

# Virginia Cooperative Extension

*A partnership of Virginia Tech and Virginia State University*



**Animal & Poultry Sciences (0306)**  
366 Litton Reaves  
Blacksburg, Virginia 24061  
540/231-9159 FAX 540/231-3713  
E-mail: [sgreiner@vt.edu](mailto:sgreiner@vt.edu)

## Livestock Update

***Beef - Horse - Poultry - Sheep - Swine***

**April 2010**

This LIVESTOCK UPDATE contains timely subject matter on beef cattle, horses, poultry, sheep, swine, and related junior work. Use this material as you see fit for local newspapers, radio programs, newsletters, and for the formulation of recommendations.

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**Scott P. Greiner, Extension Project Leader**  
**Department of Animal & Poultry Sciences**

[www.ext.vt.edu](http://www.ext.vt.edu)

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## **Dates to Remember**

### **BEEF**

#### **APRIL**

16-18 VA Beef Expo. Harrisonburg. **Contact:** Bill McKinnon, (540) 992-1009, email: [bmckinnon@vacattlemen.org](mailto:bmckinnon@vacattlemen.org)

#### **MAY**

21-22 Angus Boot Camp, Alphin Stuart Arena. **Contact:** Mark McCann, (540) 231-9153, email: [mmccnn@vt.edu](mailto:mmccnn@vt.edu)

### **HORSE**

#### **APRIL**

9-11 State 4H/FFA Horse Judging and 4H Hippology, Horse Bowl and Presentations. Virginia Horse Center. Lexington. **Contact:** Celeste Crisman, (540) 231-9162, email: [ccrisman@vt.edu](mailto:ccrisman@vt.edu)

#### **MAY**

12-14 Technical Large Animal Emergency Rescue Training. MARE Center. Middleburg. **Contact:** Shea Porr, (540) 687-3521, ext. 27, email: [cporr@vt.edu](mailto:cporr@vt.edu)  
17-19 Technical Large Animal Emergency Rescue Training. MARE Center. Middleburg. **Contact:** Shea Porr, (540) 687-3521, ext. 27, email: [cporr@vt.edu](mailto:cporr@vt.edu)

#### **SEPTEMBER**

16-19 State 4-H Horse and Pony Show. Virginia Horse Center. Lexington, VA  
**Contact:** Celeste Crisman, (540) 231-9162, email: [ccrisman@vt.edu](mailto:ccrisman@vt.edu) or Joi Saville, (540) 231-2257, email: [joi.saville@vt.edu](mailto:joi.saville@vt.edu)

### **POULTRY**

#### **APRIL**

30 VA Poultry Federation Youth Convention. Rockingham County Fairgrounds. Harrisonburg. **Contact:** Stephanie Findley, (540) 437-8037, email: [stephanie.findley@georgesinc.com](mailto:stephanie.findley@georgesinc.com)

### **SHEEP**

#### **AUGUST**

28 Virginia Performance Tested Ram Lamb Sale. Shenandoah Valley AREC. Steeles Tavern. **Contact:** Scott Greiner, (540) 231-9159, email: [sgreiner@vt.edu](mailto:sgreiner@vt.edu)

## **April Beef Management Calendar**

Dr. Scott P. Greiner

Extension Animal Scientist, VA Tech

### **Spring Calving Herds**

- Finish calving
- Check cows 3 to 4 times per day, heifers more often to assist early if needed
- Keep calving area clean and well drained, move healthy pairs out to large pastures 3 days after calving
- Ear tag all calves at birth; castrate and implant male calves in commercial herds
- Give selenium and vitamin A & D injections to newborn calves
- Feed cows supplemental energy after calving; some protein may be needed also
- Keep high quality, high magnesium, high selenium minerals available
- All bulls need a breeding soundness exam at least 30 days before start of breeding season
- Fertilize pastures and hay fields according to soil tests

