

# OFF THE HOOF

**KENTUCKY BEEF CATTLE NEWSLETTER, JANUARY 2020**



University of Kentucky  
College of Agriculture,  
Food and Environment  
Cooperative Extension Service

Cooperative Extension Service  
University of Kentucky

**Beef IRM Team**

*Published Monthly by UK Beef IRM Team and edited by Dr. Les Anderson, Beef Extension Specialist, Department of Animal & Food Science, University of Kentucky*

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## Timely Tips

*Les Anderson, Ph.D., Beef Extension Specialist, University of Kentucky*

### Spring-Calving Cow Herd

- Study the performance of last year's calf crop and plan for improvement. Plan your breeding program and consider a better herd sire(s). Select herd sires which will allow you to meet your goals and be willing to pay for superior animals.
- Consider vaccinating the cows to help prevent calf scours.
- Keep replacement heifer calves gaining to be cycling before the start of the spring breeding season.
- Start cows on the high magnesium mineral supplement soon. Consider protein supplementation if hay is less than 10% crude protein. If cows are thin, begin energy (grain) supplementation now. Cows must reach a body condition score of 5 before calving to maximize their opportunity for reproductive success. Supplementation now allows adequate time for cows to calving in adequate body condition score.
- Get ready for calving season! See that all equipment and materials are ready, including obstetrical equipment, record forms or booklets, eartags, scales for obtaining birthweights, etc. Prepare a calving area where assistance can be provided easily if needed. Purchase ear tags for calves and number them ahead of time if possible. Plan for enough labor to watch/assist during the calving period.
- Move early-calving heifers and cows to pastures that are relatively small and easily accessible to facilities in case calving assistance is needed. Keep them in good condition but don't overfeed them at this time. Increase their nutrient intake after they calve.

### Fall Calving Cow Herd

- Provide clean windbreaks and shelter for young calves.
- Breeding season continues. Keep fall calving cows on accumulated pasture as long as possible, then start feeding hay/grain. Don't let these cows lose body condition!
- Catch up on castrating, dehorning and implanting.

## **General**

- Feed hay in areas where mud is less of a problem. Consider preparing a feeding area with gravel over geotextile fabric or maybe a concrete feeding pad.
- Increase feed as the temperature drops, especially when the weather is extremely cold and damp. When temperature drops to 15°F, cattle need access to windbreaks.
- Provide water at all times. Cattle need 5 to 11 gallons per head daily even in the coldest weather. Be aware of frozen pond hazards. Keep ice "broken" so that cattle won't walk out on the pond trying to get water. Automatic waterers, even the "frost-free" or "energy-free" waterers can freeze up in extremely cold weather. Watch closely.
- Consider renovating and improving pastures with legumes, especially if they have poor stands of grass or if they contain high levels of the fescue endophyte. Purchase seed and get equipment ready this month.

## **The Art and Science of Developing Heifers**

*Les Anderson, Ph.D., Beef Extension Specialist, University of Kentucky*

The older I get the more I realize that heifer development is as much art as science. The art is understanding what type of female best fits your operation and your marketing scheme. What size cow best fits your management system? Which cows will produce the best replacements?

The science is understanding the principles enabling the "right" heifers to succeed. The first week of January is an extremely important "check-point" in spring heifer development programs.

Regardless of management system, one key factor dictating cow productivity is a heifer's ability to breed early in her first breeding season. Data from many studies ranging back to the 1960's clearly demonstrate the key to cow productivity is timing of her first breeding as a heifer. Heifers that breed early in their first breeding season wean heavier calves, breed back more quickly, and become more productive cows. So the key, then, is to optimize a heifer's ability to breed early.

Heifer fertility is greatly influenced by age at puberty. Most producers don't consider age at puberty of their heifers to be a major problem, yet few know how many heifers are cyclic at the beginning of the breeding season. A Nebraska study demonstrated that the proportion of heifers that were pubertal on the first day of the breeding season varied greatly over 5 consecutive years in a single herd. The percentage of heifers that were pubertal on the first day of the breeding season ranged from only 21% to as high as 64% over the 5-year period. For maximum fertility and reproductive performance, heifers must have had at least one estrus **before** the beginning of the breeding season. Our goal then is to incorporate reproductive management techniques to reduce the age of puberty, increase fertility, and shorten the interval to conception.

