Beef Cattle Penning

Vol 2, Summer 2009

Most of Texas recorded 100 plus temperatures during the first two weeks of summer and there are three more months of Texas hot weather to look forward to. Early spring rains set up a majority of the state for a good growing season, but the rains stopped in mid May and a majority of the state dried up. Hopefully the next rain will be just around the corner. This issue of Beef Cattle Penning will discuss the 55th Texas A&M Beef Cattle Short Course, Breeding Systems: Real & Imaginary, Producing Quality Hay and Effects of Summer Heat Stress in Cattle.

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55th Annual Texas A&M Beef Cattle Short Course August 3-5, 2009

**Look for "Beef Tips" in upcoming issues of Pennings. Each segment will provide you with up-to-date BQA tips on raising beef cattle. Brought to you by the Texas Beef Quality Producer Program.*

BEEF TIPS

AgriLIFE EXTENSION
Texas A&M System

55th Annual Texas A&M Beef Cattle Short Course

The 55th Annual Texas A&M Beef Cattle Short course is scheduled for August 3-5, 2009 at Texas A&M University in College Station. Dating back as far as 1942, Professor John K. Riggs started the first in a series of Beef Cattle Short Courses held on the campus of Texas A&M University to discuss the results of beef cattle research with Texas beef producers. Today, the highly respected Texas A&M Beef Cattle Short Course is nationally and internationally recognized as the largest attended beef cattle educational program of its type in the U.S.

Each year more than 1,300 beef cattle producers from across the U.S. and other countries converge on the campus of Texas A&M University to attend the Beef Cattle Short Course. The 2 ½ day educational event is known for being one of the most comprehensive beef cattle adult educational programs available. More than 50 different university faculty and industry leaders from across Texas and the U.S. help form a very diverse and cutting edge educational program.

The most popular part of the Short Course each year is the Cattleman's College, which is a group of workshops that are devoted to specific topics. Soil fertility, forage quality, nutrition, genetics, reproduction, cattle health and cattle handling are just a few of the topics covered in 20 different sessions this year. This format allows participants to choose the specific workshops that they are interested in. The Beef Cattle Short Course trade show is also a popular part of the conference with more than 110 different exhibitors on hand to discuss their products and services. In addition to the educational programs, participants will have the opportunity to receive at least 7 pesticide CEUs, BQA credits and Veterinary CECs to help maintain licenses or certifications. A complete schedule and additional information can be found at the following web site http://animalscience.tamu.edu/ansc/BCSC/index.html or by calling the Beef Cattle Extension office at (979) 845-6931.

**Click on the logo for more information.*

55th Annual Texas A&M BEEF Cattle Short Course August 3-5, 2009

Breeding Systems: Real & Imaginary

Breeding systems for commercial beef cow herds can be divided into two broad categories based on one simple question. Are you going to retain heifers for replacement females? If so, you have a continuous breeding system. If not, your system is terminal because you must bring in replacements from outside the herd, either purchased or produced in another herd. Within those two broad categories there are numerous alternatives.

Breeding systems can be straightbred or crossbred. A straightbred system uses just one breed. It is often continuous but can be terminal, with replacements of the particular breed involved coming from outside the herd. Straightbreeding is the easiest system to operate, but there is no heterosis (hybrid vigor).

Continuous crossbreeding systems involve a rotational plan of some sort. Rotations require separate breeding groups, unless AI is employed. The simplest rotation includes two breeds. In one breeding group a particular breed of sire is always used, call it Breed A. In the other group Breed B would be the sire. Heifers produced in one group are moved ("rotated") to the other group for breeding and they stay there for the rest of their productive life. Therefore, a female is bred to the breed she is least related to. This allows maximum expression of heterosis in the total system.

Rotations can be extended to more than two breeds. However, breeds used in a rotation should be similar in production traits, so it can be difficult to find more than two breeds that fit. Also, more than two breeding groups equal more complexity. For these reasons, rotations of more than two breeds are almost never seen. We might almost call them imaginary, or at least largely theoretical.

The systems just described are true rotations. What have been called sire rotations are similar but require only one breeding group where breeds of sire are changed periodically. Levels of heterosis in sire rotations are slightly below that of true rotations.

There is inherent genetic variability in rotations. After the system is stabilized, a true two-breed rotation has two distinct types. One group is 2/3 Breed A and 1/3 Breed B, with the reverse in the other group. In a two-breed sire rotation, individuals can range from over 3/4 Breed A to over 3/4 Breed B and combinations in between, depending on how often the sire breed is changed. This further emphasizes that breeds for rotations should be similar in production characteristics.

The simplest terminal cross involves breeding females of one breed to sires of another breed. No heifers are retained and replacements of the dam breed must come from outside. In this system females are straightbred so there is no maternal heterosis, an important shortcoming.

