeding. Soft gun grease with a paint pigment mixed in works well for painting the brisket. A color sequence of orange, red and black is recommended with colors being changed every 17 days.



3. Leave rams in NO LONGER than 51 days (35 days is more desirable).
 - A. An exception may be with ewe lambs. Allowing them four cycles or 68 days may

4. Remove rams from ewes after the season (don't winter rams with ewes).



PRIOR TO LAMBING (First 15 weeks)

1. Watch general health of ewes. If possible sort off thin ewes and give extra feed so they can catch up.
2. Feed the poor quality roughage you have on hand during this period, saving better for lambing.
3. An exception to the above is feeding pregnant ewe lambs. They should receive good quality roughage and grain (about 20 percent of the ration) during this period.

LAST SIX WEEKS BEFORE LAMBING

1. Trim hooves and treat for internal parasites.
2. Six to four weeks before lambing feed 1/4 to 1/3 pound grain/ewe/day.
3. Shear ewe before lambing (with highly prolific ewes at least a month before is preferred). Keep feeding schedule regular and watch weather conditions immediately after shearing (cold).
4. Vaccinate ewe for enterotoxaemia.
5. Control lice and ticks immediately after shearing.
6. Four weeks before lambing increase grain to 1/2 to 3/4 pound/ewe/day (usually done immediately after shearing).
7. Give A-D-E preparations to ewes if pastures and/or roughage are or have been poor quality.
8. Feed selenium-vitamin E or use an injectable product if white muscle is a problem. Caution: DO NOT use both.
9. Check facilities and equipment to be sure everything is ready for lambing.
10. Two weeks before lambing increase grain to 1 pound/ewe/day.

LAMBING

1. Be prepared for the first lambs 142 days after turning the rams in with the ewe, even though the average pregnancy period is 148 days.

2. Watch ewes closely. Extra effort will be repaid with more lambs at weaning time. Saving lambs involves a 24-hour surveillance. Additional help at this time is money well spent.

3. Pen a ewe and lambs in lambing pen (jug) after lambing, not before.
4. Grain feeding the ewe during the first three days after lambing is not necessary.
5. Be available to provide assistance if ewes have trouble lambing.
6. Disinfect lamb's naval with iodine as soon after birth as possible.
7. Be sure both teats are functional and lambs nurse as soon as possible.
8. Use additional heat sources (heat lamps, etc.) in cold weather.
9. Brand ewes and lambs with identical numbers on same side. Identify lambs with ear tags, tattoos or both.
10. Turn ewes and lambs out of jug as soon as all are doing well (one to three days).
11. Bunch up ewes and lambs in small groups of four to eight ewes and then combine groups until they are a workable size unit.
12. Castrate and dock lambs as soon as they are strong and have a good start (two days to two weeks of age). Use a tetanus toxoid if tetanus has been a problem on the farm (toxoids are not immediate protection, it takes at least ten days for immunity to build).
13. Vaccinate lambs for soremouth at one to two weeks of age if it has been a problem in the flock.

14. Provide a place for orphaned lambs. Make decision on what lambs to orphan as soon after birth as possible for best success. Few ewes can successfully nurse more than two lambs.

END OF LAMBING TO WEANING

1. Feed ewes according to the number of lambs sucking. Ewes with twins and triplets should receive a higher plane of nutrition.

2. Provide creep feed for lambs (especially those born during the winter and early spring).
3. Vaccinate lambs for overeating at five weeks and seven weeks of age.

WEANING

1. Wean ewes from lambs, not lambs from ewes. If possible, remove ewes from pen out of sight and sound of lambs. If lambs have to be moved to new quarters, leave a couple of ewes with them for a few days to lead the lambs to feed and water locations.
2. Lambs should be weaned between 50 and 60 days of age when they weigh at least 40 pounds and are eating creep and drinking water. The advantage of early weaning is that the ewe's milk production drops off to almost nothing after eight weeks of lactation.
2. Grains should be removed from the ewe's diet at least one week prior to weaning and low quality roughage should be fed. Restriction of hay and water to ewes following weaning lessens the chance of mastitis to occur. Poorer quality roughage should be fed to the ewes for at least 10-14 days following weaning.
3. Handle the ewes as little as possible for about 10 days following weaning. Tight udders bruise easily. If possible, bed the area where the ewes will rest heavily with straw to form a soft bed for the ewes to lay on.

WEANING TO PRE-BREEDING

1. If ewes go to pasture, treat for internal parasites.
2. Feed a maintenance ration to the ewes. Put ewe lambs that lambed back on a growing ration once they have quit milking.
3. Adjust ewes condition so they can be effectively flushed for next breeding season. Don't get ewes too fat prior to breeding.



Small Ruminant Nutrition

By Steven M. Jones, Associate Professor, Animal Science Reprinted from *Goat & Sheep News*, Vol. 6, No. 1, Feb. 2014 University of Arkansas Division of Agriculture, Research & Extension

Feed is the single largest cost associated with raising small ruminants, typically accounting for 60 percent or more of total production costs. It goes without saying that nutrition exerts a very large influence on flock reproduction, milk production and lamb and kid growth. Late-gestation and lactation are the most critical periods for ewe and doe nutrition, with lactation placing the highest nutritional demands on ewes/does. Nutrition level largely determines growth rate in lambs and kids. Lambs and kids with higher growth potential have higher nutritional needs, especially with regard to protein. Animals receiving inadequate diets are more prone to disease and will fail to reach their genetic potential.

Small ruminants require energy, protein, vitamins, minerals, fiber and water. Energy (calories) is usually the most limiting nutrient, whereas protein is the most expensive. Deficiencies, excesses and imbalances of vitamins and minerals can limit animal performance and lead to various health problems. Fiber (bulk) is necessary to maintain a healthy rumen environment and prevent digestive upsets. Water is the cheapest feed ingredient yet often the most neglected.

Many factors affect the nutritional requirements of small ruminants: maintenance, growth, pregnancy, lactation, fiber production, activity and environment. As a general rule of thumb, sheep and goats will consume 2 to 4 percent of their body weight on a dry matter basis in feed. The exact percentage varies according to the size (weight) of the animal, with smaller animals needing a higher

intake (percentage-wise) to maintain their weight. Maintenance requirements increase as the level of the animals' activity increases. For example, a sheep or goat that has to travel a farther distance for feed and water will have higher maintenance requirements than animals in a feed lot. Environmental conditions also affect maintenance requirements. In cold and severe weather, sheep and goats require more feed to maintain body heat. The added stresses of pregnancy, lactation and growth further increase nutrient requirements.

A sheep or goat's nutritional requirement can be met by feeding a variety of feedstuffs. Feed ingredients can substitute for one another so long as the animals' nutritional requirements are being met. Small ruminant feeding programs should take into account animal requirements, feed availability and costs of nutrients.

Pasture, forbs and browse are usually the primary and most economical source of nutrients for sheep and goats, and in some cases, pasture is all small ruminants need to meet their nutritional requirements. Pasture tends to be high in energy and protein when it is in a vegetative state. However, it can have a high moisture content, and sometimes it may be difficult for high-producing animals to eat enough grass to meet their nutrient requirements. As pasture plants mature, palatability and digestibility decline, thus it is important to rotate pastures to keep plants in a vegetative state. During

the early part of the grazing season, browse (woody plants, vines and brush) and forbs (weeds) tend to be higher in protein and energy than ordinary pasture. Sheep are excellent weed eaters. Goats are natural browsers and have the unique ability to select plants when they are at their most nutritious state. Sheep and goats that browse have fewer problems with internal parasites.

A sheep or goat's nutritional requirement can be met by feeding a variety of feedstuffs. Feed ingredients can substitute for one another so long as the animals' nutritional requirements are being met.



The white faced rams pictured above are mature Tamarack rams on the 10-7 ranch owned by Lana and Martin Rowley in Malin, Oregon (the black faced rams are Shropshires from Fred Groverman).

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Sheep Mineral Feeding Guidelines

By Hunter Nutrition (www.sheepfeed.com)

- Free-choice mineral should have a 2:1 Calcium to Phosphorous ratio and be about 25% salt. It should also contain all trace minerals, selenium, plus magnesium, potassium, and other macro minerals.
- Calcium should be about 18-22%; phosphorous should be about 7-9%; and the Ca/P ratio should always be 2:1.
- Feed free-choice mineral to the ewe flock and replacement ewe lambs only. Lambs and rams should be offered free-choice salt or a no-phosphorous mineral to avoid calculi.
- A good-free choice sheep mineral is clean and dust-free and has been made with ingredients of similar particle size to avoid separation.
- Free choice sheep mineral should be free of added copper – however it will contain a small amount of natural-occurring copper from its ingredients. Molybdenum should be added to all sheep free-choice minerals.



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*USDA Agricultural Marketing Service reports that the average value of #1 pelts for 2013 was \$10.04. The value of pelts with even a percentage of hair sheep breeding or black fibers was 0.

Good Stockmanship Has Benefits

By Steven M. Jones, Associate Professor University of Arkansas Division of Agriculture

The ultimate goal of stockmen is to produce a safe, wholesome product to sell for a profit.

To achieve this goal, stockmen must provide adequate nutrition, a safe environment in which the animals live, a planned health program and handling facilities properly designed to administer the health program for the safety of the livestock and the stockman. All of these elements require the movement of the animals.

Stockmanship is the term we use to define the action of moving animals from one point to another. Low-stress stockmanship is a new term being used for a commonsense approach that has always had success.

The secret to low-stress livestock handling is understanding innate animal behavior, why animals react the way they do, and then using that knowledge to ask, not force, them to comply with the handler. One problem of improper livestock handling is bruising.

Bruising is caused by a physical blow and the escape of blood from damaged blood vessels into the surrounding muscle tissue. Bruising can happen at any time during handling or transportation and can vary greatly in size. It is, therefore, clear that to obtain a high meat quality, it is necessary for animals to be stress and injury free during handling and transportation up to and during slaughter.

Stressed animals also incur a higher level of sickness. A stressed animal has a lowered immune system, leaving the animal highly susceptible to disease. The cost of pharmaceuticals used on livestock to combat stress related effects can have a drastic effect on a producer's already narrow profit margins. The major contributing factors to this stress are handling and transportation.

These huge financial losses are one of the main reasons that low-stress livestock handling is becoming increasingly popular in the animal industry.

But yet another reason, financial profit aside, is that low-stress handling is safer, not only for the animal, but for the handler. Animal handlers are often injured or even killed when frightened, agitated animals run over them. In addition to the human tragedy, pay-



ing hospital bills and workmen's compensation claims or replacing employees costs the meat industry thousands of dollars every year.

A common misconception is that low-stress must mean no pressure. That is absolutely false. Cattle, horses, sheep, goats and swine all respond to appropriate application and release of pressure. There are times when significant pressure must be applied to get the animals to move how and when you need.

Pressure, used appropriately, does not cause long-term, harmful stress. The correct handling of cattle is a vital component of quality food production and good animal welfare. Handling cannot improve the basic product, but good handling will minimize product quality loss and lessen stress on animals.

The use of a sorting stick can extend the distance of control over livestock as it effectively increases the length of the stockman's arm. Holding a sorting stick in front of an animal's head will cause it to either stop or turn. Hitting an animal, though, is unnecessary and ineffective in moving animals in the desired direction. Poking an animal that is already moving in the correct direction is unnecessary and dangerous, as this can cause

cattle and horses to kick and sheep and goats to panic and jump.

Electric prods are useful aids if used correctly. A prod should not be used on an animal that has nowhere to go or is already moving in the correct direction, such as animals at the back of the herd.

Good stockmen should be:

- **Observant:** They will notice slight differences in animal behavior or appearance, such as, in separation from the rest of the herd or in body posturing that suggests an illness or injury.
- **Confident:** They will always react with firm, sure movements and will always be the boss while avoiding getting overexcited.
- **Competent:** They will have the ability to control animals and know where to stand in a corral in relation to the animals being moved and understand animal behavior principles.
- **Patient:** They will always give the animals time to assess the situation before expecting a reaction.
- **Positive towards the care of the animals:** They will develop a good relationship with the stock and avoid unnecessary force and yelling.
- **Respectful:** They will respect each animal's ability for speed and power to do injury.

Buying Rams: Are We Really Getting What We See, or Are We Just Getting a New Coat of Paint?

by Rodney Kott, Extension Sheep Specialist,
Montana State University

Commercial sheep producers sell their grass and labor in the form of lamb and wool. The value of saleable product produced on a given land area is a function of the quantity and quality of lamb and wool. Production efficiency and ewe profitability can be maximized by correctly matching the biological type of sheep produced with the available feed resources, labor, weather and other environmental factors. Critical factors in matching sheep and the environment are reproductive performance, milk production potential and mature size. Accurately identifying rams and ewes that excel is the key to a successful selection program. In any sheep operation the genetic selection of individual animals and breeds and how we develop mating systems will determine the potential level of lamb and wool production. This sets the parameters of the production that is possible. The management provided determines the degree to which that potential is realized.

Management for genetic improvement requires a mix of art and science and may involve a varying degree of chance. By utilizing the most accurate tools economically appropriate to evaluate the genetic worth of replacement animals, the role that chance plays in the genetic progress of a sheep enterprise can be minimized.

Ram selection is responsible for approximately 90% of the genetic change in a sheep flock. The amount of genetic improvement made in commercial sheep flocks is primary dependent on the genetic progress being made by the purebred or seedstock flock from which the rams are being purchased. As a rule of thumb the genetic merit of a commercial sheep flock increases at the same rate as the flock from which rams are being purchased. In short, whatever genetic progress or lack of progress that is being made by the purebred or seedstock producer is transferred to the commercial producer through purchased rams.

Identifying those sheep that are truly superior is a difficult task. Remember, what a person sees is not usually what they are getting. Less than half of what can be seen visually is due to genetic differences. The rest (over half) is due to what geneticists refer to as environmental differences -- did one eat more feed, etc. The only portion of a sheep's superiority that can be passed on to its offspring is the portion that is due to genetic

differences. In many cases those differences are masked by the environmental differences. Knowing this, we must conclude that we are probably not doing a very good job of picking those sheep that might change things such as lambing rate, weaning weight, etc., by visual appraisal. The only consolation is, that until recently there was not a better way.

As a result of rapid progress in genetic research and advances in computer technology, tools have become available to assess the differences in animals due to genetic differences. When this knowledge is properly applied, rapid changes in levels of performance can be achieved. Through the National Sheep Improvement Program (NSIP), expected progeny differences (EPD's) are made available to cooperating Targhee breeders.

Through the use of the performance records of genetically related animals, an animal's own performance and a big computer, the actual genetic producing ability of an animal can be separated from that component which is due to environment. EPD's are developed from a complex set

of calculations which combine potentially large amounts of information on individuals and close relatives. While it is not important we know how EPD's are calculated, it is important that we understand that EPD's provide an accurate comparison of animals genetic ability.

An expected progeny difference (EPD) is a prediction of the difference between the future progeny of an individual and the performance of a theoretical reference animal with a zero EPD. EPD values are expressed as plus or minus deviations from a zero base point in units appropriate for each trait. EPD's below zero usually reflect low relative merit for a particular trait. However, for fleece grade a negative EPD is usually desired since that sheep would be finer.

As the name "Expected Progeny Difference" implies, EPD's allow us to compare the relative expected progeny performance of individuals within a breed. For example, if two rams having EPD's for weaning weight of +2.0 and -1.0 are bred to random ewes in the same herd, we would expect their lambs to differ in average weaning weight by 3.0 pounds (2-(-1)).



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PRE-BREEDING MANAGEMENT

*David C. Van Metre, DVM, DACVIM
Extension Veterinarian, Colorado State University*

The pre-breeding period is defined as the 8-10 week period prior to the first day that rams are turned out with the ewes. Although it is traditionally a relatively quiet period for the sheep producer, the pre-breeding period involves multiple physiologic processes in the ram and ewe that can significantly impact fertility during breeding season, and therefore can subsequently impact the size and uniformity of the lamb flock. During this period of time, the sheep producer can conduct a few fairly simple management practices to ensure that the ram and ewe flock are in optimal physical condition for breeding.

Pre-Breeding Evaluation of the Ewe Flock

Creation of sperm in rams requires approximately 7 weeks to complete; sperm is then stored in the epididymis, an organ adjacent to the testis. In other words, on the first day of the breeding season, the ram will be utilizing semen that was produced 7 or more weeks previously. Late summer heat can significantly impair ram fertility because spermatogenesis (the creation of sperm) occurs in the testes at a temperature that is slightly below core body temperature. Rams that are excessively conditioned are prone to heat stress, as are rams in full fleece. Shearing rams at this time should be considered to limit heat stress. Careful shearing of the scrotal wool should be performed for breeds and individuals with greater scrotal wool cover. For flocks in colder climates with mid-to late-fall breeding schedules, ram shearing should be timed such that 2-4 cm of fleece has grown by the time breeding begins.