### **Fall Calving Herds**

- Creep graze calves while on cows
- Give pre-weaning respiratory vaccinations IBR, PI3, BVD, BRSV, pasteurella
- Collect weaning weights on calves; weigh and body condition score cows
- Wean commercial calves based on marketing plan for calves
- Re-implant commercial calves (do not implant replacement heifers)
- Pregnancy check cows 60 days after bulls were removed
- Continue feeding high magnesium minerals to prevent grass tetany

# **Cow Herd Performance and Profitability: Measuring How You Stack Up**

Dr. Scott P. Greiner

Extension Animal Scientist, VA Tech

The arrival of April is often much anticipated, as it typically signals the start of grass season and relief from the challenges of winter. The date of April 15 takes on a special connotation thanks to the IRS, and is likely not met with the same enthusiasm for most of us. However, our annual task of gathering records and receipts to prepare tax returns also provide an opportunity to evaluate more closely our cow-calf enterprises. There is no time like the present to initiate a close examination of the performance and profitability of our operations. The information necessary to do so is largely at hand as we prepare a Schedule F, and with some minor adaptations some very useful measures can be compiled to enhance our business and animal management decisions.

Profitability of the cow-calf enterprise within any particular year is impacted by several factors. An analysis of the most basic farm records can quantify important issues affecting herd success such as reproductive performance, calf growth and weaning weight, calf health performance, market price, and herd turnover. An annual analysis of various herd performance measures can serve as a benchmark against past and future years' performance.

Many tools are available to assist with this task. One very simple tool is the Virginia Cow Herd Performance Check-Up (available on the Virginia Cooperative Extension web site <http://www.ext.vt.edu/> or at your local extension office). Using commonly available herd records, a Performance Check-Up can be completed. Basic sources of information needed to complete the analysis include: cow inventory records, calving records, and animal sale receipts.

The Virginia Cow Herd Performance Check-Up will generate many pieces of valuable information on key cow herd performance measures. Seven key measures provide the essential information for evaluation of the cow herd and decision support for changes in management.

*Herd calving percent* - Herd calving percent is perhaps the single most important measure of the cow herd's reproductive efficiency. A realistic goal for herd calving percent should be in the 90-94% range.

*Percent calf death loss* - Once calves have been born and are at least a day old, less than 1% death loss until weaning should be expected.

*Percent calf crop weaned per cow exposed* - This calculation is the best measure of a herd's overall reproductive and health status. A goal of 89-93% calf crop weaned per cow exposed should be attainable for many herds. Obtaining such herd performance will require attention to those factors which impact reproductive performance and calf health.

*Length of calving season for mature cows in days* - A restricted calving season of 60-70 days offers many benefits. With a short calving season, the manager can focus attention to the cow herd during this critical time. A shortened calving season enables the producer to more efficiently match the herd feeding program to meet the changing

nutritional needs of the cow herd. Uniformity of the calf crop at marketing is also enhanced by a short calving season also.

*Average calf weaning weight* - The average weight of calves at weaning can be impacted by several factors including age of the calf at weaning, calving season, forage conditions, milking ability of the cow herd, genetic merit, implants, deworming management, and others. A reasonable goal for most spring calving herds would be for the calves to have an average weight per day of age of at least 2.75 pounds. This growth level would equate to an average weaning weight of 575 pounds for a seven month old calf. For most fall calving herds, a weight per day of age of 2.5 pounds or a weaning weight of 525 pounds at seven months would be a reasonable goal.

*Pounds of calf weaned per cow exposed* - This measure combines the relative reproductive and growth performance of a cow herd. A realistic goal for a well managed herd should be determined by multiplying "percent calf crop weaned per cow exposed" by the goal for the "average calf weaning weight." (Example: 90% x 575 pounds = 518 pounds of calf weaned per cow exposed)

The above described measure are indicators of overall herd profitability. To capture the entire picture regarding profit, these performance measures must be integrated with measures of cost of production. IRM and SPA summary data consistently reveals that large differences exist between herds in feed and operating costs. This variation in expenditures, coupled with differences in production measures (those outlined above) equate to substantial differences in break-even costs and ultimately profitability.

A logical first step in cow-calf herd analysis is to perform the simple steps and determine herd productivity using the procedures outlined above. Most cow-calf producers have the information in hand to complete this assessment. Doing so will enhance the ability to make informed management decisions which relate to profitability.