One of the largest factors that regulate puberty in the heifer is weight. For puberty to occur, heifers must weigh at least 65% of their mature weight. This weight is referred to as their target weight. Most heifer development programs require that heifers reach their target weight, approximately 65% of their expected mature weight, by the onset of their first breeding season. Because fertility increases until the third estrus

after puberty, heifers should reach their target weight at least 30 days before the start of the breeding season. I refer to this date as the target date.

January is the time to determine if your heifers are “on track”. Most yearling heifers will need to reach 700-800 pounds (their projected target weight) by mid-April to ensure high fertility assuming that the heifer breeding season starts about mid-May. Weigh your heifers to determine how much they have left to gain to reach their target weight. If the heifers weighed on average 600 pounds and their target weight is 750 pounds, then they will need to gain 150 pounds or 1.5 - 1.6 pounds each day to reach their target weight by mid-April. Heifers should reach a BCS of 5.0-5.5 by their target date.

The next important phase in heifer development occurs one month prior to the start of the breeding season. At this time, heifers should be vaccinated (Vibrio fetus, Leptospirosis, and the respiratory disease complex which includes PI<sub>3</sub>, BRSV, BVD and IBR; modified-live vaccine is preferred), dewormed, and pelvic area measurements should be obtained. Heifers with small pelvic areas and especially large heifers will small pelvic areas tend to have greater difficulty calving. Now is the time to contact your local veterinarian to schedule this pre-breeding work.

Producers should consider estrous synchronization and/or AI. Estrous synchronization and AI has many advantages which include: higher pregnancy rates, heavier, more uniform calves at weaning, and increase production and labor efficiency. The greatest advantage of AI is the ability to use more predictable sires. Since a majority of calving problems in a herd occur when calving first-calf heifers, it seems logical to synchronize and AI your heifers to proven calving ease bulls. Contact your local AI technician to schedule a time to breed your heifers.

Proper heifer development is one of the key components to profitability in a beef cattle operation. Understanding the art and science of heifer development can enable producers to incorporate management techniques to improve the efficiency of the operation.

## **A New Face in the Herd**

*Katherine VanValin, Ph.D., Beef Extension Specialist, University of Kentucky*

Well, it is the start of a new decade, a new year, and for me the start of a new adventure as a Beef Cattle Extension Specialist for the University of Kentucky. Now you might ask yourself how a girl raised in the suburbs of Detroit ended up in this new roll, and it's a story that has roots deep in Kentucky agriculture. Bowling Green is my hometown and the adopted hometown of my husband, although we've spent more years living outside of the Bluegrass state than in, Kentucky will always be home to us. I owe summers spent on my Grandparent's farm in Warren County, KY for instilling in me an appreciation and passion for Agriculture. My grandfather, uncle, and father maintained a commercial cow-calf operation, so the opportunity to serve the beef cattle industry of Kentucky is a full circle moment for me.

I am a 2013 graduate of Western Kentucky University where I was a double major in Agriculture and Chemistry, and it was my time at WKU that really solidified my interests in beef cattle nutrition. After leaving WKU, I pursued a master's degree at Virginia Tech, where I focused my studies on understanding the impacts that fescue toxicosis occurring during gestation has on calf growth. After completing my masters, I moved out to Iowa, to complete my Ph.D. training at Iowa State University. My research at Iowa State University was focused on trace mineral nutrition of feedlot cattle. I was specifically interested in understanding how some of the unavoidable stressors of beef cattle production (i.e. weaning, transport, health challenges etc.) would impact trace mineral status of the animal, in hopes of gaining a better understanding of the trace mineral requirements of beef cattle.

I will be working out of the University of Kentucky Research and Education Center in Princeton, KY. I am looking forward to working with extension agents and beef producers throughout Kentucky to find solutions to our current challenges, prepare for the future, and ensure that the beef cattle industry in the commonwealth of Kentucky is successful for decades to come.

## **Mid-South Stocker Conference Returns to Warren County**

*Jeff Lehmkuhler, PhD, PAS, University of Kentucky*

The Mid-South Stocker Conference is coming back to Bowling Green, Kentucky this year. Bowling Green is a great location for those traveling with access to the conference location from I-65 and other main highways. Warren County Cooperative Extension will host this year's conference in their new meeting facilities. I am excited to have the conference return to this area. Central Kentucky is a major stocker cattle corridor and I hope you will join us on Wednesday, February 26<sup>th</sup>, 2020.