Heat stress can be further limited by provision of adequate shade – producers should watch the rams frequently during a summer day to ensure that the rams have shade available as the sun moves across the sky. Sand bedding in shaded areas allows for greater body heat loss when the rams lie down; the scrotum is kept cool as well. Salt and water should be readily available near the areas where the rams seek shade during the hottest periods of the day. In flocks with significant external parasite or biting insect problems, reduction of these burdens through insecticide application to the animals and / or the environment may limit fertility impairment from scrotal dermatitis (inflammation of the scrotal skin). The heat associated with inflammation of the scrotal skin has been shown to impair ram fertility.

In certain locales, infection with bluetongue virus during the late summer or early fall can cause significant morbidity and reduction in fertility in the ram flock. This viral disease is spread by gnats of the genus *Culicoides*; the disease appears to be more prevalent in flocks located near river valleys and low-lying wetlands. Many sheep may acquire the virus, develop antibodies to clear the infection, and recover without consequence. However, if a large number of rams in a flock are naïve (not immune) to the virus, infection can cause high fever and severe systemic disease that can render rams temporarily subfertile or infertile. Vaccination of sheep against bluetongue is not approved in most states. Producers in areas where bluetongue infection is particularly problematic may have to delay breeding until well after the first frost, when the *Culicoides* gnat is no longer biting.

Fever and debilitation from other common infectious diseases, such as pneumonia, can also impair subsequent fertility. Pneumonia may develop during summertime transport, showing, sales, or other stressful activities. Owners should carefully plan summer show and transport activities so as to limit the potential impact of these activities on ram fertility when the breeding season arrives.

Since weight loss is expected during the breeding season, the target BCS for rams at the onset of the breeding season is approximately 3.5 on a scale of 1 (emaciated) to 5 (obese). To limit the risk of development of ulcerative posthitis (pizzle rot), thin rams should not be fed high-protein complete feeds or allowed unlimited access to high-protein forage such as alfalfa hay. If under-conditioned rams are to be fed increased levels of energy, booster immunization against enterotoxemia is recommended.

Annual breeding soundness examination and serologic testing for infection with *Brucella ovis* have been repeatedly proven to improve flock fertility. Breeding soundness examination is described in a separate fact sheet produced by Colorado State University Veterinary Extension. The ram population should be measured against ewe numbers, with adequate consideration of ram age, breed characteristics, and topography of the breeding pastures. A ram-to-ewe ratio of 1:50 (2% of the ewe population) is usually appropriate for mature rams on flat pasture or rangeland. A mature, experienced, and BSE-proven ram can successfully breed as many as 100 ewes,

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particularly if the ewes are fenced in to limit their capacity to disperse. A 1:25 ram: ewe ratio is recommended if ram lambs are to be used. Greater ram numbers may be needed for synchronized breeding programs.

Pre-Breeding Evaluation of the Ewe Flock

Culling of ewes prior to breeding should be based upon body condition score (BCS), udder health, dentition, lameness or other musculoskeletal problems, and in some flocks, results of serologic testing for eradicable diseases (e.g. ovine progressive pneumonia, Johne's disease). The body condition scores for the entire ewe flock should be recorded, as this data can be used to adjust feeding practices to optimize body condition at breeding. In addition, trends in flock BCS data accumulated over subsequent years can be used to adjust summer grazing or feeding practices. The ewe cull should precede any immunization or anthelmintic treatment administered to the ewe flock, as administration of these products to cull ewes represents a lost treatment expense for the producer and might create violative residues if the ewes are promptly taken to slaughter. If the owner does not elect to maintain a closed flock, new introductions into the ewe flock should take place at least 8 weeks prior to the breeding season, at a time of year when gestation is not ongoing in the ewe flock. Further, immunization for abortion pathogens (*Campylobacter* and *Chlamydophila*) and/or tetracycline feeding during gestation may warrant consideration.

Thin ewes, including ewes selected for culling on the basis of low body condition, can be targeted for specific disease testing, using serology (OPP, Johne's Disease), necropsy, or slaughter checks. As an initial step in documenting

the presence of Johne's Disease in the flock, serologic tests can be applied to the thinnest 20% of ewes and rams, as these animals are more likely to test positive if their thin condition is truly due to this disease. Fecal flotation is a test that your veterinarian can perform for determination of internal parasite burden. Individual fecal samples should be taken from at least 10 adult ewes and an equal number of ewe lambs; feces are removed from the rectum and placed into a labeled ziplock bag. Samples should be kept cool and transported promptly to your veterinary clinic or diagnostic laboratory. Ewe fertility has been shown to be responsive to pre-breeding anthelmintic (deworming) treatment in flocks where internal parasite burdens are problematic.

Flushing is a practice wherein the amount of feed energy is increased to ewes, beginning 3-6 weeks prior to the breeding season. As a result of the increasing plane of nutrition, ewes will gain weight and tend to ovulate more eggs at each estrus period during the breeding season. This effect of flushing tends to be most pronounced in thin ewes, while ewes in good body condition do not respond much to flushing. Therefore, segregation of the ewe flock into a thin group (to be flushed) and adequate body condition group (no flushing) is sensible. Most medium-sized breeds of ewes can be flushed by feeding 0.5-1.0 pounds of grain per ewe per day; it is important to begin slowly (0.25 pounds/ewe/day) and gradually increase the amount of grain fed to the target level over a 7-10 day period. The duration of flushing needs to be at least 2 weeks long; if ewes are very thin, as many as 6 weeks of flushing may be needed. When possible, continuation of flushing for

2-4 weeks into the breeding season may help maintain pregnancy in previously thin ewes.

A ram-to-ewe ratio of 1:50 (2% of the ewe population) is usually appropriate for mature rams on flat pasture or rangeland. A mature, experienced, and BSE-proven ram can successfully breed as many as 100 ewes, particularly if the ewes are fenced in to limit their capacity to disperse.



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TIPS FOR A SUCCESSFUL BREEDING SEASON

By Dr. Scott P. Greiner, Extension Animal Scientist, VA Tech, Virginia Cooperative Extension, Virginia State University

The start of the fall breeding season is just around the corner. Proper management of both rams and ewes prior to, during, and after the breeding season is critical for a successful subsequent lambing season.

Ram Management

Most often, newly purchased ram lambs are coming off a high plane of nutrition heading into their first breeding season (completing a structured performance test, or managed on the farm for high growth rates to optimize maturity). To prepare ram lambs for the breeding season, rams should be “hardened up” prior to introduction with ewes. This can be accomplished through limiting feeding grain while on pasture. The amount of supplementation will vary according to the ram’s body condition and pasture quality, but as a guideline 1-2% of body weight will suffice to achieve a moderate body condition at the start of the breeding season (not excessively fat or thin). Be certain that housing and facilities provides adequate shade and ventilation so that rams can stay cool. These principles also apply to mature rams, which may be new to the flock or been in use for several years. Exposure to high temperatures can compromise the reproductive soundness of rams.

Newly acquired ram lambs should not be commingled with older, mature rams either prior to or during the breeding season. Particular care should be taken if rams from different sources (of similar age) need to be commingled and all commingling should take place prior to the breeding season.

Prior to the start of the breeding season, all rams should be subjected to a breeding soundness exam by a veterinarian. The breeding soundness exam assesses the physical fitness of the ram, and most importantly the ram’s reproductive soundness and capability of settling ewes. Plan ahead to allow adequate time to find a replacement ram should an existing sire be found to be a non-breeder.

Many factors influence the breeding capacity of rams, including age, breed, nutrition, management, and environment. As a general guideline, ram lambs are capable of breeding 15 to 25 ewes during their first breeding season, and most mature rams can service 50 or more ewes. All rams, and particularly ram lambs, should be observed closely to monitor their breeding behavior and



libido to ensure they are servicing and settling ewes. The use of a marking harness, rotating colors every 17 days, is an excellent management tool for this purpose. The breeding season should be kept to a maximum of 60 days for young rams. This will prevent over-use, severe weight loss and reduced libido. Severe weight loss may impair future growth and development of the young ram and reduce his lifetime usefulness. When practical, supplementing ram lambs with grain during the breeding season will reduce excessive weight loss (feeding rate of 2% bodyweight daily). Rams used together in multiple-sire breeding pastures should be of similar age and size. Ram lambs cannot compete with mature rams in the same breeding pasture. A sound management practice is to rotate rams among different breeding pastures every 17-34 days. This practice decreases the breeding pressure on a single ram.

Ewe Management

Some advance planning and simple management practices will assist in having a successful breeding season. Vaccination of the ewe flock for *Campylobacter* (vibrio) and *Chlamydia* are important for abortion disease control. For ewe lambs and ewes not previously vaccinated, these products typically require an initial injection prior to the breeding season followed by a second vaccination during gestation. In subsequent years, a single booster vaccination is required. Follow product label directions when administering any vaccine. A month prior to the breeding season is also an opportune time to trim and inspect feet on the ewe flock and perform preventative foot care. This is also a good time to make final culling decisions and sell poor producing and thin ewes.

Flushing is the practice of increasing energy

intake, and therefore body condition, during the 10-14 days prior to breeding. This practice has been shown to be effective in increasing ovulation rates, and thereby increasing lambing percentage by 10-20%. The response to flushing is affected by several factors, including the body condition of the ewe and time of the breeding season. Ewes that are in poor body condition will respond most favorably to the increase in energy, whereas fat ewes will show little if any response. Flushing can be accomplished by moving ewes to high quality pastures or through providing .75 to 1.25 lb. corn or barley per head per day from 2 weeks pre-breeding through 4 weeks into the breeding season. Provide a high-selenium, sheep mineral free choice.

Like rams, ewes are also prone to heat stress during the breeding seasons. Prolonged exposure to high temperatures can have an effect on ewe fertility and embryo survival. To help reduce these embryo losses and resulting decrease in lamb crop, minimize handling during the heat of the day and allow the flock access to a cool, shaded area.

Ram Management After the Breeding Season

Young rams require a relatively high plane of nutrition following the breeding season to replenish body condition and meet demands for continued growth. Body condition and projected mature size of the ram will determine his nutrient requirements during the months following the breeding season. Rams should be kept away from ewes in an isolated facility or pasture after the breeding season. In the winter months, provide cover from extreme weather that may cause frostbite to the scrotum resulting in decreased fertility.



Tips for Successful Lambing

By: Mike Boersma, Extension Educator & 4-H Program Director, Murray & Pipestone Counties, University of Minnesota Extension

Lambing season is quickly approaching for many sheep producers and this can be an exciting and challenging time of year. Adequate preparation is essential and will make lambing season more successful and less stressful. Here are a few points to keep in mind as lambing season approaches.

First, is the lambing barn ready? No two lambing barns will be identical and there is no “correct” set-up, since each operation will have slightly different needs and resources available. However, regardless of the type of facility, producers should make every effort to create a relatively warm environment free from cold air drafts on the animals. There is a fine line between creating a warm environment and creating a place with poor air exchange and high humidity. The lambing barn still needs to have a level of fresh air exchange—the

key is to provide the fresh air without creating drafts directly on the animals.

Another consideration is to be sure the lambing pens are ready. Lambing pens should consist of a mostly enclosed area that provides about 25 square feet of space for the ewe and her lambs. These pens should be clean and free of manure and should have a heat lamp or other supplemental heat source in one corner for the newborn lambs. The ewes should be kept in these pens for 1-3 days, or until their lambs have nursed and are able to get up and going on their own.

Producers should also prepare themselves to deal with sick or weak lambs. Attentiveness is key here, as weak or chilled lambs can recover much sooner if caught early. The longer the lambs are cold and/or the longer they go without adequate colostrum (first milk) intake, the less likely they are to make a full recovery.

In an ideal situation, the lamb should nurse within the first hour after birth to receive the full benefits of the colostrum from the ewe. If the lamb is unable to nurse, it may be necessary to tube-feed the lamb, which can be done with a clean syringe and a small hose. However, tube-feeding should only be performed by skilled producers, since improperly inserting the tube could pose serious risks to the lamb. It is important that producers prepare ahead of time for weak lambs by having frozen colostrum and milk replacer on hand.

In addition to these simple practices, it is also important that sheep producers work with their veterinarian to develop a proper vaccination and lamb health program. Have the necessary vaccines and antibiotics on hand at lambing time, along with syringes and other equipment. If producers take the time to prepare these few things in advance, their foresight should be rewarded with a successful lambing season.

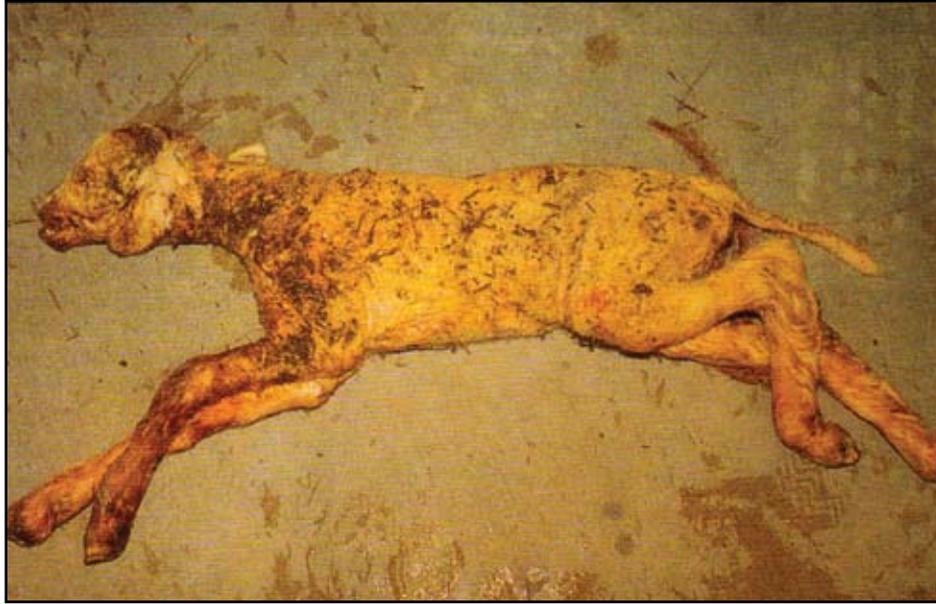
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Hypothermia and Starvation in Michigan Lambs

By J.S. Rook, DVM, Michigan State University

Hypothermia and starvation account for nearly 30% of all pre-weaning lamb losses. The majority of these losses occur prior to three weeks of age and producers should realize that starvation and hypothermia account for 50% of all losses during week one and on day one of life. Management practices greatly affect hypothermia and starvation rates within given flocks. In large flocks averaging 10-20% total lamb death losses, hypothermia and starvation may account for as much as 49% or as little as 2% of those losses. Producers and their veterinarians should routinely examine numerous dead lambs to identify trends within a given flock and use this information as a basis for management decisions. Lamb loss patterns within a given flock will vary from year to year and, thus, mortality surveillance should be an ongoing process just as dynamic as are decisions concerning management. This removable series of color prints and accompanying narrative should help producers to identify the most common mortality problems affecting their flock.

For most lambs, a quick gross postmortem examination can determine the cause of their death. In some cases it may be necessary to send lambs or their tissue samples to a diagnostic laboratory for testing. All producers, and especially women of childbearing age,

should exercise caution while handling dead lambs. Wearing rubber gloves and not allowing pregnant women to handle aborted lambs or placenta is just common sense.

Weigh the lamb to determine the approximate death weight. Small newborn lambs are extremely prone to hypothermia because they chill more quickly than larger lambs. Low birth weight lambs that die from hypothermia and starvation may indicate a nutritional problem in the ewes during late gestation.

Older lambs that die of starvation and hypothermia may also weigh less due to simple starvation. Death weights for these 2- to 3-week-old lambs are often similar or less than typical birth weights for the flock. It is important to connect this loss of weight to the mothering and milking ability of the ewe. Did she own the lamb? Was she fed enough to milk properly? Mastitis? Blocked teat?

Examine the external surface of the lamb to give you an idea of what that lamb was doing before it died. Most starvation and hypothermia lambs die on day one.

They are often thought to be stillborn lambs, and are tossed in the pile of "born dead" lambs, when this is often not the case. Stillborn lambs generally are coated with thick mucus or bright orange-yellow fluid,

have a wet, fresh looking umbilical cord, and often are still covered with placenta. The bright yellow mustard-colored fluid covering them is uterine fluid stained with the lamb's meconium (manure) and indicates a difficult birth.

Also, look under the tail in the rectal area for any evidence of scouring and check legs for any indication of fractures or swollen joints. A quick check for major congenital deformities should also be done, although these are rare.

Check feet and navel on all lambs to help determine the age of the lamb (if unknown). Stillborn lambs have soft, rounded, clean soles, typical of newborn animals. If manure is on the bottom of the feet and the soles are worn, the lamb was strong enough to stand and was looking for nutrition and warmth. This is commonly the case with newborn lambs that producers just find dead shortly after birth. These lambs were born alive and had a chance to survive. The umbilical cord also begins to dry and shrivel shortly after birth and usually falls off between 3 to 10 days of age. This will also help document age if the time of birth is unknown.