For additional information and details, contact your local agent at your Virginia Cooperative Extension Office.

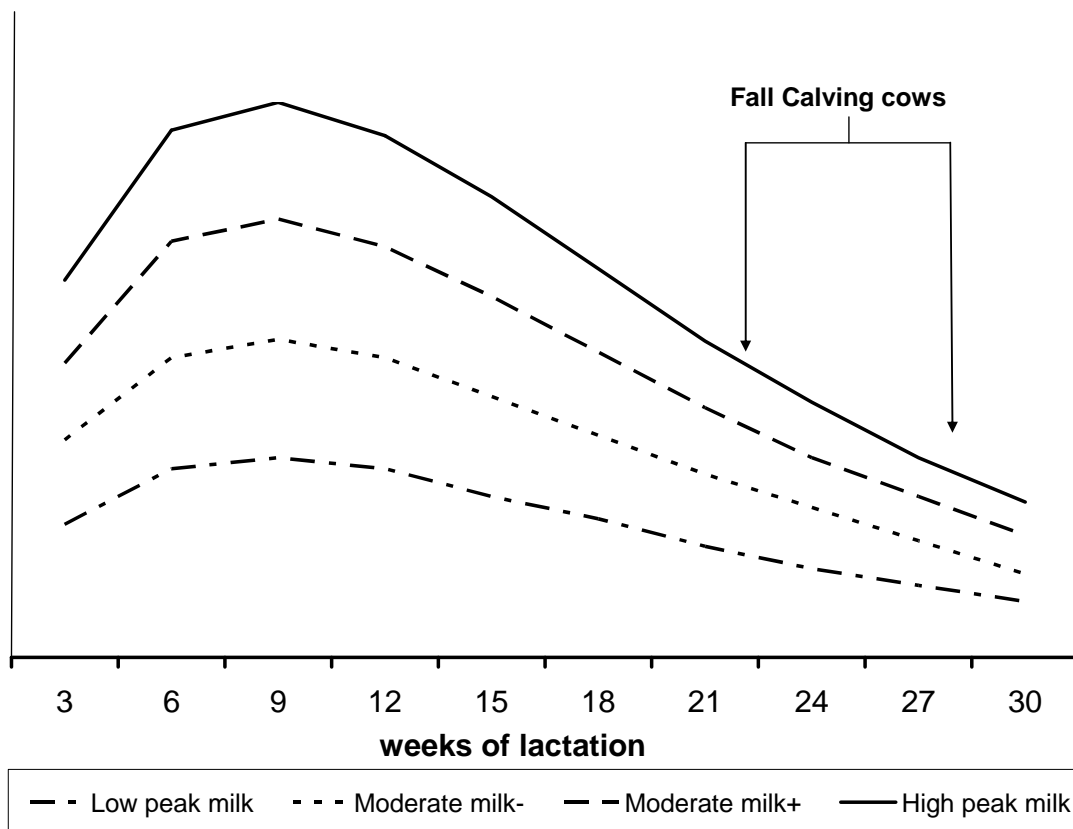
## Fall Calf Options

Dr. Mark A. McCann

Extension Animal Scientist, VA Tech

With the arrival of spring grass, the memory of this past winter can begin to fade. Several reminders of it still persist on the farm such as empty hay storage areas or the deep ruts and mud holes that accompanied winter feeding programs. As we evaluate the status of fall born calves, many producers are discovering their calves are behind in terms of expected weight and performance due to the impact of the past winter. The environmental and nutritional stress of the winter took a toll on cow milk production. Depending on age of the calf there are options which can add additional weight before weaning or marketing the fall calf crop.

As possible strategies are considered, one needs to remember that as cows get beyond the peak of their lactation their contribution to the weight gain of the calf is reduced and replaced by what is on offer in the form of grazing, hay or supplemental feed. The following figure is a graphical representation of cow milk yield and nutrient requirements over a 30 week lactation. The different bars represent different milk potential from low to high. Although the amount of milk is different, the trend is consistent across genetic lactation potential. The bracketed area highlights the stage of lactation that many of our fall calving cows are at and reinforces the fact dam's will have limited impact on calf performance from this point on.