This year's program will again have a mixture of topics. Health related topics will be a major focus this year. Dr. Michelle Arnold, University of Kentucky Extension Veterinarian, will share information on diagnostic tools for stockers. In addition, Dr. Lew Strickland, University of Tennessee Extension Veterinarian, will provide an update on the Asian longhorned tick as well as provide an update on antibiotic availability and utilization. To round out the health topics, Dr. Tom Yazwinski, University of Arkansas, will address internal parasite control in stocker cattle.

Financial risk management is essential in the stocker industry and Dr. Andrew Griffith, University of Tennessee Extension Economist, will lead a session on applying risk management strategies for stocker cattle. Virtual tours of local cattle operations will again be part of the program in the afternoon. David Trowbridge, Gregory Feedlots Inc., will also share views on what has changed with respect to procuring feeder cattle as we begin a new decade. The tradeshow will provide participants time to visit with industry partners to learn more about services and products available.

To register for the conference please visit UTIA Mid-South Stocker Conference website by searching for the Mid-South Stocker Conference with your web browser or you can visit <https://mssc2020.eventbrite.com> to pay online with a credit card. You can also contact Ben Crites at [benjamin.crites@uky.edu](mailto:benjamin.crites@uky.edu) or myself at [jeff.lehmkuhler@uky.edu](mailto:jeff.lehmkuhler@uky.edu).

## **Bull EPD Qualification Calculator for CAIP Beef Genetics Program**

*Darrh Bullock, Ph.D., Beef Genetics Specialist, University of Kentucky*

The University of Kentucky is developing a calculator to assist producers to determine if a bull qualifies for the CAIP Beef Genetics Program that provides cost-share to support improved bull purchases. There will be two separate calculators, one to assist producers who are purchasing a bull, to determine if that bull qualifies for the category that they desire, and one to assist seedstock producers that would like to determine which categories their bulls qualify for. In both calculators, producers simply enter the EPD information of the bull in the appropriate space and click the "Check Eligibility" tab and the results are displayed. Remember, this is just one requirement of the program and does not ensure that you will receive cost-share money. The first step is applying for CAIP money through your county's program. If approved then follow all of the guidelines to make sure your bull qualifies, including the EPD requirement that these calculators will assist with. More information on this program can be found at: [https://agpolicy.ky.gov/funds/Documents/caip-current/caip-20\\_animal-large.pdf](https://agpolicy.ky.gov/funds/Documents/caip-current/caip-20_animal-large.pdf).

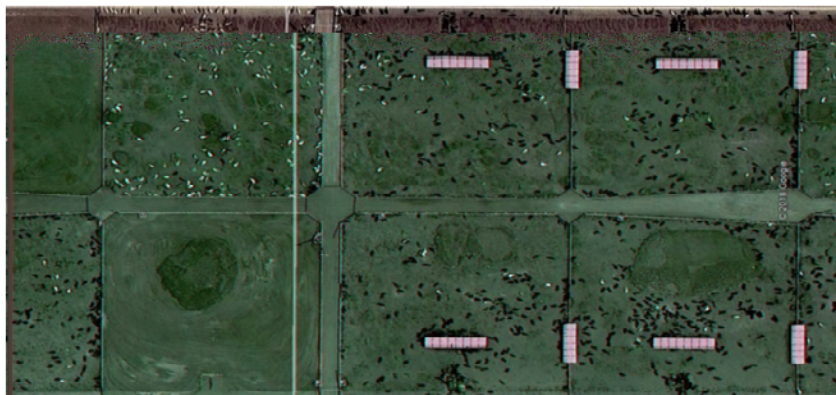
We are in the final stages of development of the calculator and it should be available soon. Please check the University of Kentucky Animal and Food Sciences' Beef website (<http://afs.ca.uky.edu/beef>) for more information and a link to the calculator when it becomes available.

If you have specific questions about CAIP programs you can contact the Governor's Office of Ag Policy ([govkyagpolicy@ky.gov](mailto:govkyagpolicy@ky.gov)). For questions specific to the EPD guidelines or the calculator can be addressed to me ([dbullock@uky.edu](mailto:dbullock@uky.edu)).