Routinely necropsy lambs no matter

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how sure you are of the cause of death since routine examination allows you to recognize normal structures and findings. You will not be prone to miss things if your exam is done the same way each time. Lay the dead lamb on its right side with the head to your left and feet towards you. Grab the front upper leg in your left hand and lift up (away from the rib cage) cutting the skin under the armpit, thus reflecting the front limb away from you exposing the entire rib cage. Look for signs of bruising over the ribs as fractured ribs are a common result of trauma. Also look for signs of pale discoloration of the muscle which might indicate vitamin E and selenium problems or hemorrhage. Do not mistake injection stains (yellow LA200 or white penicillin) under the elbow for abscesses as this is a common site for injections.

Normal newborn lambs have a layer of tan fat that follows the junction of the ribs to the cartilage of the sternum and the junction of the ribs with the spine. This fat is readily apparent in stillborn lambs but totally absent in starvation animals. After necropsying starvation and hypothermia lambs, the comparison is obvious – look for it.

Next make a long curved incision from front to rear through the cartilage junction of the ribs and sternum and continue the cut up across the abdomen to the area just in front of the hip. Lift up on the ribs and push them away from you (you may actually break the ribs at their connection to the spine) allowing all the internal organs of the chest and abdomen to be viewed like an oyster on the half-shell. Trim any skin or muscle in your way.

Finally, make a cut through the back of the muscles of the ham area to check for uneven, pale muscle discoloration characteristic in this area for white-muscle disease.

With the lamb opened in a routine manner, the diagnosis of hypothermia and starvation and other common diseases can now be easily made while asking yourself several questions.

1. ARE THE WINGS NORMAL AND INFLATED?

This is the first important question to an-

swer, especially in lambs dying from hypothermia and starvation during day one. If the lamb is stillborn, the lungs will be an even dark purple coloration throughout – much the same color and feel as the liver. Normal aerated lungs, however, will be spongy to the touch and an even colored pink. Variations in color and feel with dark purple firm areas toward the bottom and front of the lungs with normal feeling spongy pink areas toward the top and back might indicate pneumonia or some other cause of death.

Starvation and hypothermia lambs should have normal lungs unless some compounding problem exists. Pneumonia is often found secondary to starvation problems so don't be surprised to observe both problems in the same lamb.

Hypothermia lambs that die very shortly after birth may also have a small amount of clear amber-colored fluid in the chest.

2. IS THERE FAT IN THE HEART GROOVES?

While looking at the lungs, cut through the heart sac and expose the bare heart muscle. Normal stillborn lambs have a good supply of tan fat in the grooves on the external surface of the heart. This fat is lacking in starvation lambs that have metabolized it for energy.

3. IS THERE MILK IN THE STOMACH AND INTESTINES?

Normal newborn lambs have a very large true stomach filled with a clear mucus and small rudimentary forestomachs. The absence of milk in the abomasum or true stomach is common in hypothermia and starvation lambs. Normally, when a lamb nurses, the milk bypasses the forestomachs and goes directly to the abomasum where it forms cottage cheese-like curds during digestion. Weak lambs tube fed by producers often have fluid milk (lacking curds) present in the forestomachs and abomasum (since suckling did not take place) and sometimes the extreme upper portion of the small intestine. Milk in the forestomachs, lack of curdling and absence of milk in the lower intestinal tract indicate tube feeding as a last resort. Do not rule out starvation simply by the presence or absence of milk. The presence of large amounts of silage, hay or grass in the stomach of very young

lambs may also support starvation.

4. IS KIDNEY FAT PRESENT IN NORMAL AMOUNT AND COLOR?

Kidney fat color and consistency is probably the most remarkable change occurring in starvation and hypothermia lambs. As you examine stillborn lambs, look at the large amount of light brown fat Mother Nature deposits around the kidney. This fat acts as a source of energy for newborn lambs until they receive adequate nutrition. As starvation ensues the fat changes from a light tan color to a dark purple gelatinous material (about the color of black cherry jello) as it is gradually metabolized for energy. Kidneys in older starvation lambs are often totally devoid of any fat. In extremely cold weather, when the starving lamb requires lots of calories for heat production, this change in color may occur over the 3-12 hours preceding death. In warmer weather, starvation may occur over several days and result in kidneys that are totally devoid of fat. If you look closely, a small gland known as the adrenal gland is also more obvious in older starvation lambs. The adrenal is normally small and hidden under the renal fat just in front of and to the inside of the kidney. The adrenal enlarges to produce more cortisone-like products in response to the stress of starvation and becomes more obvious due to the lack of fat.

Hypothermia and starvation lambs dying very early in life will not have obvious adrenal enlargement due to the acuteness of their condition. Older starvation lambs may.

Remember to check kidney fat on all dead lambs to appreciate normal amounts and color, and avoid missing starvation-related infectious diseases.

Conclusion

Remember that 50% of all Michigan lambs that were born alive and died during week one of life died from hypothermia and starvation. Approaching the nutritional, environmental and management factors contributing to starvation and hypothermia after lambing has begun is simply plugging the dike. Think about your operation and where changes could be made for next year.

See Why Didn't It Live page 20

WHY DIDN'T IT LIVE ? From page 19



Figure 1: Typical stillborn lamb positioned on its right side and ready to be necropsied. Notice the yellow meconium staining and soft rounded hooves commonly seen in stillborn lambs.



Figure 2: Cut the skin under the front leg and fold the cut leg over the back of the lamb. Next cut the cartilage junction of the ribs and sternum and continue this cut through the skin and muscle up the flank to the point of the hip.



Figure 3: Stillborn lamb. After cutting through the rib cartilage, lift the ribs and push them away from you, breaking the ribs at their attachment to the spine. This should open the chest and belly cavity for easy viewing. Notice the dark purple non-inflated lungs typical of a lamb that never breathed. Also, notice the straw-colored mucus normally found in the newborn's stomach and the large deposits of tan-colored fat surrounding the kidney. Inflated lungs of a lamb that had breathed would be reddish-pink in color and spongy feeling compared to these dark purple lungs that are of similar consistency to raw liver.



Figure 4: Notice the normal amount and color of the kidney fat in a newborn lamb. This tan fat serves as an energy source during the first few days at life. Compare this to the pictures of starvation and hypothermia lambs.

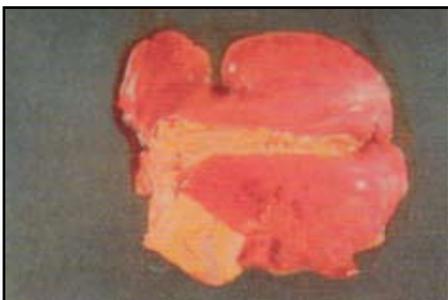


Figure 5: Non-inflated lungs of a stillborn lamb. Areas of hemorrhage (dark purple spots) on the lung surface are commonly observed.



Figures 6 & 7: Notice the normal amounts of tan fat covering the ribs and chest muscles of a newborn lamb (Figure 6). Compare this to the lack of fat cover in a 5-day old starvation lamb (Figure 7).





Figure 8: This picture illustrates the progressive fat loss and color changes commonly observed in hypothermia and starvation lambs. In cold weather; progression from the normal fat color and consistency observed in the upper left kidney to the black cherry jello color of the lower left or upper middle kidney may only span several hours. Warm weather starvation lambs surviving several days may totally deplete the kidney at fat as observed in the kidney in the lower center row or on the far right.



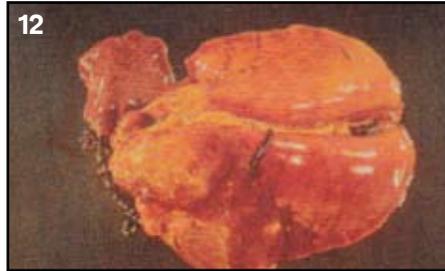
Figure 9: All the components of hypothermia and starvation are present. Notice the sharp, manure-stained hooves indicating that this lamb was up and walking. Notice the inflated lungs, empty stomach and intestines and the typical color change in the kidney fat.



Figure 10: Trauma lambs often show blood loss into the chest or abdominal cavity. This is normally due to fractured ribs or ruptured livers. Notice the clotted blood around the liver of this traumatized lamb.



Figure 11: Many lambs die from more than one cause. Notice the fractured ribs and punctured lungs typical of a traumatized lamb. The owner thought that this lamb had been crushed. However, further examination revealed a starvation kidney and empty stomach. Starvation was the primary cause of death. Starvation underlies many trauma and pneumonia deaths.



Figures 12 & 13: Lambs dying from pneumonia usually will have a sharp line of demarcation between normal (pink and spongy) and diseased lung tissue. The dark reddish-purple, firm diseased area is usually located to the front and bottom of the lungs with the normal area usually positioned to the top and back. This is obvious in both Figures 12 and 13. Figure 12 shows the sudden severe pneumonia that often occurs in 1- to 2-day-old lambs. Figure 13 shows a more chronic condition with round, yellow abscesses distributed throughout the diseased portions of the lung.



Figures 14, 15 & 16: Abortion causes are often difficult to document. Figure 14 illustrates the circular, doughnut-shaped areas on the liver sometimes noted with vibronic abortion. Figures 15 and 16



are commonly seen with toxoplasmosis abortion. Figure 15 illustrates a typical set of twins aborted from toxoplasmosis. Notice the mummified fetus and more normal looking twin. Figure 16 illustrates



the white, granular appearance to the buttons of the placenta commonly seen with toxoplasmosis abortions.

Colostrum is key

By Mike Metzger, Michigan State University Extension

One of the most important functions of colostrum (first milk) is to provide kids and lambs with antibodies (immunoglobulins) that provide passive immunity for the first two months of life. Newborn lambs and kids, like other mammals, are born with no antibodies of their own and rely on those provided by the mother in colostrum for protection.

Protection provided by colostrum starts during pregnancy. Does and ewes must be adequately vaccinated and receive proper nutrition in order to mount an immune response needed to manufacture antibodies for colostrum and remain healthy themselves. Minerals such as selenium, copper and zinc are vital components of immune function. Newborns are very dependent on copper acquired during the prenatal period since copper levels in milk are poor. Therefore, proper copper nutrition, especially in goats, in gestating females is critical to body stores in newborns. Pregnant animals must be on the farm for at least fourteen days to produce the correct antibodies for their specific kidding/lambing environment to pass on to their offspring.

The antibodies found in colostrum are absorbed whole by the kids and lambs through the lining of the stomach. However, the efficiency with which a newborn can absorb these antibodies declines within just one hour after birth. The ability to absorb antibodies drastically decreases after 12 hours and is essentially gone by 24 hours of age. Therefore, if a newborn doesn't get colostrum within the first 24 hours of birth, its chances of survival are very slim.

The single most important component to successful transfer of antibodies from mother to offspring is the consumption of sufficient amounts of colostrum.

Kids and lambs must consume enough colostrum to provide the immunoglobulins needed for passive immunity. A good rule of thumb would be 8 to 10 percent of the body weight of the kid/lamb, however it is best to feed according to appetite.

For example if the birth weight was five pounds, that would mean that you would need roughly 1/2 pound of colostrum (5 pounds X 10 percent). This translates into about a half of a pint (one pint roughly equals one pound). This is normally not a problem as long as animals accept their offspring and have enough colostrum and teats to feed the litter. However, occasionally you will run into the problem of an animal rejecting her kids/lambs or producing a larger litter than she is capable of nursing effectively. In these cases you will be forced to bottle or tube feed colostrum or risk losing the kids or lambs.

Planning ahead in these situations is critical. Freeze extra colostrum from several healthy older animals (colostrum quality is better in older animals than first timers) to have it on hand. It is important to thaw only the amount of colostrum needed (once thawed you cannot refreeze), thus it is best to freeze colostrum in small quantities. Do not thaw frozen colostrum in the microwave as this will have an adverse effect on the antibodies. Use a warm water bath to thaw frozen colostrum quickly.

Antibodies in colostrum provide kids and lambs with passive immunity for the first few months of their lives. Therefore, it is vitally important that newborns receive adequate amounts of colostrum as soon after birth as possible to ensure survival. The quality of the colostrum will be dependent on how the doe or ewe is managed during pregnancy, especially during the last few weeks.





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BODY CONDITION SCORING OF SHEEP

By J. Thompson & H. Meyer; Oregon State University Extension Service (1994)

Throughout the production cycle, sheep producers must know whether or not their sheep are in condition (too thin, too fat, or just right) for the stage of production: breeding, late pregnancy, and lactation.

Weight at a given stage of production is the best indicator, but as there is a wide variation in mature size between individuals and breeds, it is extremely difficult to use weight to determine proper condition. Body condition scoring describes the condition of a sheep, is convenient, and is much more accurate than a simple eye appraisal.

A body condition score estimates condition of muscling and fat development. Scoring is based on feeling the level of muscling and fat deposition over and around the vertebrae in the loin region (Figures 1–3). In addition to the central spinal column, loin vertebrae have a vertical bone protrusion (spinous process) and a short horizontal protrusion on each side (transverse process). Both of these protrusions are felt and used to assess an individual body condition score.

See **Sheep Body Scoring**
page 24

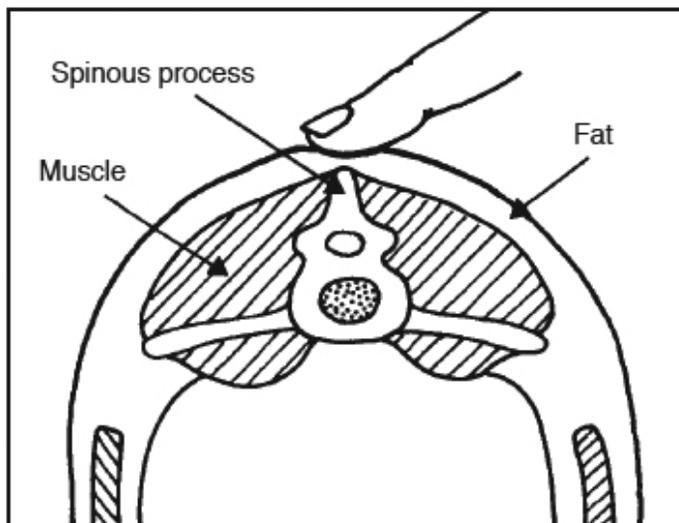


Figure 1: — Feel for the spine in the center of the sheep's back, behind its last rib and in front of its hip bone.

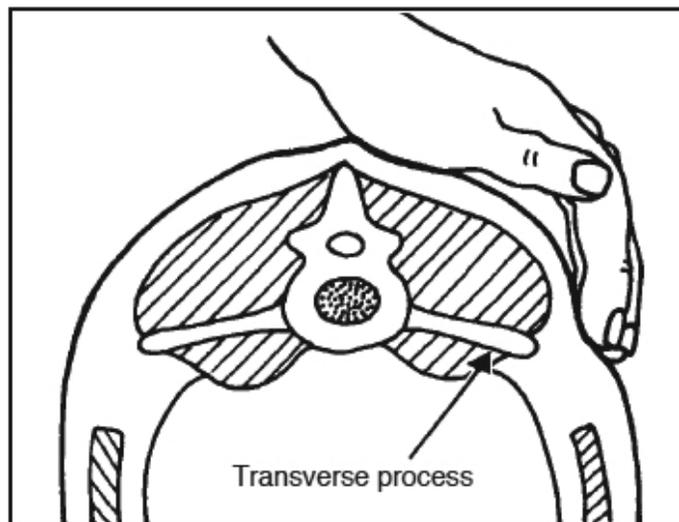


Figure 2: — Feel for the tips of the transverse processes.

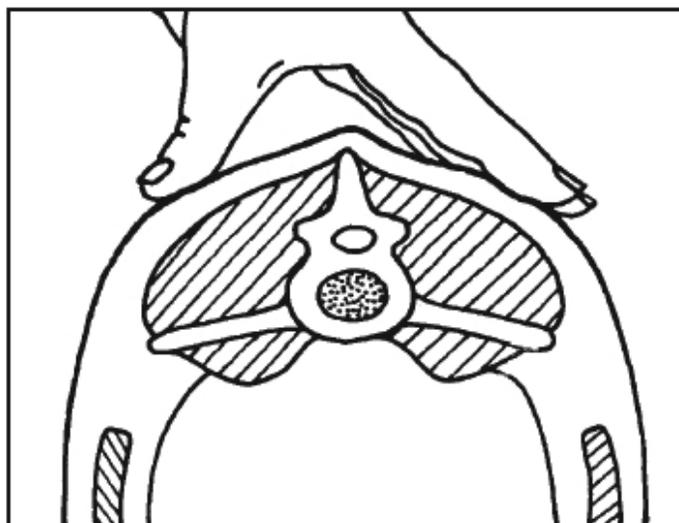


Figure 3: — Feel for fullness of muscle and fat cover.

SHEEP BODY SCORING From page 23

The system used most widely in the United States is based on a scale of 1 to 5. The five scores (Figures 4–8) are:

Condition 1 (Emaciated)

Spinous processes are sharp and prominent. Loin eye muscle is shallow with no fat cover. Transverse processes are sharp; one can pass fingers under ends. It is possible to feel between each process.