Adapted from 1996 Nutrient Requirements of Beef Cattle

Rather than the cow, any plan should focus on directly impacting the calf. This can be accomplished through creep grazing or creep feeding calves while they remain with their dams or could utilize weaned calves with a grazing or feeding backgrounding period. Weaning calves would be an excellent choice in managing the spring flush of cool season pastures.

Creep supplementation is most often in the form of feed is a long debated topic. Ability to store and offer creep feed is often limited. The ability to monitor and control intake is also limited and contributes to a wide range of efficiencies and economic results. If too much creep intake is an issue, a couple of percentage units of additional plain white salt can be effective in slowing intake. Nursing calves are more sensitive to salt than weaned calves and mature cows. The best approach should be to add an additional 20lbs/ton (1%), monitor intake and make adjustments of in 10-20lbs of salt to reach the desired intake.

A much less used option is the practice of creep grazing where calves have access to more selection and/or improved forage varieties. The limited amount of high quality vegetative forage growth available in early spring is an excellent opportunity to get more results from a limited resource by creep grazing calves. As the previous graph illustrated, a cow's nutrient demand is greatly diminished and does not require high quality grazing in late lactation. Placing a creep gate in a fence opening or providing enough clearance under a single strand of temporary electric fence can effectively limit access to high quality forage. Currently, cattle research at the Shenandoah Valley Agricultural Research and Education Center has successfully used creep grazing to add extra pounds to beef calves.

Calves beyond 6-7 months of age probably should be weaned and managed separately from the cow herd. A preconditioning phase of limited feed and grazing will be a cost efficient way to take advantage of some compensatory growth in calves as well as add value in the form of improved health and nutrition status. Feed intake levels of 1.0% of body weight in feed will prevent over consumption of feed and fattening, while allowing increased growth. Where retained ownership is planned, a more aggressive feeding plan can be used if the efficiency and cost of gain support it.

The period of time when most producers wean fall-born calves matches reasonably well to the availability of quality spring forage. Feed supplementation and expense can be minimized by transitioning these calves to high quality pastures and using these resources to add value to your fall calf crop.

## **Polioencephalomalacia (PEM or Polio) Associated With Feeding Corn Gluten**

Dr. John F. Currin, DVM  
Extension Cattle Veterinarian, VA Tech

Corn gluten is very commonly used as a feed co-product in Virginia. Corn gluten feed is a co-product of the production of high fructose corn syrup. The corn syrup is removed by a wet milling process. Wet milling separates the corn kernel into starch, oil, protein, and bran. The corn kernels are soaked in sulfurous acid to soften the kernel. The resulting steep liquor contains protein, minerals, vitamins and energy sources. The starch and oil are extracted from the swollen kernel. The remaining fiber or bran is mixed with the steep liquor. This co-product, wet corn gluten feed, contains about 40% dry matter. The wet corn gluten feed is often dried to 90% dry matter and is called dry corn gluten feed. Corn gluten feed usually contains 20-25% crude protein. Because most of the starch has been removed corn gluten is safe to be fed to cattle at high rates without causing rumen acidosis and bloat. The decreased concern over calves eating too much grain and getting sick is one of the major positive aspects of corn gluten. It is a common practice to give calves free-choice corn gluten. Generally, calves will eat about 2% of their bodyweight in corn gluten when fed free choice. However, fast growing calves that have been on corn gluten over 30 days can eat a higher percentage of bodyweight than this.