## Lanes for Beef Cattle Operations

*Steve Higgins, Ph.D., Director of Animal and Environmental Compliance*

Lanes are essential for moving cattle and creating efficiency on beef cattle operations. A good example of this can be seen in the layout of western feedlots (Figure 1). An examination of Figure 1 shows the intersection of two lanes, which can provide a route into four different lots. Along a single lane, cattle can be led into four different lots. Getting cattle from the lane into a lot is accomplished by flaring out the lane and closing a cross gate to funnel cattle into one of two available lots.



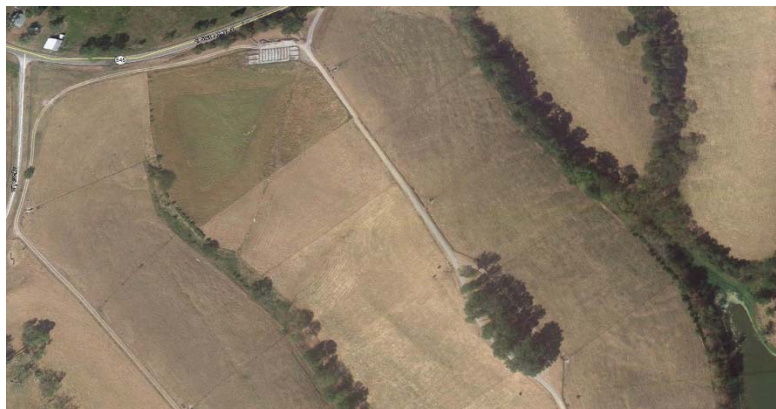
*Figure 1. Birds-eye view of a western feedlot using lanes to move cattle.*

The benefits of lanes can be applied to pasture-based Kentucky cattle operations of any size. Lanes can be used to move cattle from pasture to pasture, and to access structures or barns, handling facilities, and load-out areas, which are obvious connections. Lanes can also be used so cattle can use areas with shade. Figure 2 shows a lane on the Eden Shale Farm in Owenton, Ky. This lane is used to move cattle to and from small research paddocks and to the handling facility. However, the lane is also used seasonally so cattle can use a shady grove of trees in

the center of the photo.

A lane can create efficiency for a cattle operation by saving time and effort. In addition to moving cattle from point to point, lanes can have important cattle production components, such as watering stations, gates, mineral sources, and feeding structures. Properly situated, these components can be used by cattle in multiple pastures, saving the producer time and money depending upon the layout and acreage.

Figure 3 shows a watering station that has been situated at the end of a lane and at the intersection of two pastures. This lane tees into another lane, which is also grazed. The hub that is created can be used to move cattle from field to field as well as to provide a watering station for multiple pastures and the two lanes. There is also space within the hub for hay feeding, a mineral source, and



*Figure 2. Access lane to the paddocks on the Eden Shale Farm*



portable feed bunkers. Feeding cattle in lanes or hubs makes them easier to catch. Waste hay and manure are easy to remove from a hardened surface.



*Figure 3. Aerial photo of a watering station at the end of a lane on the Eden Shale Farm.*

Farm roads normally are thought of as a means of moving trucks, tractors, and equipment. However, they can also serve as a means for moving cattle. Gates along a road or lane are an obvious choice to limit cattle movement. However, cattle guards, strategically placed and constructed using concrete, steel pipe, or electric wire, can be used as a stopgap structure to keep cattle from getting off the farm and onto highways.

The width of the lane should be sized to accommodate the herd size, the number of animals being moving at one time, and vehicles. The lane could be as narrow as eight feet to reduce cost for materials. However,

this may be too narrow to accommodate farm equipment and vehicles. Conversely, lanes should not be too wide. A wide lane is a waste of space that increases the cost of materials for all-weather surfaces, fences, and gates. A wide lane may also require more than one person to move cattle and may cause producer frustration, as cattle will always go the wrong way if given the opportunity. However, the lane can and should be widened in places to accommodate fence-line feeder, waterers, and sharp turns.

The width of a lane should be planned based on available materials, cost, and personal preferences. Filter fabric typically comes in rolls that are 12 to 15 feet wide. Some vendors only stock 15-foot rolls. This allows producers the option of incorporating 12-foot to 14-foot gates in the design. Regardless of the size of the gate used, it should be rigid enough to handle the pressure exerted by cows or bulls. A heavy 16-foot gate places a significant load on swing posts and may create problems after prolonged use. Gate latches should be easy to operate. A bull-nose latch is a good choice as it is functional and simple to operate. Some producers prefer gate latches that can be operated from horseback, which can create lead to better flow and additional efficiency.