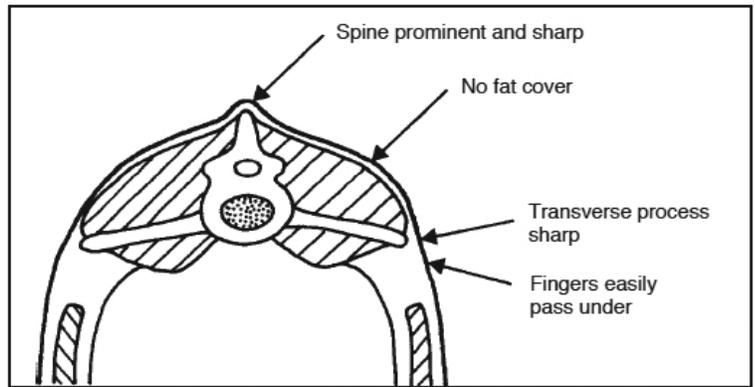


Figure 4.—Condition 1

Condition 2 (Thin)

Spinous processes are sharp and prominent. Loin eye muscle has little fat cover but is full. Transverse processes are smooth and slightly rounded. It is possible to pass fingers under the ends of the transverse processes with a little pressure.

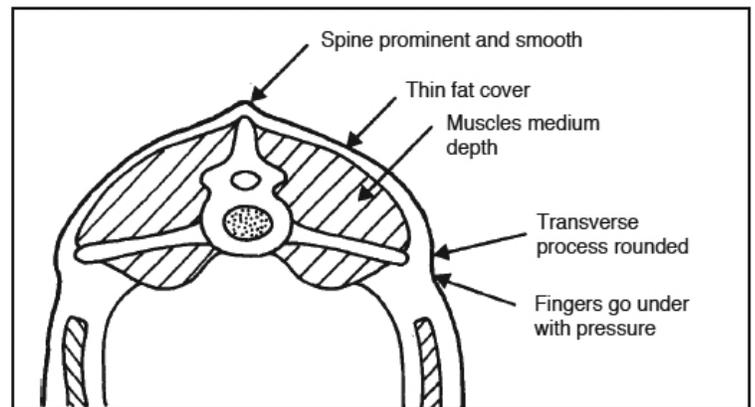


Figure 5.—Condition 2

Condition 3 (Average)

Spinous processes are smooth and rounded and one can feel individual processes only with pressure. Transverse processes are smooth and well covered, and firm pressure is needed to feel over the ends. Loin eye muscle is full with some fat cover.

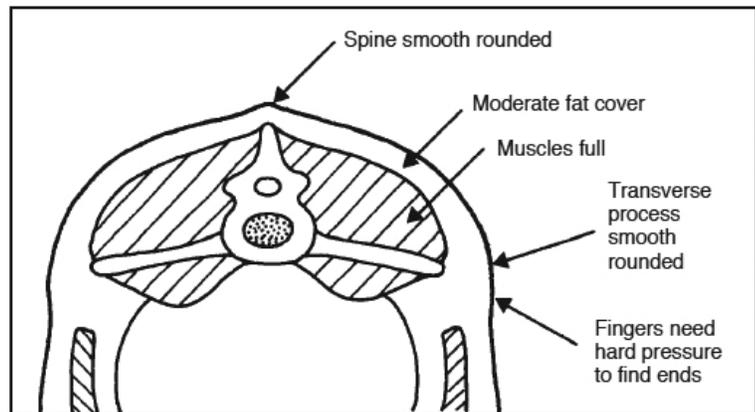


Figure 6.—Condition 3

Condition 5 (Obese)

Spinous processes cannot be detected. There is a depression between fat where spine would normally be felt. Transverse processes cannot be detected. Loin eye muscle is very full with a very thick fat cover.

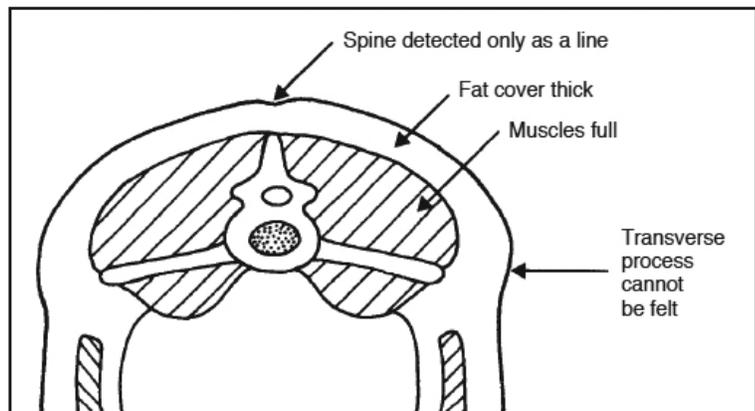


Figure 7.—Condition 4

SHEEP BODY SCORING From page 24

The system contains everything from emaciated sheep to those that are grossly obese due to overfeeding or being nonproductive. In most typical sheep flocks, over 90 percent of the sheep should have a body condition score of 2, 3, or 4. It is recommended that half scores be used between 2 and 4, giving the following scores: 1, 2, 2.5, 3, 3.5, 4, and 5.

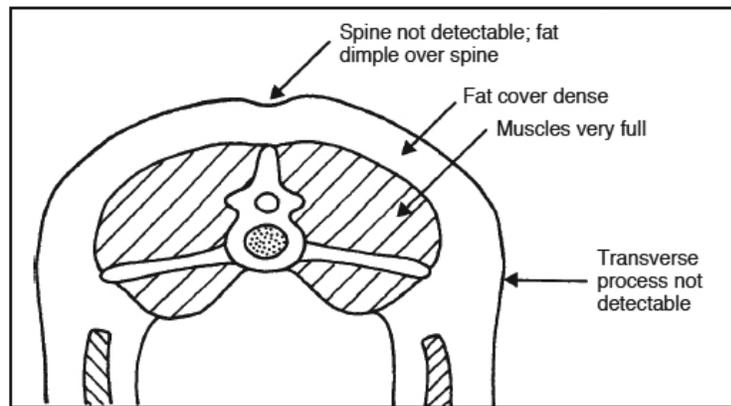


Figure 8.—Condition 5

The intermediate half scores are helpful when an animal's condition is not clear. Keep in mind that placing an exact score is not as important as being able to assign a relative score. A body condition score of 3 versus a 3.5 is not such a big deal, but the relative difference between a 2.5 and 4 certainly is of concern.

Other than practical experience, there is little available research comparing condition scores with performance. The majority of the research reported has dealt with the relationship of body condition score at breeding to ovulation rate and subsequent lambing percentage.

Generally, the better the body condition score at mating, the higher the ovulation rate and therefore the higher the potential lambing percentage. However, ewes with a condition score greater than 4 at breeding tend to have a higher incidence of barrenness.

Ewes with a condition score less than 3 at breeding will be more responsive to the effects of flushing than those with condition scores at 3.0–3.5 at mating.

Two research trials conducted by Oregon State University found that ewe body condition score at lambing had an effect on total pounds of lamb weaned per ewe.

Ewes with a body condition score of 3 to 4 at lambing lost fewer offspring and weaned more pounds of lamb than those with a condition score of 2.5 or less.

In one study, ewes with a body condition score of 4 at lambing had a total weight of lamb weaned

per ewe that was 82 percent greater than ewes with a body condition score of 2.5. The total weight weaned was 113 pounds versus 62 pounds per ewe. The increase in total weaning weight was due to improved lamb survival and heavier weaning weights.

In the other study, there was a 33 percent difference in total weight of lamb weaned (64 versus 85 pounds per ewe) between ewes with pre-lambing body condition scores of 2.5 to 3.5. This increase in pounds of lamb weaned was primarily due to improved lamb survival for offspring from the ewes with the higher body condition score.

Some suggested (optimum) condition score values for the various stages of the production cycle are:

Production stage	Optimum score
Breeding	3–4
Early–Mid Gestation	2.5–4
Lambing (singles)	3.0–3.5
(twins)	3.5–4
Weaning	2 or higher

The scores suggested above should allow for optimum productivity in highly prolific ewes. On average, a difference of one unit of condition score is equivalent to about 13 percent of the live weight of a ewe at a moderate (3–3.5) body condition score. Thus, a ewe with a maintenance weight of 150 pounds would need to gain approximately 20 pounds to go from a body condition score of 2.5 to 3.5.

Body condition scoring is a subjective way to evaluate the status of a sheep flock—a potential tool for producers to increase production efficiency in their flocks.

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Hoof Care Is Essential for Sheep & Goat Welfare

Steven M. Jones, Associate Professor - Animal Science, University of Arkansas Reprinted from *Goat and Sheep News*, June 2013 - Vol. 5, No. 2

Regular hoof trimming is an essential part of raising small ruminants. Flocks should be checked on a regular basis for hoof growth. Over-grown hooves may inhibit the animals' desire to travel due to discomfort, predispose the animal to other foot and leg problems and limit competing for feed sources. Animals with overgrown hooves are also very susceptible to joint and tendon problems and arthritis. Also, breeding animals use their hind legs during mating; mating and reproductive performance of a flock may seriously be affected if hooves of breeding males are not trimmed.

The number of hoof trimmings per year will be dependent on environmental conditions and management. A minimum of two to three times a year is essential for almost

all animals, no matter their diet or environment. Animals that are fed a high energy and protein diet tend to have hooves that grow more rapidly. Animals that have access to hard surfaces and play areas will naturally wear down the hoof and require less frequent trimmings. Sheep and goats that are kept in damp, muddy environments and do not have their feet trimmed regularly are very prone to foot problems, such as footrot and footscald. If the foot is left neglected for extended periods of time, permanent damage can result. Care should be taken to avoid trimming feet of ewes/does during late gestation.

Hoof Trimming Basics

The sheep or goat should be properly restrained. The most common method of restraining sheep is to place them on their rumps and hold them in the shearing position. This procedure can be accomplished by standing on the sheep's left side, holding the jaw with the left hand and placing the right hand on the animal's hip. Hold the jaw tightly and bend the sheep's head sharply over its right shoulder. At the same time, press down on the animal's right hip. As the sheep falls to the ground, raise the front feet and head so the sheep rests on its rump and leans off center of the tailbone and against the person doing the trimming.

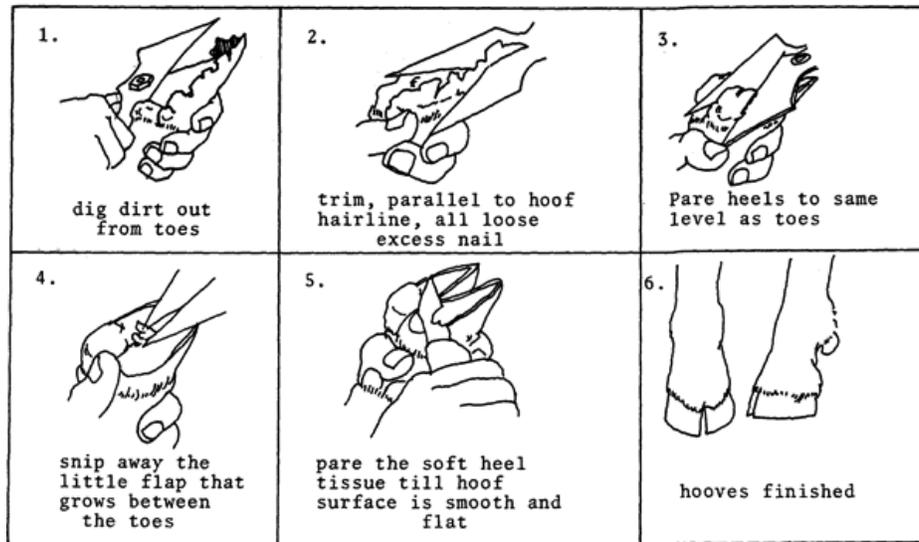
Goats, however, should be trimmed while in a standing position. Goats should have their heads tied to a secure place, preferably on a wall or fence. This allows the person doing the trimming to stand to the outside of the goat and gently push the goat up against the fence or wall for extra control when needed. The feet of a goat can be picked

up from many different positions. Commonly, the person doing the trimming will stand on the same side as the foot they are trimming. The hind legs are often brought back straight behind the goat.

Another method of restraint acceptable for all species is to use a tilting squeeze table. The animal is rotated on its side while being restrained. This equipment requires added expense, but offers easy access to the animal's feet. Care must be observed, however, to avoid being kicked.

The overall goal of the trimming process should be to make the foot

flat on the ground. Toes should be short enough to support the animal's weight across all the surface area of the hoof. This also quickens "break-over" and allows the animal to stride naturally. A pair of hoof trimmers or a sharp pair of ornamental shears should be used. The toe region should be examined while removing any excess debris.



Source: FAO.org

When learning how to trim, begin by taking very small amounts of hoof wall and toe off at a time. If the trimming goes too deep, the sensitive structures of the foot can be injured. This can lead to excessive bleeding, pain, lameness and infections. If the foot is trimmed too deep, the bleeding can be stopped by holding the foot and applying some blood-stop powder. The foot should be kept clean and free of debris for the next few days. This will help prevent infections and possible problems with tetanus. A tetanus booster should also be given if the bleeding is significant.

The inside wall of the foot can also be trimmed. It should be trimmed a little bit lower than the outside wall. This allows most of the animal's weight to be on the outside hoof wall where it should be placed naturally. The heel regions can also be trimmed when needed.

Once the entire process is finished, the foot should be released and examined for proper balance while the foot is bearing weight. The toes should not be left too long; if left too long, the animal will rock backwards on the foot and cause unnecessary stress on the flexor tendons. If the toes are trimmed too short, the fetlock may "break forward" in an abnormal position.

References:

Footrot in Sheep and Goats, Lynn Pezzanite, Animal Sciences Student; Dr. Mike Neary, Small Ruminant Extension Specialist, Purdue University; Terry Hutchens, Extension Goat Specialist, University of Kentucky; AS-596-W; Purdue University Cooperative Extension Service, West Lafayette, IN 47907 Small Ruminant Manual, InfoVets.com.

Shear Sheep Before Lambing

North Dakota State University

Shearing sheep prior to lambing improves flock productivity. Shepherds have some simple ways to capitalize on one of the best lamb and wool markets the American sheep industry has seen.

One of them is shearing sheep. It can have tremendous impacts on flock productivity, according to Reid Redden, North Dakota State University Extension Service sheep specialist. He recommends sheep producers have their sheep shorn 30 to 45 days before anticipated lambing for several reasons, including:

- Shearing sheep before lambing equates to healthier and more productive lambs. Recent research indicates that shearing may improve blood flow to the unborn lamb.
- Shearing will stimulate ewes to seek shelter prior to lambing and reduce the chance of lambs being born outside, where they are more likely to become hypothermic.
- Shearing ewes prior to lambing will increase ewe feed intake and increase the calories ewes consume, which helps meet growing nutrient demands during this phase of production.
- Shearing ewes will help keep the barn warmer and drier.
- Shearing ewes prior to lambing creates a cleaner environment for the newborn lambs and helps the lambs nurse sooner.

Shearing before lambing time also is a good practice to improve the value of the wool clip, Redden says. Normally, the stress of lambing causes a small break in the wool fiber. If this break is at the end of the fiber because the ewe was shorn close to lambing, it doesn't reduce the value of the wool. However, if ewes were sheared midway through the lambing season, the fiber can break in half, which reduces the fiber's usefulness.

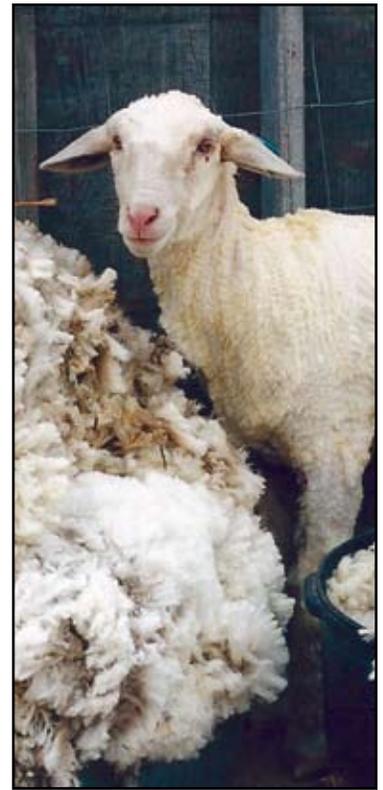
"Maintaining good management practices when we harvest our wool is

important," Redden says.

Here are some common tips to improve the wool clip:

- Keep ewes off feed and water for at least 12 hours prior to shearing.
- Don't shear wet sheep.
- Bed the barn with fresh straw one week prior to shearing.
- Reduce the animals' contact with poly twine and poly tarps that eventually could be mixed in with the wool.
- Sort off wool that is heavily contaminated with manure, vegetable matter or paint.
- Maintain a clean shearing floor.
- Sort and package fleeces into similar wools (main line, bellies and tags).
- Shear sheep by wool class (fine vs. medium wool breeds), keep the classes of wool separate and sweep the shearing floor between groups.

"Proper packaging of wool improves your wool harvest and improves the reputation of American wool," Redden says.



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Relatively low-cost, easy “fixes” to decrease gastrointestinal parasite loads on the farm

By Jean-Marie Luginbuhl, North Carolina State University Reprinted from *Meat Goat Notes*, No. 1 – 2013.

Decreasing parasite loads is every producer’s challenge. Nonetheless, relatively low-cost, easy “fixes” as described below can be readily implemented on every farm.