In the past, there have been rare outbreaks of polioencephalomalacia (PEM) in groups of calves fed free-choice corn gluten. Recently, I have been involved in investigations into several cases of PEM associated with feeding free-choice corn gluten. The clinical signs of PEM are blindness, staggering, down, and seizures. The clinical signs are caused by laminar cortical necrosis (brain damage). Most cases of PEM are thought to be caused by thiamine (Vitamin B1) deficiency. B Vitamins are produced by the bacteria in the rumen and then absorbed and used by the calf. Classic cases of PEM are caused by thiamine deficiency because either the calf ingested thiaminases from toxic plants that destroyed the thiamine in the rumen before it could be absorbed or because the bacteria have been killed off and are not producing thiamine. It is now understood that sulfur toxicity can cause the same brain damage as PEM caused by thiamine deficiency. When sulfur levels in the diet are too high rumen bacteria produce too much hydrogen sulfide. The hydrogen sulfide is absorbed across the rumen wall into the blood stream. An increase in the level of sulfide in the blood interferes with cellular energy production. The brain has a high requirement for energy production and is unable to use some alternative energy pathways. Total sulfur intake in calves consists of the level of sulfur in the feed and the sulfur intake through water. Sulfur levels in the diet should not exceed 0.4% of the diet on a dry matter basis. Not all cattle consuming a diet containing 0.4% will develop PEM. Total water sulfur intake and decreases in rumen pH are important in the development PEM. Decreased rumen pH causes more sulfide gas to be produced and absorbed. While feeding high levels of corn gluten grain does not cause clinical rumen acidosis and bloat, the rumen pH in these calves will be lower than calves that are on a higher forage diet putting them at greater risk of developing PEM. Injectable thiamine is the treatment of choice for calves with PEM. Thiamine is a prescription drug that must be purchased from a veterinarian and should be used under the order of your veterinarian. The dose of thiamine is 2.5-3 cc of thiamine per 100 pounds of bodyweight. Vitamin B complex contains thiamine at different levels. Plain Vitamin B complex contains thiamine but only at very low levels. It would take 50cc per 100 pounds of bodyweight of plain Vitamin B Complex to treat PEM. Some Vitamin B complexes sold under trade names like



Super Vitamin B complex and Vitamin B Complex Forte contain more thiamine than plain Vitamin B complex. These products would require 5-6cc per 100 pounds of bodyweight to treat PEM. Ideally, the first dose of thiamine should be given intravenously (IV) but if caught early the intramuscular (IM) or subcutaneous (SQ) route will work. Early diagnosis and treatment is the key to successful treatment. Once significant brain damage has occurred it is irreversible and treatment will fail. Even though cases of PEM caused by sulfur toxicity are not thiamine deficient they still respond to treatment with thiamine. In these cases, the response to treatment is slower and requires longer treatment. Supportive care to prevent blind calves from injuring themselves and allow them access to feed and water will greatly improve treatment success.