The type of surface will depend on how often a lane will be used, when it will be used, and the number of cattle using it. Soil type and drainage will affect the load-bearing capacity of a surface. Leaving the surface as grass is an effective way to reduce cost when a few cattle need to be moved a long distance some of the time. More frequent use or winter-time use will require a more robust surface. An example of a reinforced surface is geotextile fabric and rock heavy-use pad. Steep slopes, drainage, and frequent use may require a more robust surface constructed using geotextile fabric and rock with the addition of geocells or a plastic grid incorporated into the design. Other options for strengthening the surface could include concrete cinder blocks, tire cylinders, otherwise known as Mechanical Concrete®, soil cement, and concrete. The surface type dictates how well and how quickly cattle should be or can be moved. Any drainage issues should be addressed at the time of installation. Often, a producer will not have time or funds to redo anything afterward.

Adequate fencing is required in order to make the lane last, to eliminate the chance of escapes, and reduce maintenance. Tame cattle may respect a lane fenced with electric tape. A more permanent and heavily reinforced fence can be constructed using welded cattle panel or four- or five-board plank. Wood fencing

can be constructed using white oak boards or 2 by 6 treated lumber wood materials. However, white oak boards are in short supply, which is increasing the cost. Treated lumber is readily available but may have longevity issues.

The installation of lanes can be justified by the “hard” savings of time and labor saved. Conversely, not having lanes can increase time considerably and creates unnecessary stress on cattle and the handler. Moving cattle without a lane or with a poorly designed one can make for a long and difficult experience. Another example of a “hard” savings is that when cattle are stressed, conception rates can be lowered, cost per pregnancy goes up, and the additional stress and exercise interferes with growth. However, there may be “soft” savings that are less obvious. An example of soft savings might be the inclusion of a large waterer that provides abundant clean water to cattle. If sited correctly using the 600- or 800-foot rule, this watering source may reduce pinkeye or other bacterial infections caused by limited access to water. This in turn could reduce veterinary costs. If the watering source is laid out correctly, these benefits may extend to multiple pastures and groups of cattle.

To summarize, pasture-based grazing operations require that cattle be moved on a reoccurring basis to multiple pastures. Ideally, the number of pastures could be 6 to 24 depending on the size, scale, and management style of the operation. The most efficient way of moving cattle is to install gates as close together as possible to reduce travel distances between pastures. As a consequence, a lane or lanes should be installed, with an appropriate surface, to facilitate movement and ease management. A producer may want to include cattle grazing components such as watering stations, mineral, and forage and supplemental feeders, in the lane design, to create a synergistic effect to further increase efficiency and ease management.

## **Choosing a Supplement for the Cowherd**

*Jeff Lehmkuhler, PhD, PAS, Beef Extension Specialist, University of Kentucky*

The spring of 2019 delayed hay harvest in many parts of the state. This delay resulted in much of the hay being harvested at mature stages. Fescue was in full flower to soft-dough stage or even more mature in some cases. Mature forages have greater cell wall and lower digestibility.

I tried to demonstrate the impact of late cutting on feed value by clipping non-fertilized fescue plants the 3<sup>rd</sup> week in June. These plants were over three feet tall when I cut them. I proceeded to separate the bottom leaves, stem and seed head for yield and quality. The stem and seed head represented approximately 50% of the biomass. The stem had already matured to the point that it was tan in color. The leaves comprised the remaining 50% of the biomass and contained 10% crude protein and a calculated TDN of 54%. The stem itself was only 3.1% crude protein with a TDN of 45%.

Let me give you a reference to better relate the fescue stem quality (about half the biomass). As we all know, wheat straw is the aftermath from harvesting the grain. Wheat harvest often occurs in late June through July. Did you catch that? The book values for crude protein and TDN of wheat straw are 3.6% and 43%, respectively. Yes, that stem fraction on the hay cut in late June is similar in quality to straw! I know we can't control weather, and many of you are just trying to make the best out of what you have to feed. Let's make an action plan.

Step 1) Test the hay for nutrients so we know what we have in the hay. Surprisingly much of the hay may be sufficient in protein for dry, mid-gestation beef cows and only need energy supplementation. However, cows that came into the winter thin, may need additional protein supplementation to regain body condition.