Repair water trough leaks

The concentration of feces is likely to be high around water troughs as animals will defecate when coming to drink water. In addition, forage will grow well around leaky water troughs due to the additional moisture.

The combination of moisture and a high concentration of feces will most likely result in an area highly contaminated by gastrointestinal tract larvae waiting to be ingested when the lush forage is consumed by the goats or sheep. Such a scenario may potentially affect the entire herd or flock even when gastrointestinal tract larvae concentrations are low in the rest of the pasture.



Fence off moist areas

Low-lying wet areas, marshes, and stream banks will favor the growth of lush forage and the survival of gastrointestinal tract larvae, and thus will likely be highly contaminated.

Avoid grassy pens

Pens used for sorting small ruminants and to protect them from theft and predation will contain a high concentration of feces. Following a few days of rain, forage will grow readily due to the high concentration of nutrients and, at the same time, gastrointestinal tract larvae will hatch and will soon be ready to be ingested by the penned animals grazing the forage.

Separate animals into groups

Different classes of animals vary in their nutritional requirements and their susceptibility to gastrointestinal parasites and their effects. Therefore, goats or sheep should be separated into distinct groups to be managed separately according to their specific nutritional requirements and susceptibility to gastrointestinal parasites.

As healthy, well-nourished animals can resist gastrointestinal tract infection better, match the nutritional requirements of the animal groups to the pasture resources of your farm. The animals with the highest nutritional requirements are young, weanlings, and late pregnant and lactating animals. These same animals are most susceptible to gastrointestinal tract parasite infection.

Subdivide your pastures

Divide pastures into sub-paddocks using temporary electric fences and always move animals before the pasture becomes shorter than 3 inches. In a grazing program consisting of only one pasture, all animals (most susceptible and less susceptible) will be exposed to the same load of gastrointestinal parasite larvae and will keep re-infecting themselves.

Other benefits of pasture subdivision include the ability to strictly ration pasture feed according to animal nutritional requirements and the need to provide recovery periods for pasture plants. In addition, pasture rest is an effective tool to decrease gastrointestinal parasite larvae on pasture. The length of pasture will vary with climate, season, and rainfall. A good rule of thumb is at least 3 months of rest.

Decrease stocking rates

The primary cause of internal parasitism is overstocking, therefore it is important to match animal numbers to pasture size and amount of forage.

Graze multiple species

of livestock

Use cattle or horses to graze pastures after goats or sheep. The benefits are three-fold: (1) Cattle or horses will act as vacuum-cleaners and will ingest many gastrointestinal tract parasite larvae that goats and sheep share; in turn, these larvae will die in gastrointestinal tract of the cattle or horses; (2) Goats and sheep will be able to select and graze the pasture of the highest quality to meet their nutritional requirements; and (3) Goats, sheep, cattle and horses differ in the types of forage they prefer, thus leading to a better pasture utilization.

Keep recently purchased goats or sheep off pasture

Do not add anthelmintic-resistant worm larvae to your pastures. Recently purchased goats or sheep should first be quarantined on a dry dirt or concrete pen and dewormed aggressively using multiple dewormers before being grazed with the rest of the herd or flock.

Keep good records and cull aggressively

Recording the health status of animals through the use of FAMACHA® scores and deworming frequency will allow producers to readily find out which animals are re-infecting their pastures and therefore the rest of their herd or flock.

As a general rule, 20% of animals will shed approximately 80% of gastrointestinal parasite eggs. Culling those worm-susceptible animals is the most important factor that can be used to increase herd or flock resistance and reduce pasture contamination.

Understanding Anthelmintics

By Susan Schoenian, Maryland Small Ruminant Page (www.sheepandgoat.com)

An anthelmintic is a substance that expels or destroys gastrointestinal worms. The more common name is dewormer or “wormer.” Anthelmintics are also called parasiticides, endectocides, nematocides, parasitics, antiparasitics and drenches.

Before 1940, the only compounds used to deal with parasitism were natural substances that had some effect on parasites, but also risked toxicity to the animal. The modern age of deworming began with the introduction of phenothiazine, which was administered to sheep as a drench and/or included in salt mixtures. It was sometimes combined with lead arsenate to control tapeworms.

In the 1960s and 70s, organophosphate anthelmintics were introduced. Haloxon (Loxon) was an organophosphate anthelmintic that was eventually removed from the U.S. market due to toxicity issues, especially with Suffolk sheep and Angora goats.

Nowadays, anthelmintics are separated into classes on the basis of similar chemical structure and mode of action. Although anthelmintics are sold under many brand names, there are only three chemical classes of dewormers.

All drugs in a chemical class kill worms in the same manner, though the effectiveness within chemical families varies. For drug rotation to be of any value, you need to switch chemical classes, not just brand name products. On the other hand, it is no longer recommended to rotate dewormers (in the traditional sense) but rather to selectively deworm sheep and goats, using specific dewormers for specific situations.

All anthelmintics essentially kill worms by either starving them to death or paralyzing them. Because worms have no means of storing energy, they must eat almost continuously to meet their metabolic needs. Any disruption in this process results in energy depletion. Interfering with feeding for 24 hours or less is sufficient to kill most adult parasites. Parasites will also die if they become paralyzed and temporarily lose their ability to maintain their position in the gut.

Benzimidazoles

The first chemical class of modern anthelmintics developed was the benzimidazoles (BZD). The first drug in this class, thiabendazole (TBZ), was introduced in 1961. In addition to thiabendazole (which is no longer sold), this chemical class includes fenbendazole (Safeguard[®]), albendazole (Valbazen[®]) and oxfendazole (Synanthic[®]). Benzimidazoles interfere with the worm's energy metabolism on a cellular level.

They bind to a specific building block called beta tubulin and prevent its incorporation into certain cellular structures called microtubules, which are essential for energy metabolism. Interfering with energy metabolism is a much more basic mode of activity than the other classes of dewormers. For this reason, benzimidazoles are also able to kill worm eggs. Benzimidazoles have a wide margin of safety and broad spectrum activity.

Nicotinic Agonists

Nicotinic agonists comprise the next class of anthelmintics. They include imidazothiazoles (IMID) and tetrahydropyrimidines (TETR). The tetrahydropyrimidines group includes pyrantel pamoate (Strongid[®]), pyrantel tartrate and morantel tartrate (Rumatel[®]).

The tetrahydropyrimidines mimic the activity of acetylcholine, a naturally occurring neurotransmitter that initiates muscular contraction. The worm is unable to feed and quickly starves. Tetrahydropyrimidines only affect adult populations of worms. They do not have activity against the larval stages and are ineffective against cestodes (tapeworms) and trematodes (liver flukes).

Imidazothiazoles have a similar mode of action as pyrantel and morantel, causing spastic paralysis of the worms. The group includes the drug levamisole (Prohibit[®], Tramisol[®] and Levasol[®]). In addition to being used as an anthelmintic for animals, levamisole has been used to treat various human diseases: colon cancer, melanoma and head and neck cancer and influenza. It was discovered in 1966.

Compared to other anthelmintics, levamisole has the narrowest margin of safety, though toxicity is usually the result of excess dosage. Le-

vamisole has a broad spectrum of activity and is effective against many larval stages of parasites, though not arrested larvae. It is currently off the market.

Macrolytic Lactones

The last chemical class to be introduced was the macrolytic lactones (MLs, macrolides). The first drug, ivermectin, was introduced in the early 1980s by Merck. It was the first drug to kill migrating larval stages of worms, as well as the adults. Ivermectin quickly dominated the market, leading to its overuse.

Macrolytic lactones consist of two closely related chemical groups: avermectins and milbemycins. The avermectins include ivermectin (Ivomec[®]) and derivatives: doramectin (Dectomax[®]) and eprinomectin (Eprinex[®]). Moxidectin (Cydectin[®], Quest[®]) is the only milbemycin.

All of the macrolytic lactone compounds have the same mode of action. They are developed from the same genus of soil-dwelling organisms (genus *Streptomyces*). They interfere with GABA-mediated neurotransmission, causing paralysis and death of the parasite. Macrolytic lactones are the most potent killer of worms and are more persistent in their effect. The duration of persistent activity varies according to the drug and formulation.

Macrolytic lactones also have the unique quality of killing several external parasites such as lice, mites and ticks. They have a wide margin of safety for livestock and are effective against all stages of worms, including inactive forms. However, MLs are ineffective against cestodes (tapeworms) and trematodes (liver flukes).

Ivermectin is also used as a broad-spectrum antiparasitic agent in humans. It is mainly used for the treatment of river blindness. Ivermectin is the primary ingredient used in several types of heartworm preventatives. Collies and related breeds may be sensitive to ivermectin, though ivermectin-based heartworm preventatives deliver doses of ivermectin which are suitable for dogs with this sensitivity.

Moxidectin was introduced in 1997. It is the most potent of the ML group and able to kill some worms resistant to ivermectin. Moxidectin works like Ivermectin, but disrupts a different neurological chemical. Moxidectin is effective in the prevention of heartworm disease in dogs and cats.

Because moxidectin is so closely related to ivermectin, its overuse (and misuse) is expected to lead rapidly to resistance. As such, many experts recommend moxidectin only be used for clinically parasitized animals.

“Anthelmintics are separated into classes on the basis of similar chemical structure and mode of action. Although anthelmintics are sold under many brand names, there are only three chemical classes of dewormers.”

A new anthelmintic class

In 2009, Novartis launched Zolvix® (monep-antel), the first product of a new class of anthelmintics called the amino-acetonitrile derivatives (ADDs). Zolvix® has a unique mode of action. It paralyzes worms by attacking a previously undiscovered receptor HCO-MPTL-1, present only in nematodes. Zolvix® is effective against sheep gastrointestinal nematodes which are resistant to other drenches. So far, it is only available to sheep producers in New Zealand, Uruguay, and the United Kingdom.

Anthelmintic Resistance

Anthelmintic resistance was inevitable. It is a worldwide problem, having reached catastrophic proportions in some regions. Each time an anthelmintic is administered to an animal, it eliminates parasites whose genotype renders them susceptible and selects for parasites who are resistant and pass their resistant genes onto the next generation of worms.

Certain practices accelerate the rate by which the worms become resistant to the anthelmintic(s). These include frequent deworming, treating every animal in the flock, putting treated animals immediately onto a clean pasture, underdosing the drug, injecting the drug and pouring the drug on the animal's back. Frequent treatments are primary cause of resistance.

Understanding how anthelmintics work may help to devise strategies for slowing down the rate by which the worms develop resistance. At the same time, producers need to limit their use of anthelmintics in order to prolong their effectiveness for as long as possible.

The level of drug resistance can be determined

by performing the fecal egg count reduction test (FECRT) or by a larval development assay (LDA, DrenchRite®). In fact, anthelmintics can only be properly used IF their effectiveness (or lack of effectiveness) is known. Each farm is different.

Natural dewormers and other old-time remedies With increasing levels of anthelmintic resistance and a movement towards more sustainable farming practices, there is a renewed interest in natural dewormers. Many universities are conducting experiments to determine the efficacy of various natural dewormers and other old-time remedies.

Tobacco has historically been used as an anthelmintic for livestock. While nicotine does have some anthelmintic properties, it is extremely toxic in the doses needed to kill worms. Copper sulfate is another historical worm treatment. The problem is that sheep are very sensitive to copper sulfate and can die if they get too much of it.

In more recent years, scientists have been investigating the use of copper oxide wire particles

as an anthelmintic for sheep and goats. Due to a lower absorption rate, this form of copper is safer to administer with less risk of copper toxicity. So far, the research looks promising. The mode by which copper kills abomasal parasites is unknown.

There are a number of herbs which are believed to have anthelmintic properties (e.g. wormwood), but they have the same problem as tobacco - what's poisonous to the worms is also poisonous to the animal when given in a sufficient volume to kill the worms. Numerous plants are being tested for their anthelmintic properties (e.g. pumpkin seed, garlic). So far, none have been proven under formal research conditions to be effective anthelmintics.

Diatomaceous earth (DE) is touted as an anthelmintic, but various studies have failed to prove its efficacy as an anthelmintic. DE is composed primarily of silica (the main component of glass). There is some evidence that it might be abrasive to the integument of worms in the digestive tract.

DRUG CLASS	DRUG	TRADE NAMES
Benzimidazoles	Fenbendazole, albendazole, oxbendazole	SafeGuard, Panacur, Valbazen, Synanthic
Nicotinic agonists (imidazothiazoles and tetrahydropyrimidines)	Levamisol, morantel, pyrantel	Prohibit, Rumatel, Positive Goat Pellet, Strongid
Macrocylic lactones (avermectins and milbimycins)	ivermectin, doramectin, eprinomectrin, moxidectin	Ivomec, Eprinex, Dectomax, Cydectin, est

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Bloat at pasture turn-out – recognize the risks

Grazing legumes increases bloat risk for cattle and sheep.

By Kevin S. Gould, Michigan State University Extension

Bloat, or frothy bloat, is a life-threatening disease in cattle that can occur when animals ingest young, vegetative legumes. The most common bloat causing legumes grazed in Michigan are white clover, alfalfa and red

clover. Grazing legumes shorter than ten inches in height will double the risk of bloat.

Forages are about three weeks ahead of schedule due to the warm temperatures. Grazers are watching those pastures closely gauging when to begin grazing. Legumes, which are high in soluble protein, can cause the formation of a froth that traps gasses in

the rumen. Being unable to expel gas can cause the animal's rumen to distend. As pressure increases, breathing is affected, which can lead to death from suffocation. Cattle and sheep can die from bloat in as quickly as an hour after grazing begins, but more commonly, death occurs after 12-48 hours of grazing on a bloat-producing pasture.

The main symptom of bloat is a swollen left abdomen. Other symptoms include repetitive standing up and lying down, kicking at the belly, frequent defecation and urination, grunting and extension of the neck and head. If untreated, the animal will collapse and die within three to four hours after symptoms appear. Quick intervention is the key to saving affected animals. Treatment can range from orally tubing the affected animals to emergency intervention of a trocar that punctures the rumen behind the ribs and below the loin to immediately release rumen gas pressure.

Reduce the risk of bloat by following these management practices:

- Establish grass-legume mixtures instead of pure legumes (60% grass and 40% legume is desirable)
- Avoid grazing immature legumes
- Watch animals closely after frost or a significant change in the weather
- Avoid grazing frost damaged legumes for seven days after the frost event
- Do not put animals into legume-rich pastures when the pastures have moisture on them from rain or dew
- Make certain livestock are full of dry hay before turn-out to prevent overconsumption
- Do not remove animals from a pasture when bloat symptoms first appear. Continuing grazing causes less incidences of bloat as the cattle consume higher fiber portions of the plant
- Feed bloat-reducing compounds like poloxalene in block-form 24 hours prior to turn-out and in the high risk pastures
- Give animals access to water and minerals
- Cull animals that have frequent bloat problem.

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Copper Excesses and Deficiencies

by Susan Schoenian,
Sheep and Goat Specialist,
Western Maryland Research & Education
Center
(Reprinted from Spring 2013 Wild & Woolly,
a publication of the University of Maryland
Extension.)

Copper is an important topic for many reasons. It is being recommended for deworming again; copper (sulfate) has a historical use as an anthelmintic. Some people and publications are recommending that copper be added to the diets of sheep and goats. Copper is always a good topic for sheep producers, since sheep are the species most susceptible to copper toxicity.

Raising sheep and goats together is problematic from the standpoint of copper. This is because sheep and goats differ significantly in their copper requirements, as well as their tolerance for excess copper in their diet.

Copper nutrition is very complicated. Copper absorption is affected by other minerals in the diet, especially molybdenum and sulfur. Both molybdenum and sulfur form insoluble complexes with copper and affect its absorption.

Copper absorption is affected by other factors, including age, breed, genetics, and diet. Copper absorption in mature ruminants is very low, less than 10 percent, whereas it can exceed 90 percent in immature ruminants. Ionophores (Bovatec[®] and Rumensin[®]) increase copper absorption.

Copper is absorbed in the small intestines. Absorbed copper in excess of dietary requirements is stored in the liver. If insufficient copper is consumed, copper stored in the liver is mobilized. If the concentration of copper in the liver exceeds a critical level (usually >1000 ppm DM), there can be a sudden release of copper into the blood stream, with potentially deadly consequences.

Copper requirements vary by species, age, and production status. The National Research Council (NRC) does not give specific copper requirements for sheep. Instead, equations are used to calculate

requirements. The equations use different absorption coefficients, variable levels of absorption antagonists, and metabolic interactions to calculate copper requirements for specific sheep. The maximum tolerable level of copper in the diet of sheep is 15 mg/kg (ppm), assuming the diet contains normal levels of molybdenum (1-2 mg/kg) and sulfur (0.15-0.25%).

Less is known about goats, so equations cannot be used. Instead the copper requirements for goats have been set at 15, 20, and 25 mg/kg (ppm) for lactating goats, mature goats and bucks, and growing kids, respectively. No maximum tolerable level of copper has been determined for goats, so it is suggested the maximum tolerable level for cattle be used (40 ppm).