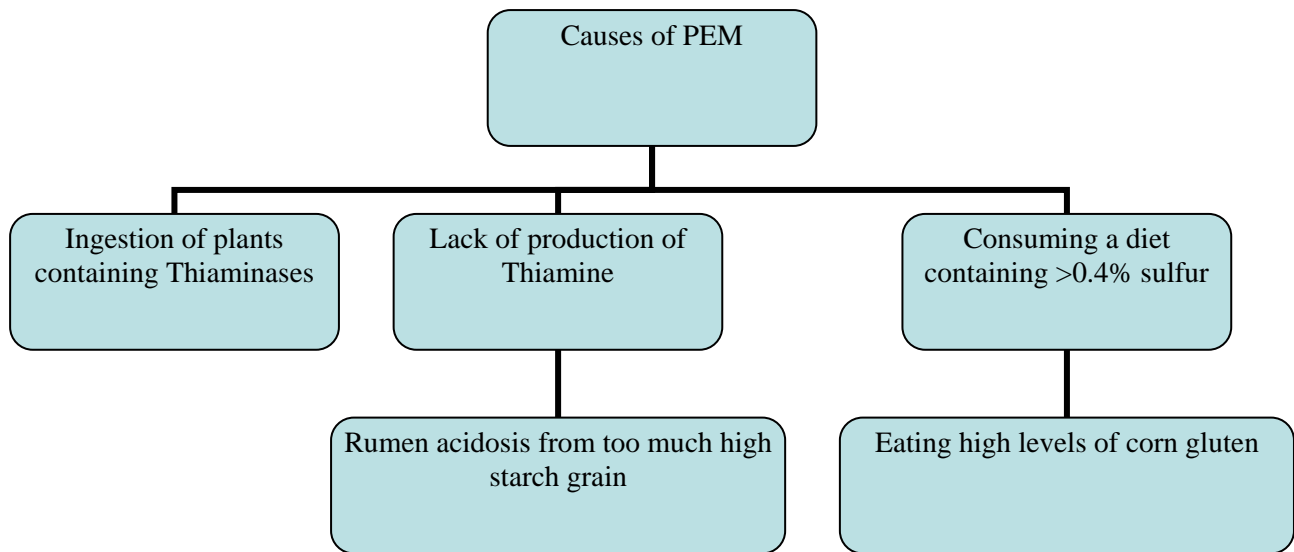
Preventing PEM caused by feeding corn gluten can easily be accomplished by limiting the amount of corn gluten fed. Grass and hay are usually very low in sulfur. Feeding even small amounts of these feeds will dilute out the sulfur in corn gluten to safe levels. Feeding cattle 2% percent or less of their bodyweight in corn gluten almost assures that the level of sulfur in the diet will be low enough to not be of a concern. It is when you are going to feed calves corn gluten free-choice that care must be taken to ensure that calves will not intake too much sulfur. If feeding corn gluten free-choice (or more than 2% of bodyweight) to calves for more than 2 weeks then sulfur levels in the corn gluten should be checked prior to feeding the corn gluten. Sulfur levels can be measured at any forage analysis lab such as Cumberland Valley Analytical Services or DairyOne. Measuring sulfur levels should cost less than \$10 + shipping to the lab. Based on my best judgment, at this time, it appears that sulfur levels <0.6 percent should be okay to feed free choice. The book value for sulfur levels for corn gluten is 0.47%. Table 1 shows the sulfur levels of 500 corn gluten samples analyzed at DairyOne labs since 2000. As you can see, the level of sulfur varies considerably in corn gluten and can often exceed 0.6%. Table 2 shows the sulfur levels of 2 herds feeding corn gluten free choice that suffered from outbreaks of PEM.

Table 1. Sulfur levels in corn gluten samples

| <b>Year</b> | <b>#<br/>Samples</b> | <b>Avg. Sulfur<br/>%</b> | <b>High Sulfur<br/>%</b> | <b>Low Sulfur<br/>%</b> | <b>STD<br/>Deviation</b> |
|-------------|----------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 2000-2001   | 22                   | 0.51                     | 0.695                    | 0.325                   | 0.185                    |
| 2001-2002   | 21                   | 0.581                    | 0.86                     | 0.303                   | 0.265                    |
| 2002-2003   | 39                   | 0.493                    | 0.65                     | 0.37                    | 0.156                    |
| 2003-2004   | 44                   | 0.527                    | 0.772                    | 0.281                   | 0.245                    |
| 2004-2005   | 54                   | 0.49                     | 0.669                    | 0.311                   | 0.179                    |
| 2005-2006   | 75                   | 0.608                    | 0.818                    | 0.397                   | 0.21                     |
| 2006-2007   | 74                   | 0.48                     | 0.616                    | 0.344                   | 0.136                    |
| 2007-2008   | 68                   | 0.462                    | 0.574                    | 0.351                   | 0.111                    |
| 2008-2009   | 105                  | 0.443                    | 0.544                    | 0.342                   | 0.101                    |

Table 2. Sulfur levels in 2 herds experiencing PEM outbreaks while feeding high levels of corn gluten

| Farm | Corn Gluten Sulfur % |
|------|----------------------|
| A    | 0.69%                |
| B    | 0.70%                |



## **Will Cows Get Pregnant in the Coming Breeding Season?**

Dr. W. Dee Whittier, Extension Veterinarian, Cattle  
VA-MD Regional College of Veterinary Medicine, VA Tech

The winter of 2010 has broken a number of records. Beef cows on most farms have probably been affected to a significant degree by the winter. The seventy days of snow cover that we experienced in Blacksburg have altered cow diets for the worse while unusually cold temperatures and wind chills have markedly increased nutrient requirements.