Step 2) Determine the nutrient needs of the class of cattle fed. Fall calving cows that are nursing 90-100-day old calves need more nutrients than a dry, gestating cow that won't calve until April. Match up lower quality forages with cattle that have lower nutrient requirements.

Step 3) Develop a supplement program to meet the nutrient needs. Having the forage test will let you see if you need to supplement energy, protein or both. A protein tub may balance the protein needs but still not provide enough energy due to limited intake. Focus first on meeting the nutrient needs and then determine what supplement is the most cost effective and/or easiest to handle to provide to the cattle.

Protein source generally is recommended to be a plant-based product. Soybean meal, corn gluten feed, dried distillers grains, cottonseed meal, and other plant protein sources can be utilized. Non-protein nitrogen sources (i.e. urea and biuret) can be utilized but may not be as efficient as plant sources. However, providing non-protein nitrogen on very low-quality forages is better than not supplementing if protein is needed to meet the rumen degradable protein requirements.

In many instances, energy is deficient in the forages and will need to be supplemented to meet the needs of the cows. The energy may be from about any source such as starch, sugar, highly digestible fiber, protein or fat. However, the level or amount supplemented from these sources have limits to avoid digestive upsets. For instance, this year corn may be a cost-effective energy supplement. However, the starch from corn can reduce fiber digestion if there is insufficient degradable protein in the rumen. As a rule of thumb, cows should be limited to not more than three pounds of corn per 1,000 lb of body weight to reduce the risk reducing fiber digestion. Sugars from molasses tend to have less of impact on fiber digestion in the rumen.

However, excessive amounts of sugar consumption can lead to reduced fiber digestion. Fat supplementation can also have a negative impact on fiber digestion at higher intakes. Total dietary fat is typically recommended to not exceed 6%. Forages when often contain 2-3% fat. Fat intake from supplement then should be limited to around 0.75 lb/d for mature cows. Let's say you had some whole soybeans in the bin that you wanted to feed rather than sell. Soybeans will contain around 18% oil or fat. The amount of whole soybeans that would be recommended to be fed would be four pounds or less. Four pounds supplies about 0.7 lb of fat to the diet. Limiting intake based on fat applies to distillers syrup and other high fat feeds. Feedstuffs with highly digestible fiber work well on forage-based diets. Soyhulls, rice bran, beet pulp, corn gluten feed, wheat middlings and other feeds can be utilized. Feedstuffs with low starch and highly digestible fiber can be fed at higher rates with minimal risk of digestive upsets. These feeds can be blended with cereal grains and protein sources to develop supplements for the cow herd.

When choosing a supplement to provide to beef cows, begin with a plan. Once the forage nutrient content is known along with the nutrient needs of the cattle, the supplement that will balance the supply and needs can be selected. Several choices will be available. Cost and ease of handling narrows the selection for many. Always work with a nutritionist to ensure to develop a strategy for supplementing your herd. For more information contact your nutritionist or local county extension office.

## **What's in your Baleage? - Inadequate fermentation may lead to Botulism**

*Dr. Michelle Arnold, UK Veterinary Diagnostic Laboratory*

Botulism is a disease caused by one of the most potent toxins known to man. This toxin is produced by *Clostridium botulinum*, a Gram-positive bacterium from the *Clostridia* family. This bacterium survives in the environment as a "spore" and contaminates plant material during harvest. For the bacteria to multiply and produce toxin, an anaerobic ("without oxygen") environment must be maintained. Under certain conditions, round bale silage (or "baleage") can provide the correct place for botulism toxin to form. In the absence of oxygen (as is found in wrapped hay) and a pH greater than 4.5 (poor fermentation), the spores



enter a vegetative state, multiply and produce toxin. This toxin, once consumed and absorbed into the blood stream, blocks transmission of nerve impulses to the adjacent muscles. Two forms of the toxin, Types B and C, occur most frequently in KY cattle. Type B is associated with improperly fermented forage while Type C occurs from the accidental feeding of dead birds, dogs, cats or poultry litter contaminated with dead birds in the rations of cattle.