While sheep and goats can experience both toxicity and deficiency of copper, sheep are more likely to experience copper toxicity and goats are more likely to experience copper deficiency. The primary symptoms of copper toxicity are anemia,

jaundice and blood, red urine. Common symptoms of a copper deficiency are ataxia (swayback), depigmentation of skin, hair, or wool, and steely wool (loss of crimp). A copper deficiency can also cause more generalized symptoms, such as poor growth, bone problems, connective tissue disorders, and poor disease resistance.

There are many steps to take if you suspect either a copper toxicity or deficiency in your flock or herd. Laboratory tests which determine copper levels in the blood (serum and plasma), liver, and kidneys can be done. A necropsy can confirm a diagnosis, especially for copper toxicity. One of the most important things you need to do is determine the concentration of copper and other minerals in the diet. Never add copper to the diet of goats and especially sheep without first determining the levels of other minerals in the diet.

View PowerPoint presentation at <http://www.slideshare.net/schoenian/copper-16391507>.



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by Mike Metzger, Michigan State University Extension

Foot rot disease causes labor and income loss for many small ruminant producers. Foot rot-infected sheep and goats frequently experience debilitating pain, discomfort and lameness, which can affect their ability to graze or move to the feed bunk. These animals can die from starvation or become more susceptible to other diseases.

Foot rot is caused by a synergistic infection of two organisms, *Dichelobacter nodosus* and *Fusobacterium necrophorum*. *Fusobacterium necrophorum* is in virtually all sheep and goat environments and sets the stage for infection with the organism necessary for foot rot to occur; *Dichelobacter nodosus*. *Dichelobacter nodosus* produces a powerful enzyme that dissolves hoof horn and leads to the undermining of the sole, the severe lameness, the foul smell and the abnormal hoof growth seen with classic virulent foot rot. About 20 different strains of *D. nodosus* are believed to occur in the US. The most common lesion seen is a moist, raw infection of the skin between the toes that becomes painful. Typically animals are seen grazing on their knees. The foot will become red and the skin between the toes will be slimy and foul smelling. If not

treated early, the bacterial toxins break down the hoof wall and sole of the foot, resulting in the hoof wall loosening and detaching from the foot. Precursors to the disease include overgrown, cracked or damaged hooves. Diets deficient in certain minerals also predispose animals to poor hoof health and secondary infections.

Provide good drainage in pastures and paddocks and keep the barn clean and dry. Also, practice regular hoof trimming and good hoof care and management.

Systemic treatment with antibiotics with or without trimming of the hoof is most effective. Trimming of the claws is recommended to remove excess tissue that provides a place for the bacteria to thrive. After feet have been trimmed, affected animals should stand for at least 5 minutes with all feet in a medicated foot bath (10 percent copper or zinc sulfate) and dry before being turned out. This process should be repeated weekly for 4 weeks. Michigan State University Extension recommends that animals that do not respond to treatment should be culled.

Prevention is the key controlling foot rot in sheep and goats. Do not buy lame animals and thoroughly inspect the feet of all animals before purchase. All new purchases and all animals that have left the farm and returned should be quarantined for 30 days. Provide good drainage in pastures and paddocks and keep the barn clean and dry. Also, practice regular hoof trimming and good hoof care and management.

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Enterotoxemia (overeating disease) of Lambs

Sheep Health Fact Sheet No. 4, April 2000 Prepared by Nolan Hartwig, extension veterinarian Iowa State University Extension & Outreach

Enterotoxemia, or overeating disease, is a major killer of lambs from shortly after birth through the entire feeding period. It is characterized by acute indigestion, convulsions and other nervous system signs, colic, and sudden death. It most commonly affects single lambs, nursing ewes that are heavy milk producers, and feeder lambs on high energy diets. With proper feeding, management, and immunization, the disease can be controlled.

Enterotoxemia is caused by a bacterium called *Clostridium perfringens*. This organism is universally present in soil and manure and is a common inhabitant of the digestive tract of all animals. It normally inhabits the lower digestive tract and causes no harm to the animal. *Clostridium perfringens* thrives on starch and sugars that are normally digested and metabolized higher in the digestive tract. When a lamb overeats, undigested starch and other carbohydrates provide a medium that allows the *Clostridium perfringens* organism to grow and proliferate. It also enhances the organism's ability to produce several very potent toxins that are released into the intestinal tract and absorbed into the animal's system. The result is the sudden death associated with this disease. Vigorous, healthy, rapidly growing lambs are particularly susceptible to enterotoxemia.

Diagnosis of the disease is accomplished by careful evaluation of the affected population, management, post mortem examination of dead lambs, and submission of tissue specimens to a diagnostic laboratory. It is very important to call a veterinarian whenever sudden death occurs in

lambs of any age. It is a common error to assume that all causes of sudden death in lambs are due to enterotoxemia. There are several causes of sudden death including white muscle disease (selenium deficiency), acute pneumonia, and many others. So, a careful diagnostic effort should be made. Enterotoxemia rarely causes death in adult sheep.

Prevention of the disease is directed toward avoiding rapid proliferation of the organism in the intestinal tract and neutralization of the toxin when it is produced. This is accomplished in several ways.

The most effective method of preventing enterotoxemia in lambs is to maintain a steady intake of feed or milk. This is a tall order, but it can avoid some causes of overeating. Gradually adjust feeder lambs to rations containing more than 50 percent concentrate. Avoid sudden changes in ration ingredients, especially those affecting palatability. Prolonged periods of hot weather often adversely affect the lambs' appetites. When weather suddenly cools, the lambs may eat heavily with some suddenly dying. Water deprivation will drastically reduce feed intake. When water is reintroduced to the lambs, they will often overeat and have problems. So, a steady source of clean water is very important in preventing this disease. Chilling and its effect on feed intake can also cause problems.

Sheep producers have long known that wet bedding is conducive to the onset of an enterotoxemia outbreak. Chilling and stress cause a variable feed intake and problems with the disease. This

is especially true for heavy-milking ewes nursing single lambs.

Enterotoxemia vaccines are available and are an important aspect of controlling the disease. To prevent the disease in nursing lambs, vaccinate ewes at 6 and 2 weeks prior to lambing. In succeeding years, vaccinate the ewes once at about 2 to 3 weeks prior to lambing. Use the multivalent *Clostridium perfringens* C-D bacterin/toxoid. This procedure protects the lambs through a steady intake of colostrum. Late in the nursing period, vaccinate the lambs with the same type of vaccine. Repeat this procedure in 2 to 3 weeks. When early weaning (40 days), give the first vaccination about 10 days prior to weaning, the second about 10 days after weaning. Give late-weaned lambs both vaccinations prior to weaning.

In addition to vaccination and feedbunk management, incorporating chlortetracycline (Aureomycin*) at a continuous low level in the feed provides additional protection against enterotoxemia.

When an outbreak occurs in feeder lambs, it is usually advisable to increase the amount of roughage in the ration for several days and also the level of chlortetracycline in the feed to about 200 grams per ton for several days. Do this with the direction of a veterinarian. In nursing lambs, injection of all susceptible lambs with enterotoxemia antiserum may be necessary. This will provide protection for about 14 to 21 days, at which time the lambs can be vaccinated.

When an outbreak occurs ... it is usually advisable to increase the amount of roughage ... for several days and also the level of chlortetracycline in the feed ...



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Justin S. Luther, Ph.D., NDSU Extension Sheep Specialist (October 2006)

The lambing season can be the most exciting time of the year for a sheep producer.

The long awaited opportunity to evaluate that new ram or great set of replacement ewes finally arises. So, when the first two ewes abort, the next ewe has a stillborn lamb and the fourth ewe has a set of twins that are weak at birth and soon die, the experience can be very depressing and frustrating. These are all signs of an infectious abortion outbreak that should motivate you to 1) identify the cause(s) of abortion in your flock and 2) develop a plan to control or prevent abortions from occurring in the future.

Identifying the Causes of Abortion

Identifying the exact cause of abortion in your flock requires knowledge of the clinical signs, flock history and laboratory diagnostics. You should deliver the proper samples (fetus and placenta) to your local veterinarian or state diagnostic laboratory. Samples always should be placed on ice in a spill-proof, insulated container. Your diagnostic laboratory likely will provide results for one of the four common types of infectious abortion. The clinical signs and mode of transmission for each of these four types are described below.

1. Enzootic abortion is caused by *Chlamydia psittici*. This organism will spread through infected fetuses, placentas, vaginal discharges, feces and nasal secretions. The organism enters the bloodstream but causes no signs of infection in the ewe unless she is, or becomes, pregnant. During pregnancy, the organism enters the uterus and causes inflammation of the placenta and death of the fetus. If infection occurs before conception, the ewe will abort during midpregnancy. If infection occurs during early pregnancy, abortion will occur 60 to 90 days thereafter. If infection occurs during mid or late pregnancy, stillbirths and weak lambs at birth may result.

Ewes in their first pregnancy are most susceptible to infection. In the Western U.S., isolated range flocks are highly susceptible when the organism is introduced. Similarly, Western ewes introduced into infected Midwestern flocks are very susceptible. Approximately 25 percent to 60 percent of ewes will abort, depending on the time of the outbreak relative to initiation of pregnancy. Older ewes will become immune to *Chlamydia psittici*, thereby minimizing the annual flock abortion rate to 1 percent to 5 percent. *Chlamydia psittici* infection also can occur in young lambs and may lead to pneumonia.

2. Vibrio abortion is caused by *Campylobacter* sp. The organism is discharged with the membranes, uterine fluids and fetus at the time of abortion. Transmission will occur when ewes ingest infected membranes or fluids, or through consumption of feeds contaminated with *Campylobacter* sp. If infection occurs during early pregnancy, the ewe likely will reabsorb the fetus. If infection occurs during midpregnancy, abortion will occur 10 to 20 days later. A late-pregnancy infection will result in stillbirths and weak lambs at birth.

In general, 20 percent of ewes in a flock will abort following introduction of *Campylobacter* sp.; however, some outbreaks have led to 80 percent or 90 percent of ewes aborting. As with enzootic abortion, older ewes may become immune, but 5 percent to 10 percent of the infected flock will continue to abort each year.

3. Toxoplasmosis abortion is caused by *Toxoplasma gondii*, a protozoa that causes coccidiosis in cats. Infection will occur following ingestion of feed or water that has been contaminated with oocyst-laden cat feces. If infection occurs during early pregnancy, the embryo or fetus generally will be reabsorbed and rebreeding may occur. If infection occurs during

midpregnancy, abortion will occur and the ewe may be susceptible to a secondary infection. During late pregnancy, infection will lead to abortion, stillbirths, mummified fetuses or weak lambs at birth.

Abortion can occur in 5 percent to 50 percent of the ewe flock, with typical losses averaging 15 percent to 20 percent of the lamb crop. In healthy, nonpregnant ewes, toxoplasmosis will not cause clinical symptoms or detrimental effects.

4. Salmonella abortion is a rare occurrence that is caused by various salmonella organisms. Stress and the number of ingested salmonella bacteria will determine whether the pregnant ewe aborts. If abortion does occur, it usually is during the final month of pregnancy. Most of the ewes will exhibit diarrhea, and some will die from metritis, peritonitis and/or septicemia. Healthy, young lambs also may contract the disease and die.

Controlling Abortion

When faced with unexpected abortion outbreaks, here are some general practices that producers can use to minimize the risk of spreading the infectious organism:

- Check feed and water supplies for sheep and cat feces contamination.
- Sanitize feeding and watering equipment.
- Separate ewes showing signs of abortion and house them apart from the remainder of the flock.
- Properly dispose of (burn or bury) the infected placenta and fetus.
- Do not feed ewes on the ground.

The following treatments also can be used to minimize the number of ewes aborting in an infected flock:

- Immediately vaccinate the remaining pregnant ewes for enzootic and/or vibrio abortion.
- Begin feeding 500 milligrams (mg) of chlortetracycline per head per day for five days, and then reduce to 250 mg per head per day for the remainder of the pregnancy.
- If the outbreak is severe, inject all ewes with long-acting tetracycline (LA 200) at the rate of 10 mg/pound subcutaneously.
- If salmonella is the causative agent, inject ampicillin at the rate of 5 mg/pound. Spectinomycin also may be used at the rate of 5 mg/pound per day for three days.

Preventing Abortion

After an abortion outbreak, you must develop a plan for preventing abortions from occurring in the future. You should consider the following guidelines:

- Vaccinate - Vaccines are available for vibrio and enzootic abortion. *Campylobacter* fetus (cause of vibrio abortion) vaccine is given 30 days before breeding and repeated 60 to 90 days later. *Chlamydia psittici* (cause of enzootic abortion) vaccine is given 60 days before breeding and repeated 30 days later. (Note: The supply of both vaccines has been unreliable, so you need to place your order early in the year)
- Maintain sanitary feed and water supplies.
- Manage first-lambing ewes in a separate flock.
- Do not purchase replacement ewes from an infected flock.

Summary

Infectious abortions result from four major causes. Accurate determination of the infectious agent requires a diagnostics laboratory.

Antibiotics, vaccines and sanitary facilities all can be used to minimize the risk of abortions and ultimately improve reproductive efficiency of the ewe flock.

Toxoplasmosis: Common Cause of Abortion in Sheep & Goats

By Dr. Dahlia Jackson-O'Brien, Delaware State University Cooperative Extension

Toxoplasmosis is a disease that causes abortion in sheep and goats. The agent is a common parasitic infection, the protozoan organism known as *Toxoplasma gondii*.

Both sheep and goats can get toxoplasmosis and can experience abortions, stillbirth, fetal mummification, and the birth of weak lambs and kids. Goats also seem to be more vulnerable to *Toxoplasma* infection than sheep. Cats that have eaten infected rodents or birds are a common carrier, with kittens (infected in the womb) spreading the organism in the environment, which is then consumed by sheep or goats.

Signs of toxoplasmosis vary depending on when the female gets exposed. *Toxoplasma* commonly invades the placenta and fetus approximately two weeks after initial infection of the doe. Fetuses infected in the first half of pregnancy are more apt

to die than fetuses infected in the second half. If infected during the second half of pregnancy, stillborns or weak lambs/kids usually are the only indications of this disease. The incidence of abortion in a flock is usually low, varying between 1 and 5%, so if levels occur above this, an infectious abortive agent might be the cause. Diag-

nosis of toxoplasmosis is possible by the detection of high antibody titers in the blood. The most conclusive diagnosis requires the isolation of organisms from the placenta or body of a stillborn lamb (store on ice – not frozen- until you can get it to the nearest animal health lab).

To avoid *Toxoplasma* infection (and other problems), cleanliness is important, especially around feeding areas. It is especially important to try to prevent cats from defecating in hay, bedding, grain, or water

that will be fed to pregnant animals. Any fetal membranes and dead fetuses should be disposed of properly (burned or buried) to prevent transmission of infection to

more animals, and aborted females should always be separated from the flock.

A successful prevention/treatment of toxoplasmosis can be achieved by adding coccidiostats such as decoquinate (Decox) or lasalocid (Bovatec) to the diets of sheep and goats (with a veterinarian's guidance if not labeled for such use). Does and ewes previously infected with the organism *Toxoplasma gondii* are likely to be resistant to exposure in subsequent pregnancies; therefore, the highest risk will be in younger females.

Please note that Toxoplasmosis is transmissible to humans, and pregnant women should be especially careful in handling aborted fetal membranes and fetuses (along with cat litter, of course). Infection with *Toxoplasma gondii* during pregnancy can result in encephalitis or blindness in human fetuses. It can also be transmitted to humans via the consumption of sheep and goats milk so care should be taken by pasteurizing or boiling milk before consumption.

For more information, contact: Dr. Dahlia Jackson-O'Brien Delaware State University Cooperative Extension 1200 N. Dupont Hwy Dover, DE 19901 djjackson@desu.edu, (302) 857-6490 <http://www.desu.edu/cooperative-extension>.

Please note that Toxoplasmosis is transmissible to humans, and pregnant women should be especially careful in handling aborted fetal membranes and fetuses (along with cat litter, of course).



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Managing Perinatal Mortality

By David Fernandez, Extension Livestock Specialist, UAPB (Reprinted from Arkansas Agriculture Newsletters, Goat and Sheep News March 2013 - Vol. 5, No. 1)

Lambing and kidding seasons are upon us, and if you do not yet have lambs or kids on the ground, you probably soon will. Nothing is better than looking out at the fields and seeing the new lambs and kids nursing or playing. But nothing is sadder than early lamb or kid losses. Lambs and kids are most likely to die during the first eight days of their lives, the perinatal period. In a Wisconsin study over a nine-year period, their sheep flock had a 9.9 percent death loss from birth to weaning. About two-thirds of those deaths occurred on the first day of life. Another 18 percent died during the next eight days. That means 84 percent of all lamb deaths occurred between birth and the eighth day of life. There is no similar data available for goats, but it would not be surprising to find they are similar. What this means to you as a goat or sheep producer is you need to do everything you can to reduce your losses during the perinatal period.

Manage Perinatal Losses

- Keep the paddock clean and free of excessive manure build-up.
- Maintain healthy weights.
- Be prepared to assist with birth.
- Provide shelter from extreme weather.

Keep an eye on higher-risk newborns.