A review of what research and experience has taught us about reproductive performance helps us predict and hopefully take steps to remedy the effects of this situation on the upcoming breeding season. Otherwise open cows and later calves may have a profound effect on future profits.

The number of cows that get pregnant during a calving season is a function of three major factors:

1. The number of cows that are cycling (coming into heat) at any point in the breeding season.
2. The fertility of the cows, that is, the likelihood that they get pregnant each time they come into heat.
3. The fertility of the male, whether in the form of a bull breeding or an artificial insemination.

Years of research have helped to show the major factors that influence each of these main items. Here are the generally agreed on contributors:

### **Estrous cycling:**

- Days since calving
- Body condition score at calving
- The nursing of the calf
- Exposure to a bull
- Age of the cow
- The influence of hormones

### **Cow conception rates:**

- Days since calving
- Whether cows are gaining or losing weight
- Heat stress, especially as influenced by fescue grazing

### **Bull fertility:**

- Normal sperm cells
- Scrotal circumference
- Libido
- Body condition
- Age and dominance

So what's different this season than most years? Cows lost more weight in the winter and therefore calving at lower body condition scores than usual. That means that they will tend to be slower to cycle than usual. If the average cow begins cycling twenty-one days later that results in about 15% more open cows in a 65-day breeding season.

A wise producer can use the other knowledge we have of the factors that determine outcomes of beef reproduction to overcome this drawback. Here are some procedures that can be done to increase the odds that cows will become pregnant efficiently.

1. Do everything possible to get cows in a gaining situation as early in the spring as possible. Judicious use of fertilizer on some pastures might pay premiums in pregnant cows.
2. Don't stop feeding cows until there is plenty of grass to meet nutritional needs.
3. Take extra care of young and old cows.
4. Consider the use of teaser bulls with cows before actual breeding begins. Bull exposure has been shown to start cows cycling as much as thirty days earlier.
5. Removing calves from cows for 48 hours at the beginning of the calving season or as part of a synchronization program has been documented to increase the number of their dams that begin cycling.
6. If you are doing synchronization for artificial insemination, consider using a system that adds progesterone in the program as progesterone treatment has been shown to increase the number of cows that are cycling.
7. Manage pastures and grazing to minimize the effects of fescue toxicity. Take steps now to get clover into pastures and manage grazing so that cows are not eating headed out fescue while being bred.
8. Perform Bull Breeding Soundness examinations on all bulls before the breeding season. Then watch bulls carefully during the season to be sure they are performing well.

Having a successful breeding season this year will require that typical management be improved in many operations. Utilizing some of the above special techniques, even if they are not necessary in most breeding situations, may pay real dividends this season.

# Sheep Foot Care and Treatment

Dr. Scott P. Greiner

Extension Animal Scientist, VA Tech

A wet winter, coupled with early spring rains and warm weather have set up ideal conditions for sheep producers to deal with the menacing challenges of foot problems. The two most common of these are foot rot and foot scald. While similar in the fact that both are contagious and cause lameness and decreased production, there are some distinct differences between the two diseases. Foot rot is caused by an interaction of two anaerobic (without oxygen) bacteria, *Bacteroides nodosus* and *Fusobacterium necrophorum*. *Fusobacterium necrophorum* is a normal inhabitant of the ruminant digestive tract and in wet weather may interact with another bacteria, *Corynebacterium pyogenes*, to produce foot scald, an infection of the skin between the toes. This infection sets up the foot for invasion by *Bacteroides nodosus*, which, working in conjunction with the *Fusobacterium*, produces the condition known as foot rot. Since *Bacteroides* can only live in the hoof of an infected animal or in the soil for no more than 10-14 days, it is possible through careful management procedures, to keep from introducing foot rot into a flock and to successfully control and/or eliminate the disease if the flock is infected.

## Diagnosis

Lameness is usually the major sign of an infected animal, although sheep with an early infection may not exhibit lameness. The area between the toes first becomes moist and reddened. Then the infection invades the sole of the hoof, undermining and causing separation of the horny tissues. The infection causes a characteristic foul odor and may infect one or more feet at the same time. Foot scald is confined to the skin surface between the toes, which becomes moist and irritated.