Round bale silage or “baleage” is an increasingly popular alternative to baling dry hay that allows shorter hay curing time and saves valuable nutrients in the face of approaching adverse weather conditions. Baleage is simply forage of a relatively high moisture content that is baled with a round baler and then stored in a sealed container, usually a long plastic tube or individually wrapped in plastic, to keep oxygen out. Both grasses and legumes can be preserved by this method if proper techniques are followed. Forage cut at the correct stage of maturity, allowed to wilt to a 40-60% moisture range, then tightly baled and quickly wrapped in 6 or more layers of UV-resistant plastic will undergo fermentation (“ensiling”), a process that should drop the pH of the feed below 5.0 (ideally below 4.5) where spoilage organisms (including Clostridials) do not grow well. Problems arise when there is a lack of adequate fermentation to reach this low pH, which occurs most often with small grains (rye, oats, wheat, barley) but can occur with any type forage. If fermentation is restricted, it is critically important to maintain the integrity of the wrap to keep an anaerobic environment in the sealed bale and preserve the silage. If wrapping is delayed or there is damage to the plastic covering, spoilage may result which supports the growth of Clostridial organisms. On the other hand, very wet, non-wilted, and/or overly mature forages wrapped for baleage have less soluble sugars available for completion of fermentation and are also at an elevated risk for botulism toxin formation. Bacteria from the *Clostridia* family thrive in wet environments where forage moistures are in the higher 67-70% range; greater than 70% moisture is very high risk for Clostridial growth and spoilage.

Both types of toxin produce the same characteristic clinical picture in cattle including:

1. Typically, multiple cattle will be affected with symptoms at the same time; some cases may present as sudden deaths. Otherwise, animals first appear dull, depressed, lethargic and eventually become thin and dehydrated due to the inability to eat and drink;
2. Progressive muscle weakness leading to recumbency (downers) depending on the amount of toxin ingested; clinical signs may be first observed from about 24 hours up to 17 days after exposure to the toxin;
3. Decreased Tongue Tone (Figure 1) - Tongue weakness is characteristic of botulism. Without tongue control, a cow will have other associated signs such as a dirty nose, difficulty chewing and



*Figure 1: Decreased Tongue and Jaw Tone are characteristic findings in botulism cases. If the tongue is grasped and pulled out the side of the mouth, the tongue may hang from the side of the mouth or is pulled in very slowly as the disease progresses. Without tongue control, a cow will have other associated signs such as a dirty nose, difficulty chewing and swallowing, drooling, and plunging the nose deep in a watering trough to drink (Photo: <http://www.nadis.org.uk/bulletins/clostridial-disease-in-cattle.aspx>)*

swallowing, drooling, and may plunge the nose deep in a watering trough to drink. Although they may appear to chew hay or grass, there is an inability to swallow so feed and forage may be seen to fall from the mouth or may be found within the mouth (Figure 2);

4. Jaw Laxity and Decreased Muscle Tone - In affected cattle, back and forth movement of the lower jaw may be very loose; the upper eyelid and tail tone are often noticeably limp;
5. Constipation/Raising the tail while straining. Sometimes see colic (abdominal pain) and a “hunched up” appearance;
6. Most cattle that go down due to botulism toxin will die due to paralysis of muscles of the diaphragm,



Figure 2: Hay dropped from the mouth of a bull affected by botulism toxin

dehydration, or complications from being a “downer”. Cattle with a more gradual progression of signs and that maintain the ability to eat and drink may recover although it can take 30 days or longer to return to normal function.

Treatment consists of supportive care including administering fluids for dehydration and propping cows up on the sternum (breastbone) to prevent them from lying down flat on their sides. A vaccine (toxoid) for *Clostridium botulinum* type B (Bot Tox B, Neogen Corporation) is approved for horses and can be used in an extra-label fashion in cattle if a valid veterinary-client-patient relationship exists. This vaccine will not reverse clinical signs already present but may help to prevent new cases. Dead animals must be disposed of properly as the meat is not safe for human consumption.

Diagnosis is difficult and is usually based on history and clinical signs. Rumen contents recovered at necropsy are the best sample for identification of the toxin. A sample of the suspected baleage should also be submitted for pH and moisture testing. Baleage testing for quality and a fermentation profile are highly recommended. Other possible causes of muscle weakness and downer cows include low blood levels of calcium, potassium or magnesium, ionophore toxicity (monensin, lasalocid), organophosphate or carbamate insecticides, heavy metals such as lead, and infectious causes such as listeriosis or rabies. Calves may exhibit extreme muscle weakness due to a lack of selenium. A thorough physical examination by a veterinarian will help rule out these other possible diseases.