The causes of so many of our lamb and kid deaths at birth or in the next few days are usually fairly easy to prevent. In the Wisconsin study, 44 percent of the lambs lost at birth were stillborn. Usually, this indicates an infection like toxoplasmosis, chlamydiosis or leptospirosis. These infections are often the result of poor hygiene. Make sure the paddock in which females are kept is clean and free of excessive manure build-up. If you have a large number of stillborns, check with your veterinarian. Make sure the flock or herd is properly vaccinated about 60 days before lambing or kidding begins.

Another reason for a high number of stillborns might be pregnancy toxemia or ketosis. Ketosis is most common in overconditioned ewes and does but can also be a problem in thin ones. Don't overfeed, but don't underfeed either. Remember, too, that newborns from underfed females tend to have lighter birth weights. Lambs smaller than

7 pounds have higher death losses than heavier lambs. Ewes and does should be in body condition score 2.5 to 3 on a 5-point scale (5 or 6 on the 9-point scale).

Nearly 9 percent of the lamb deaths were the result of a difficult birth, called dystocia. Kids and lambs undergoing a difficult birth may not have received enough oxygen while they were being born, may have gotten fluid in their lungs or may just be exhausted. Exhausted newborns don't have the energy to keep themselves warm

or to get up and nurse. Be ready to assist ewes or does within an hour after the birth process begins. Make sure you have all the necessary equipment and that it is clean before lambing or kidding season starts. Don't breed smaller females to larger-framed males. Larger fetuses have more trouble being born than smaller ones. Lambs over 13 pounds tend to have more trouble being born, another reason to avoid overfeeding animals.

The Wisconsin study reported that 5.8 percent of the lambs lost suffocated because the amniotic sac did not break. This is

another instance where being prepared and available when birth is imminent can help reduce losses.

Exposure is another major cause of perinatal losses. Almost as many newborns (8.4 percent) died of exposure as died after a difficult birth. Newborn lambs and kids are wet and don't have a heavy layer of fat and hair or wool to keep them warm on cold, wet days. Putting does or ewes in a simple shelter that will keep newborns dry can be enough to alleviate these losses. If you know an animal will give birth soon, put it in the shelter if the weather is expected to be wet or extremely cold in the next couple of days.

Some causes cannot be avoided. For example, lambs born in larger litters had higher death losses. Ewes lambing for the first time had higher lamb losses as well. But knowing this, you can plan to keep a closer eye on these animals.

The moral of managing perinatal losses is keep your paddocks clean, maintain healthy weights, be prepared to assist with birth, provide shelter from extreme weather and keep an eye on your higher-risk newborns. These simple steps could save you nearly 7.5 lambs or kids out of every 100 born. At \$1 per pound for lambs and \$2 for kids (February, San Angelo, Texas), you could have an extra \$700 to \$800 next year.



Livestock Protection Dogs

From USDA Wildlife Services Fact Sheet, October 2010



Livestock producers use many methods to reduce predation from coyotes, bears, wolves, mountain lions, and domestic dogs. An effective predator management program typically incorporates a variety of methods to increase productivity. Livestock protection dogs (LPDs) can be an important component of an overall predation management program.

LPDs are working dogs that stay with or near sheep most of the time, with the purpose of aggressively repelling predators. While LPDs are most commonly used to protect sheep, they are also helpful in protecting other livestock from predators.

LPDs are generally large animals (80-120 pounds), often white or fawn colored. Unlike dog breeds used for herding, they are typically independent and less energetic. While various breeds of LPDs exist, some of the more readily known and utilized in the United States include Great Pyrenees, Anatolian Shepherds (Akbash), Komondors, and Maremmas.

Although many LPDs ultimately perform well, it is important to realize that some dogs bred for livestock protection are unsuccessful at repelling predators. In many cases, however, failures can be attributed to improper rearing or acquiring a dog beyond the optimum age for training.

Rearing a Livestock Protection Dog

There are several key points to keep in mind to successfully rear an LPD.

- Select a suitable breed. Evaluate the type of environment where the dog will be working. Some breeds excel in particular situations. Thorough research of breeds suited to local conditions will increase the odds of success. Select a reputable breeder once you have decided on the breed best suited for

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your needs.

- Rear pups singly from 8 weeks-of-age with sheep. Human contact, while important, should be minimized. Unlike a dog intended as a pet or human companion, an LPD must develop social bonds with the sheep. This is probably the most critical ingredient for success.

- Monitor the dog and immediately correct undesirable behaviors.

- Encourage the dog to remain with or near the livestock.

- Ensure the dog's health and safety, providing adequate food and water.

- Manage the livestock in accordance with the dog's age and experience. For example, use smaller pastures while the dog is young and inexperienced.

- Be patient and allow plenty of training time. Understand that an LPD may take 2 years or more to mature.

- Potential Benefits of Livestock Protection Dogs Effective LPDs help livestock owners by:

- Reducing predation on livestock

- Reducing labor and lessening the need for night corralling

- Alerting the owners to disturbances in the flock

- Allowing for more efficient use of pastures and potential expansion of the flock

Potential Problems

LPDs require an investment with no guarantee of success. The dogs may become ill, injured, or die prematurely. Some dogs roam away from flocks.

LPDs are potentially aggressive. Some dogs may injure the stock or other animals, including pets. They may confront unfamiliar people (e.g., hikers and bikers) who inadvertently approach the sheep or other livestock; this can be an important consideration for pro-

ducers who periodically graze livestock on public lands. To reduce conflict, livestock producers should ensure that signs indicating the presence of LPDs are readily visible.

Livestock Protection Dogs and Other Predator Management Tools: Use of LPDs does not preclude the implementation of other predation management methods. All applied techniques should be compatible with each other. Toxicants are not recommended where LPDs are working. Traps and snares can kill dogs if they are caught and not released in a reasonable period of time. As a precaution, dogs should be restrained, confined, or closely monitored if these methods are being used nearby.

Many factors influence dog effectiveness, but LPDs can be helpful in a variety of livestock operations. LPDs will not solve all predation problems for most producers. Nevertheless, in many situations, they are a useful tool. They can aid in reducing occasional predation and have worked well in both fenced pasture and herded range operations. Their effectiveness can be enhanced by good livestock management and by eliminating persistent predators.

Large pastures (large, open range) where livestock are widely scattered may decrease effectiveness of LPDs. At least two dogs are recommended for range operations or in large areas with several hundred sheep.

LPDs have been shown to be an effective tool in reducing predator conflict from a variety of species including coyotes, black bears, and mountain lions. Successful deterrence of wolves and grizzly bears is less evident. Many LPDs have been killed by wolves. Larger or more aggressive breeds of LPDs can be considered for use in wolf country, but the potential benefits and problems should be weighed carefully, especially on public lands.

Introduction

Donkeys are gaining in popularity as livestock guardians due to their relatively low cost, minor maintenance requirements, longevity and their compatibility with other predator control methods. Donkeys also offer the additional advantage in that they can be fed in much the same manner as sheep.

How Do Donkeys Protect the Flock?

The more time the guard animals spends with the flock the more likely it will be present when needed. The donkey's natural herding instinct means if properly bonded to the sheep, it will stay with the sheep most of the time. The donkey's herding instinct combined with its inherent dislike and aggressiveness towards coyotes and dogs can make it an effective livestock guard animal ... if managed properly.

Donkeys rely predominantly on sight and sound to detect intruders. When approached, sheep will tend to move so the guard animal is between the intruder and themselves. The donkeys' loud brays and quick pursuit will scare away predators and may also alert the shepherd. In most instances donkeys will confront and chase dogs or coyotes out of the pasture. If the canines do not retreat quickly the donkeys will attack them by rising up on their hind legs and striking with both front feet. A solid blow can injure, kill or at the very least discourage the predator.

Donkey Compatibility with Sheep

Given ample opportunity, most donkeys will bond with sheep and protect them from predators. The donkey should be introduced to the sheep as early as possible to increase the likelihood of the donkey bonding to the flock. Getting the sheep and donkey to accept each other as flock mates is the first step in allowing the donkey to exhibit its true guarding instincts. Under ideal circumstances the jenny (female donkey) and her foal should be raised with the sheep. The weaned foal should then be left alone with the flock.

All is not lost if the donkey has not been raised with the sheep. The donkey can still be taught to protect the sheep by housing them next to each other for 1 - 2 weeks. Usually after this adaptation period the donkey can safely be turned out with the sheep, although they should be watched carefully for signs of potential conflict.

In order to effectively protect the flock from predators the donkey and sheep must be com-

Donkeys as Sheep Guardians



From the Ontario Ministry of Agriculture, Food and Rural Affairs

patible. Conflict-free compatibility should not be assumed! There is wide variation in how individual donkeys interact with sheep. Be aware that the donkey's behaviour and mood may be unpredictable during estrus, or when the ewes are lambing. Not all donkeys make good livestock guard animals, as there are significant behavioural differences between individuals.

Compatibility

The donkeys' distinct dislike of canines may also include the farm or herding dog. Be careful to initially limit and supervise the interaction between the donkey and dog. Most herding dogs will eventually adapt and learn to work around the donkey rather than try to control it like one of the sheep.

Considerations When Buying a Guard Donkey Size, Conformation and Behaviour

- Miniature - under 36" at the withers small standard - over 36" and up to and including 48"
- Large Standard - over 48" and under 54" for jennies and over 48" and under 56" for jacks (males) and geldings
- Large - over 54" for jennies and over 56" for jacks or geldings.

Most miniatures are likely too small to effectively fend off predators. Although the large donkeys' frame enables them to repel predators, they do tend to be more difficult to handle. It would thus appear that the small and large standards provide the best combination of predator control and ease of handling.

Key points to look for when purchasing a donkey are good conformation, straight legs

and a good attitude. A donkey's aggressive tendencies towards dogs and coyotes can be checked by introducing a dog into a small pen containing the prospective guard animal.

Flock size & number of donkeys

Producers using donkeys as livestock guard animals tend to have smaller flocks. Donkeys appear best suited for farm flocks of less than 100 ewes. Ideally a donkey may be able to guard up to 200 ewes if the terrain is flat and barren and provided the sheep are grazing in one pasture. However many Ontario flocks are raised or pastured on rough and rolling land, scattered with bushes which provides ideal cover for coyotes. Under such conditions the donkey will likely have obstructed sightlines and thus be less likely to oversee the entire flock.

The use of guard donkeys may have limitations for larger flocks and rolling and bush laden pastures, unless one donkey is used for each group or pasture. It should be stressed that if using donkeys in adjacent pastures that the pastures be adequately separated to ensure the donkeys stay with their respective sheep and not with each other. There is also concern that coyotes and/or dogs may become adept at luring the donkey away from the flock, while other coyotes come in for the unprotected kill.

Donkey Gender

A jenny and foal probably provide the best protection, however jennies also work very well on their own. Geldings are also effective and especially popular because of their even temperament. Intact males (jacks) are not used as commonly as they tend to be overly aggressive with both sheep and people.

PRODUCTION OF HANDSPINNING FLEECE

By Judy Lewman, Spring Creek Farm, Minnesota.
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Though creative and efficient marketing is clearly the most important factor in selling to handspinners, obviously one must have a desirable product to sell. The following ideas and methods have worked for us and others but are certainly not to be taken as hard-and-fast rules. Each of us must find our own “best way.”

Selection Of Breeding Stock

Purebreds are not necessary. Most spinners, most of the time, prefer a multi-purpose medium-grade wool, neither fine nor coarse, with a minimum 4-5” staple length, defined crimp and luster, and a soft hand. This type of fleece can certainly be produced on a crossbred ewe.

There is demand for many different types of fleece, but you may have to work harder (create a larger customer base) in order to market some of the specialty wools. An average hobby spinner can easily go through 20 pounds of the above-mentioned, medium-grade wool in a year. In contrast, fine wool is more time consuming to process, and two pounds would be a large purchase.

If you decide to specialize, be prepared to market only those fleeces characteristic of your selected breed. This may seem obvious but is often overlooked. There are good and bad fleeces in any breed. Don't give your breed, and your reputation, a bum rap by selling an off-type fleece.

Natural-colored sheep are available in all breed types and many colors. Spinners will sometimes dye the colored wools for heather effects, but there are limits as to how much colored wool a handspinner will use in relation to white. A general rule of thumb is 20 percent dark to 80 percent white.

Consideration must also be given to production/performance records, correct body type, and meat flavor (most who sell to handspinners also direct market freezer lamb). If you already have good ewes you are happy with, the right ram can produce prime handspinning fleece on the first generation of lambs, regardless of the dams' wool type.

Nutrition

Ewes selected for their potential to grow prime wool, while also producing a fast growing set of lambs, must be fed well, but not allowed to get too fat. If inadequately fed during late gestation and lactation, wool quality can suffer



dramatically. This is doubly important if raising your own replacement stock since wool follicle development of the lamb—a primary determining factor of future fleece weight—occurs during the last weeks of gestation and the first 30 days of the lamb's life.

A good vitamin/mineral mix can boost fleece weights and must be available to the handspinning flock year 'round. Compare ingredient labels to ensure that you get what you pay for. Palatability is important, too—a vitamin/mineral mix won't do your sheep any good if they don't eat it. Some prefer to force feed the vitamin/mineral mix (by mixing it with grain) during late gestation and lactation. We highly recommend Bill Keough's program (<http://bksheep.com>). Clean, fresh water is the cheapest 'nutrient' there is.

Management

The barn door can be your most important management tool—keep it shut! Wool must be kept clean or it will be worthless to the handspinner. And the cleanest fleeces come from flocks that spend most of the time outdoors. If you have no choice but to confine your sheep, coats will keep the wool free of contaminants.

Vegetable contamination can occur from:

- Burdock, Canadian Thistle, etc. These must be controlled by mowing pastures before seed herds form, or eliminated by physical removal and/or spot use of an herbicide.

Seed heads on other pasture plants. Even desirable grasses can form seed heads that may contaminate fleece (timothy is especially bad). If your sheep can't keep up, clip pastures before grasses go to seed.

- Leafy hay. If you have a choice, grass or grass/legume hay (with grain for added protein and energy if/when needed) is preferable to alfalfa during months when pasture is not available. Well designed feeders are another good fix.

Other Contaminants:

- Branding Paint/Marking Sticks and Sprays. Even “scourable” branding paint is unacceptable in handspinning wool. For temporary marking use colored chalk sticks, or put marks on faces rather than on the fleece. If you must use branding paint, put numbers low on the britch (less desirable wool that can then be skirted off).

- Canary Staining/Banding. Yellow discoloration often unnoticed until after scouring. You may be at the mercy of the weather on this one. Try to keep sheep out of barns in hot, humid weather. Some individuals seem more susceptible.

- Barnyard Grit. Common in flocks kept in confinement; also pastured ewes that bed down on bare dirt, especially in dry, dusty conditions. Wind makes it worse. If you can't keep sheep with grass underfoot, coats will prevent.

Abrasion/rubbing will cause wool to tangle and felt together in lumps. These “cotted” areas of the fleece must be skirted out. Some causes:

External Parasites—Ticks are easy to see and easy to eliminate. Lice are another story! Most often found on longwool sheep and angora goats. Twice-a-year shearing will help to control. Some oil-based pour-on insecticides leave a residue that migrates down from the sheep's backbone into the prime parts of the fleece. This

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Hair or Wool?

In considering sheep breeds, producers are faced with the choice of wool or hair sheep breeds, with the goal of picking the breed that best fits the shepherd's situation, management, environment, and market.

In some areas of the country, hair sheep are a viable option, especially where sheep shearers are no longer routinely available, and some wool is worth less than the cost of shearing. Wool breeds thrive in cold, dry environments such as the Rocky Mountains, while hair sheep thrive in hot, humid areas such as the southeastern United States.

Hair Sheep Advantages:

- High level of reproduction
- Natural resistance to internal parasites
- Tolerance for heat and humidity
- No need to shear.

Wool Sheep Advantages:

- High value of fine wool
- Lambs finish at higher weights
- Natural flocking instinct in many breeds

- Tolerance for cold, arid conditions.

Stress-Free Shearing

Sheep should be shorn once per year, generally one month prior to lambing.

- Arrange pens and wool handling area a day ahead of time.
- Select a dry location.
- Hold sheep off feed and water the night before shearing.
- Have sheep penned and waiting for arrival of shearer.
- Have shearers disinfect equipment prior to shearing.
- Have plenty of knowledgeable helpers available to keep the sheep catch pen full.
- Shear colored sheep last to avoid contamination in white wool.
- Package belly wool and top knots separately.
- Keep shearing floor and boards clean.

Take Care of Shearer

- Have nutritious food and water ready for breaks.
- Have sheep waiting in pen for shearer's arrival.
- Keep catch pen full so shearer can access sheep with ease.

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attracts and holds dirt particles like glue — affected areas must be skirted out.

Crowded feeding conditions — Handspinning flocks may need more than the “minimum requirement” of feeder space. And having provided ample space, you may need to train/entice your sheep to spread themselves out and use it!

Narrow doorways/horizontal creep openings — An easy creep “panel” consists of a horizontal placed 6” above the floor with another at 18” (no vertical dividers). This stops squirmy yearlings but leaves ample space for lambs to 50 pounds.