## Transmission

The bacteria that causes foot rot is spread from infected sheep to the ground, manure, bedding, etc. where it is then picked up by non-infected sheep. Foot rot is typically introduced by purchase of an infected animal. Favorable environmental conditions (warm temperature, moisture) facilitate the spread of the infective organisms. Since the organism doesn't survive long in the environment (< 2 wks), carriers in the flock will continue to reinfect the flock unless the animal is either culled or the organism is eliminated by proper treatment. Warm, wet weather, irritation to the skin between the hooves, and overgrown hooves are predisposing factors. These factors, in combination with the presence of infective bacteria, lead to foot rot in sheep.

## Treatment

The control of foot rot is based on several management practices that decrease predisposing factors, and on the treatment and immunization of infected and susceptible sheep. The best results are obtained when several of the following methods are combined.

**1. Foot trimming:** This reduces the number of cracks and crevices where bacteria can hide, removes infected hoof, and exposes the organism to air and various medications. All affected tissue should be trimmed away. Many times, this involves removing a large portion of the hoof wall as well as the overgrown portion. This is necessary if the topical treatment and oxygen are

to reach the bacteria and eliminate them. Foot trimming should be done at least one to two times per year as a part of normal management practices, and more often in conjunction with footbaths in the control of foot rot.

**2. Footbaths:** The most common solution commonly used in foot baths is zinc sulfate. For treatment, foot baths should be used 1-2 times per week for several weeks. They may also be used routinely after foot trimming and as a preventative. Zinc sulfate (10% solution = 16 pounds in 20 gallons of water) is perhaps the most effective and least toxic bath solution. A surfactant or wetting agent (detergent) can be added to the baths to increase their penetration into the cracks and crevices of the hoof. Use of zinc sulfate increases their efficacy in a treatment program. When designing the foot bath area, it is important that length of contact with the solution be kept in mind. Sufficient sized baths/soaks are necessary to handle the flock and allow sufficient contact time with the solution. In many cases, footbath treatment effectively eliminates foot scald conditions when used in combination with practices which eliminate wet conditions/sources of the infective bacteria.

**3. Dry chemicals:** Zinc sulfate (dry) can be placed in a box in an area sheep must walk through. This will not treat infected animals but will help decrease the spread of the disease. Lime, disinfectants, or drying agents may be used around feed or water troughs to reduce moisture and decrease the spread of the disease.

**4. Antibiotics:** Penicillin and streptomycin combinations used either as a one-shot treatment or every day up to ten days has been proven to be effective in treating foot rot. Procaine Penicillin G or long-acting penicillin products at the same dosage may also be effective. Single injections of long-acting tetracycline have also been successful in some cases. Use of any of these should be after consultation with or by a veterinarian and should never be used on animals that are intended for slaughter before an adequate withdrawal time.

**5. Topical medications:** There are several different medications that can be applied to the hoof immediately after paring that are helpful in controlling foot rot. Direct application of zinc sulfate solution is an option. Other commercially available topical medications may also be applied.

**6. Vaccination:** Vaccines for *Bacteroides nodosus* are approved for use in the U.S. The vaccine has been shown to work not only as a preventative but as a treatment as well. Vaccination before the start of the wet season is recommended, followed by a booster each year prior to the wet season if eradication efforts have not been successful. Abscesses are common at the injection site and therefore vaccination of show animals or animals that may be going to slaughter soon may not be practical. As always, follow label directions carefully. In the eradication protocol, the first vaccination may be given upon initiation of the program, followed by a second dose 4-6 weeks later. Discuss this process thoroughly with a veterinarian to determine the best approach.

Using combinations of these procedures, foot rot can be eradicated. However, the best strategy is to practice good flock biosecurity and prevent introduction. Studies have shown eradication is possible using combinations of treatment programs. While no single treatment is highly effective alone, treatment protocols that include foot trimming along with foot bath regiment and vaccination are most effective.