Prevention is based on ensuring proper harvest and preservation of wrapped forages and maintaining proper feedout rates to reduce the risk of growth of organisms dangerous to cattle. Correct moisture content is of primary importance; there is a field method to assess moisture that will yield a general idea of moisture content but there are far more accurate methods available. Cut forage at the proper stage of maturity so it contains adequate levels of fermentable carbohydrates for good ensiling. See *Quality Hay Production* (AGR-62) for specific cutting recommendations for various forage crops

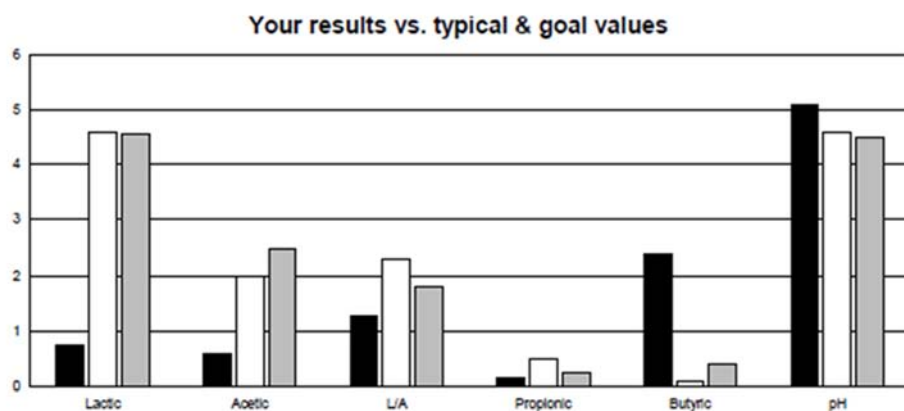
<http://www2.ca.uky.edu/agc/pubs/agr/agr62/agr62.htm>. Also, achieving the highest bale density possible, especially with high internal core densities, removes the maximum amount of oxygen with few air pockets. Wrapping the bales quickly after baling with a good quality plastic, preferably with an ultraviolet inhibitor and 6-8mm thickness, and using multiple (4-6) layers will extend the storage time. Bale weight can be a safety and equipment issue. Details of proper techniques can be found in the UK Extension Fact Sheet AGR-173 entitled “Baling Forage Crops for Silage” at your local extension office or on the web at <http://www2.ca.uky.edu/agc/pubs/agr/agr173/agr173.pdf>. Another excellent resource is the UK Forage

website for more information: <http://www.uky.edu/Ag/Forage/ForagePublications.htm#Silage/Balage0> and look for Baleage: Frequently Asked Questions. If holes appear during storage, these should be covered immediately with the proper repair tape. Store the wrapped bales on a north facing slope if available because prolonged exposure to the summer sun may cause the upper side and the south face of the bale to dry out, with the moisture condensing on the bottom or north face of the bale.

In summary, it is advisable to test the pH and moisture content of your baleage at the very least to insure adequate fermentation before offering it to cattle. Samples can be submitted to a forage laboratory such as Dairy One for quality and a fermentation profile (Figure 3) requested. This type of forage analysis will include a pH and volatile fatty acid profile and will give a very good idea of the quality of feed produced. This is a common practice for corn silage and one should consider this with fermented forages of all types to avoid health risks. It is important to remember that thousands of round bales are wrapped annually with only a few cases of botulism occurring; the risk of disease is low if one applies the proper management techniques from time of harvest through feeding.

Figure 3: A fermentation report from Dairy One Forage Testing Lab (Ithaca, NY) on a sample of poor quality wheat baleage.

Component	DM Basis	Goal	Typical Value for DM Range 28 - 32
Dry Matter, %	28.05		
Lactic Acid, %	0.74	> 3	4.57
Acetic Acid, %	0.58	< 3	2.49
Lactic/Acetic Ratio	1.28	2.0 - 3.0	1.80
Propionic Acid, %	0.18	< 1.0	0.25
Butyric Acid, %	2.38	< 0.1	0.40
IsoButyric, %	0.08		
Total Acids, %	3.93	5.0 - 10.0	7.70
pH, As sampled	5.10	< 5	4.51
Crude Protein, %	9.42		
Ammonia, CPE %	1.27		1.51
Amm-N, % of Total N	13.48	8.0 - 15.0	10.54
VFA Score	< 1	6.0 - 10.0	



Legend: The black bar=your results White bar=Goal Value Grey bar=typical values