Weak fibers can be caused by excessive weathering, internal parasites, starvation, fever, or stress. This will appear as “tender wool” (an overall weakness in the fibers), a definite “break” (wool breaks, as if cut, when snapped between your fingers), or “tippy wool” (tips pull off easily). All are serious defects in a handspinning fleece. Healthy sheep, fed well and managed properly, will usually produce healthy wool. Coats may prevent weathering, but illness is not always possible to control. It's good practice to check fleece strength while skirting.

Shearing

Work with your shearer, explaining your objectives. Second cuts are unacceptable. If possible, bellies, tags, and head and leg wool (if any) should be thrown off to the side. Hair on legs

and heads should not be clipped and allowed to fall into the fleece. Don't expect your shearer to slow down while you skirt. Have adequate help available or skirt later.

When to shear? Most spring lambing flocks are shorn in late gestation. Those who lamb in January and February sometimes shear in late fall before winter hay feeding begins. If your fleeces exceed 7” in length, twice-a-year shearing may be best, with the summer interval about two weeks shorter than the winter growing period; wool grows faster during summer, and your spring and fall clips should be as near the same length as possible.

Storage Of Fleece

Immediately after shearing, fleece should be allowed to “cool out” (body heat allowed to dissipate) for 12-24 hours before being packed away for storage.

Don't be afraid to pack wool tightly for storage. Seal in heavy paper bags or cardboard boxes, not plastic.

Store in a cool, dry area. Do not allow wool packages to sit on concrete floors or touch concrete walls,

or other walls on which condensation may form.

Keep it moving! Try to sell all of one year's clip before the next shearing. Best to thoroughly sweep out storage area once a year — then mist with an aerosol insecticide for “flying insects” (moths).



A Grower's Guide to Expanded Profits by Producing a Cleaner Clip

By Carrie Hull

We are creatures of habit. It happens every year, no matter the circumstance. Each year we do exactly the same thing. We change nothing so nothing changes. The day the wool comes off the sheep...

It's time to make some changes, simple changes that benefit individual farms and ranches, the wool industry, and ultimately the U.S. textile industry. What we do daily on the ranch is the very first step towards benefitting not only our farms, but also the growth of the textile industry and jobs in the U.S. The difference between doing the same old thing and implementing simple yet crucial improvement practices can mean as much as 10 to 100 times more return for the grower! It's time to pull the wool back from over our eyes.

U.S. wool producers need to compete with other wool producing countries. The easiest and fastest way to do this is through the quality of our clip. Incremental steps that have a profound impact upon the quality of the wool need to be taken. Whether you are a large producer

or a shepherd with a small flock, these impactful practices can easily be incorporated into daily life and increase profit and sustainability. They require little additional money, just a bit of thought and a moment of time. Many sheep producers could increase their wool check more than 100% if they would get their wool out of the defect grade. While we may not be able to control the market conditions for wool

or lamb, improving our wool preparation and quality increases the number of markets that are available to us. As we learn more about the fiber grown on the animals we raise, we are better equipped to make breeding, management and marketing decisions.

Expanding your thinking from the inside out is the first step. Sheep are more than a carcass (inside) – they also naturally produce wool (outside). Utilizing the entire animal increases your ability to profit. Expand your thinking, planning and implementation with the sheep and its wool in mind.

Increasing your wool income starts the day after shearing. Proper shearing should have left the animal with a short smooth fleece. The challenge is to keep this growing wool free from contami-



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nants. Clean wool is valuable wool. Contaminants increase the cost of processing as they decrease the yield. It is always easier and more successful to prevent contamination than to remove it afterwards. You don't have to raise sheep in a bubble, simply do things that increase the value and income potential of your wool harvest. While improving the wool quality, many of these practices benefit the health of the sheep as well.

Fleece contaminants come in several varieties, with the most common being acquired contaminants: feed, pastures, polypropylene, bedding and other animals.

Contamination from vegetable matter is the most prevalent problem. You've heard it before: feed at the level of the feet (not in overhead racks). But there is more to it than where the feed is placed. The act of feeding must also be analyzed. If the head and neck of your sheep are green, your feeding practices need desperate attention. In smaller operations, where feeding is done by hand, it is important not to carry or throw hay over the head or backs of the sheep. Doing so allows leaf and shavings to rain down on the wool. Feeding on the range from the back of a truck also requires focus on limiting hay contamination. Hay that is tossed inadvertently onto the head or back of an animal begins or enforces the contamination cycle. It also contributes to eye problems caused by chaff or seeds. Avoid feeding in windy open areas where hay, chaff, dirt and sand are forcibly blown into the fleece. Instead, choose a sheltered location, in a protected valley or hillside to feed. The fleece and the sheep will thank you!

Grain is also a contaminant. Never pour grain in troughs over the heads of impatient sheep. Carrying a bucket of grain into a flock of sheep can be a dangerous! Plan feeding areas so that sheep can be locked out while troughs are filled, then open the gate and let the feeding frenzy commence. Adequate space at grain troughs is equally important for body condition and growth as well as wool cleanliness. Grain can be fed on the range from the truck through a piece of PVC pipe attached vertically to the trail gate or bumper of the truck. A hopper mounted at the top allows grain to be poured into the pipe, while the bottom open end of the pipe is mounted 10-12" above the ground level.

Pasture management is vitally important in limiting contamination. Weed patrol and seed head elimination is the main emphasis. Walking pastures several times a year not only provides some exercise, but potential threats to the health and safety of your sheep and their wool can be identified early on. Invite your local 4-H or FFA group to learn about and remove contaminants from your pastures, even if it is only one pasture. Cutting or burning pastures before weeds and thistles go to seed improves not only the current wool clip, but also the future pasture as well.

It's been said before and bears repeating: Polypropylene does not

wash out or come out in processing. Once incorporated into the yarn, it will not accept dye. While baling twine is the most common source, an often-overlooked problem is old feed bags, tattered from the weather and use, blown out into the pastures and picked up by the fleece. Old feed bags (polypropylene or burlap) should never be used to store fleece.

Animal bedding choices should be "woolfriendly." Short chaffy straw and wood chips cling to fleece and are embedded with animal movement. If wood chips/shavings are used for urine absorption, a thick layer of long straw (free of chaff/seed heads) needs to completely cover them. The heavy stalks of the uneaten hay provide appropriate bedding as well.

Running other livestock that shed foreign fibers on the sheep reduces wool quality. Annual shearing

of guard llamas and dogs limits contaminating fibers. Preventing birds or chickens from roosting overhead not only decreases fecal contamination and possible illness, but keeps feathers to a minimum. Contamination by foreign fibers has heavy price deductions.

Coating sheep will significantly reduce contamination but may be impractical for larger flocks. Coating requires labor and maintenance, but is a "time trade-off" for other management practices. Remember, clean wool is valuable wool. If you are running a fairly large herd, start with coating 10% of the sheep, then track how much more profit you realize to weigh the benefits.

Applied contaminants should be scrutinized. Paint markers are at the top of the list. While a necessity for many flocks, using scourable paint and reducing the size of the mark increase the amount of useable wool produced. Even scourable paint may permanently stain the wool. Freezing or over-heating of the marker causes congealing of the pigment, which makes it extremely difficult if not impossible to remove. When possible, marks should be placed on the head or even the face to prevent wool staining.

Topical dewormers and sprays affect wool. Dewormers that contain phenothiazine are not only marginally effective against internal parasites, but also cause a red-brown urine stain on wool. Topically applied chemicals limit lanolin recovery and affect how scouring effluent is treated. Lanolin used in cosmetic products must contain minimal chemical content.

Now is the time to start thinking about your wool in a broader application. Don't we all need a little more cash? Getting your wool out of the defect grade requires managing contamination. If your focus has been on meat production, consider moving just 10% of the fleece into a fiber-based income stream. If you sell fleeces to hand-spinners/wool buyers consider dividing your fleece a little differently. Move 10% into a new income avenue or value-added-product system in which you own and control the profitability. Moving 10% can double your profitability.



Small changes reap big rewards

By Carrie Hull

How can a simple “tweak or two” possibly increase your marketable wool and by extension, your farm’s income? Is there really more one should do with their fiber after it is shorn? Why would a farm focusing on lamb production even care? Let’s pretend for a minute that it isn’t wool or lamb that we are growing, but bananas. It’s fairly obvious that we could sell the bananas themselves (if they were food-grade quality), but how much more profit would we make if we moved a percentage of our bananas into say, selling banana bread, or banana-nut muffins? What if we made fertilizer for roses from the peels that we would normally throw away and sell that too?

This is called “value adding.” For farms focusing on meat production, simply utilizing some, if not all, of the fleece produced is the first step. If we take that fiber a step further and produce a value-added product as well as use the fiber normally thrown away, profit increases and farm sustainability improves. This has been the focus of CBI Fiber Solutions for the past seven years and we continue to place emphasis and educate natural fiber producers in the U.S. about improving their profitability and sustainability through their fiber. Using all of your raw fiber and expanding the production possibilities should be the goal for every farm. Expanding income sources makes everyone happy!

Managing contamination through the growing cycle (the topic of our last article) is a great beginning. The next and equally important step is to control and benefit from your shearing day. It’s your annual harvest! Simple shearing day practices can contribute to an increase in marketable wool (usable harvest) and the success of that important day. Raw fiber sales as well as successful value adding through textile applications requires specific types of fiber. Let’s explore how shearing day practices can increase your ability to produce this valuable type of fiber.

Shearing Quality

One of the challenges is finding a good shearer. In the past, as producers moved away from fiber and the emphasis was put on meat production, quality of the shearing was reduced. The focus was to just getting the fleece off the animal. To receive the most benefit from your shearing day, the quality of the shearing must improve. It is important to select shearers who avoid cutting the sheep (defective pelt), and damaging the fiber itself. Successful textiles require that second cuts and double cuts are kept to the absolute minimum, as it results in short, wasted fibers, in-

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A section of fleece shorn from the body and then cut in half again. This is a result of poor shearing. Double cuts included in yarn production results in slubs and thick and thin areas.

creased loss in processing, and creates sub-standard yarns. In short, it costs the producer money. It is often incorrectly assumed that the shearer knows the best procedure for wool handling and preparation. This is not the case. Ultimately it is the producer’s responsibility to control the harvest, and the quality of their clip.

If quality shearing is difficult to find, creating it should then be the goal. Agricultural colleges, in conjunction with shearing instructors well versed in textile requirements, can team up to teach ag students with interest how to shear properly. This can benefit the industry as a whole: the student earns income and learns a marketable skill, the farms in the area get a price break, the focus on quality shearing moves back to the frontal lobe, and hasty shearing becomes a thing of the past. Chances are some of those ag students will continue to shear once they graduate. Breed associations can also sponsor a person, or persons, willing to learn how to shear in return for their shearing services. Shearers trained in the “Maximum Harvest Shearing” method understand and practice quality, textile-based shearing.

Shearing Day Practices

Practices performed on shearing day can greatly improve the quality and quantity of your clip as well as expand your options.

Timing of shearing is important and should occur before lambing for pregnant ewes as the act of lambing causes sufficient stress to create a tender or weak area in the fiber. Tender fiber is difficult if not impossible to process and is not accepted by most buyers. Shearing before lambing has additional benefits to the flock: It creates more room in the barn; stocking numbers can be increased; lambing can be easily observed; and lambs find the teats without the distraction of long fiber.

Length of fiber is another timing issue. Shearing when the staple length of the fiber is between 3.75” and 6” will increase the market value of the fiber. This longer staple processes best in the worsted spinning system and creates additional markets to the producer. Superior knit-wear or woven garments are created with these longer fibers.

Shear those animals that are not pregnant once in that year for a longer staple length. This

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SMALL CHANGES From page 43

adds diversity to your clip.

Be prepared for shearing day with adequate help, pen space, and shearing floor area. Having crew members who can assist in handling, sorting, and cleaning animals before they hit the shearing floor helps the process move smoothly and produces clean fleece. It is much easier to remove obvious contaminants before shearing than from the shorn fleece. Sorting animals into like color and fiber type groups also aids in a cleaner clip. All the animals from a group should be shorn, and then the shearing floor and shearing blades thoroughly cleaned before starting another group.

Clean shearing floors are essential. It's really a no-brainer – if you want clean, contaminate free fleece, the floor must be clean. Intensive cleaning and inspection of the floor before and during shearing should be a hard fast rule. Shearing contaminate such as odd-colored fibers from the last color group, short hairy fibers that stick to the floor, and clipper blade contamination decreases the value of the clip as well as the yield. Paying close attention to this single area often means the difference between fibers accepted for sale or value adding and those that are rejected.

Use a fiber sorter/grader. Fleece handlers and a fiber sorter/grader are important members of your team who can dramatically improve the quality of the clip. They can also identify areas that create waste or lost profit during the shearing process. The sorter/grader will correctly remove what should be considered waste as well as grade and/or class the fleece. Not only will your wool be more appealing and has more value, but shipping costs for that bale is reduced as you are no longer shipping waste. Having the clip sorted identifies the grades and amount of fiber produced. This allows the producer to make better decisions regarding sale and/or value adding of your fiber.

Successful value adding starts with the correct grade and type of fiber. Sorting also aids in utilizing the coarser fibers grown. Certain products require coarser fibers. Moving these stronger fibers out of waste and into value added production, increase your profit exponentially. For large flocks, experiment by moving just 10% of your animals through the increased scrutiny or sorting/grading (1 or 2 shearing lines) then weigh the results regarding increased profits. From our experience, profit margins increase by at



One fleece resulted in 9 different grades. Utilizing each grade individually results in the best use and the highest yield and profit return.

least 50% over your return on the standard shearing shed setup.

How much difference can a sorter really make? Isn't the fleece off one animal all the same? Because natural fibers are created by animals in unstable environments (weather, feed, stress, etc.), they are not all uniform. Synthetic fibers (the competition) are created in controlled environments and excel in uniformity. Sorting natural fibers equals the playing field with the competition. While we strive to improve fiber uniformity through breeding decisions, fiber sorting allows us to utilize the fiber we currently produce to its best and highest potential.

However, not all sorting systems are the same or produce the same result. When fiber is sorted using the Certified Sorted® System, the resulting grades of fleece are extremely uniform. The more uniform the fiber, the higher the value, and the higher the production yield.

Fiber sorter/graders also identify health and management issues through the fleece. External parasites, skin conditions, as well as stress times are noted and management can be addressed to improve the health and marketability of not only the wool, but the animal itself.

What makes sorted fiber more valuable? In the textile world, sorted fiber creates higher yield, repeatable and accurate results and increases value. Sorted fiber allows the processor to accurately predict their total yield prior to production. This is invaluable! Production problems are also minimized and speed of production can be increased, which saves the processor money. As a breeder, the ability to correlate sorting data to individual animals is key to making better breeding decisions as well as improving farm and herd management practices. Of course, also repeat fiber sales and superior value added products which command premium prices are benefits the producers can receive as well.

Good fiber management encompasses the yearly growing cycle. All the work to produce clean fleece during that year can be negatively affected or destroyed on shearing day unless the producer takes control and manages this important event (their harvest) carefully. Following the steps outlined in this article and tweaking just a few of your shearing day practices will make big changes. Those "tweaks" increase the amount of marketable wool for raw fiber sales and produce the type of fiber required for successful value adding through textile applications. Start with 10% of your clip, weigh the profits you realize over the following year to determine if you should add an additional 10%. What we've been doing hasn't been effective enough, so let's adjust.



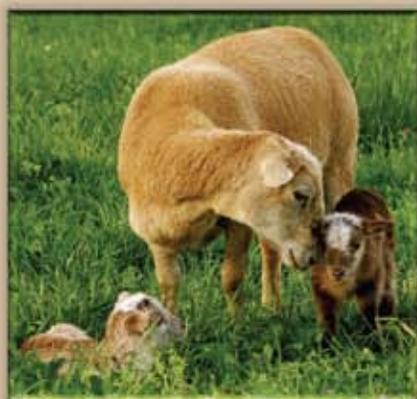
Contamination of a white fleece from a dirty shearing floor.

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Premier first imported electrifiable netting in 1977 when Stan Potratz (Premier's founder) returned to the family farm after farming for 10 years in England.

The original netting was yellow and black, 33" tall, 150 ft long, a poor conductor (compared to our nets now) and used thin 0.50" diameter posts. During the past 38 years we've talked daily to netting users about what they like and dislike about it. We've used netting extensively (2 miles of it currently) on our 3 farms—and have our own likes and dislikes.

As a result we've:

- Developed better netting designs.
- Become the world's leading educator on the uses and abuses of electrified netting.
- Supplied 80% of the USA's netting.

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Electrified netting, in its many variations, has been such an essential tool on our farms that it's difficult to imagine life without it.

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Premier has 3 farms (total of 400 acres) upon which we raise (and fence) sheep, goats, horses, livestock guard dogs and poultry.

And our sales consultants have their own farms and fences for their cattle, pigs, goats, sheep, poultry and horses. They are testing and observing our products in use all year long—and passing that knowledge onto our customers.

We support what we sell

Customers all across the US know this from repeated experience.

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- **ElectroStop 42" (temporary)**
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