Perhaps the most common terminal system involves two-breed cross (F1) females (say A-B) bred to a third breed (C). A complete self-contained system of this type would require:

1) a straightbred A group
2) a straightbred B group
3) a straightbred C group
4) a group crossing A and B
5) a group to conduct the terminal cross

So, a self-contained three-breed terminal cross is pretty much imaginary. A terminal system could also use crossbred females other than F1s, such as those produced from rotations. Regardless, replacement females must be created outside the terminal-cross herd.

For crossbreeding, the number of breeding groups determines the possible choices of breeding systems. The following are possible systems, realizing that straightbreeding is an option regardless of the number of breeding groups:

ONE-GROUP
1) terminal cross, using females brought in from outside the herd
2) sire-rotation

TWO-GROUP
1) true two-breed rotation
2) straightbreeding in one group creating replacements for terminal cross in other group
3) buy straightbred females to create F1s in one group for terminal cross in other group [continued on p.3]

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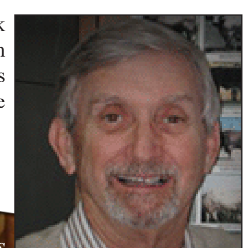


[Breeding Systems, continued from p.2]

4) sire-rotation in one group to create replacements for terminal cross in other group

THREE-GROUP
1) true three-breed rotation
2) true two-breed rotation in two groups creating females for terminal cross in third group
3) straightbreeding in one group to create replacements for creating F1s in second group for terminal cross in third group

An option that may not be well understood is straightbreeding of a combination breed (sometimes called a composite breed) as a continuous one-breeding-group herd or perhaps to create replacements for a terminal cross. In Texas in particular that might mean using an American breed, formed from a base of Brahman and British or Continental European breeds. (Some combinations of British and Continental are also being developed that could be used where adapted.) Depending on how long these combination breeds have been formed and how much inbreeding, if any, has occurred, there is some residual heterosis still in the breed. So, straightbreeding of those breeds gets you some heterosis.

In actuality, at least partly because of the prevalence of one-breeding-group herds regardless of size, the most common systems seen in Texas are straightbreeding, buying replacements (regardless of type) for terminal crossing, and sire rotations. Unfortunately many of the latter include non-complementary breeds and are unplanned, producing a hodgepodge of "mongrels" of highly varying genetic content. All other systems, to varying degrees, are largely imaginary except for producers able and willing to implement multiple breeding groups, which require more planning and even some imagination.

Finally, it should be noted that some breeds fit better into some systems than others. Continuous systems need breeds that are balanced in production traits. Terminal systems can, and should, exploit specialized sire and maternal types that are often ill suited to continuous systems. Regardless of the breeding system, it is important to choose breeds and select individuals within breeds that fit prevailing production and marketing conditions. You should use a breeding system that fits your operation, choose the right breeds and individuals for that system, and pay attention to the many non-genetic factors affecting the production and profitability of your herd.

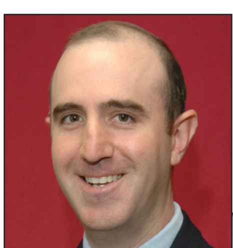
Producing Quality Hay

In parts of the state many producers have harvested their first cutting of hay and have or will be getting ready to harvest their second cutting. However, many other parts of the state have not received sufficient rainfall to produce any hay and in these areas many producers are looking to purchase hay. Regardless of which one of these situations applies to you, understanding some of the basic factors affecting hay quality is important. Hopefully, your goal is to produce or purchase high quality hay that will reduce or better yet eliminate the need for additional protein and energy supplementation from grain and other concentrates.

When evaluating hay for beef cattle many components should be considered including, but not limited to crude protein concentration (CP), an estimate of energy content or digestibility (i.e. TDN, NEm, NEg, in vitro digestibility, etc.; TDN = total digestible nutrients), mineral concentration, palatability, and factors related to storage losses (i.e. bale size, bale shape, bale density, forage species, etc.). Because CP and TDN represent two major nutritional requirements of beef cattle, we will focus on how various agronomic and environmental factors affect CP and TDN concentration of hay and the amount of CP and TDN required by different classes of beef cows to maintain body weight under typical production conditions (see Table 1).

In Texas, it is common to see hay for sale advertised as "well-fertilized". What does "well-fertilized" truly tell us about

[continued on p.4]



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[Hay, continued from p.3]
hay quality? Unfortunately, saying hay was "fertilized or well-fertilized" tells us very little about hay quality and its feeding value for beef cattle. To understand why "fertilized" does not tell us very much about hay quality, let's consider the effect that nitrogen fertilizer has on hay yield and quality. Assuming other plant nutrients are adequate and that forage maturity is the same, then increasing the amount of nitrogen fertilizer will typically increase forage yield as well as CP concentration in the forage. However, nitrogen fertilizer has very little if any effect on TDN concentration (see Table 2).

When analyzing hay quality many people focus solely on the CP concentration of the hay, but this is not a good idea. Both CP and TDN should be considered when evaluating hay because a high CP content does not always correspond to a high TDN content. Additionally, a high TDN content does not always correspond to a high CP content. There are several reasons why this could occur. One of these reasons is that if hay is rained on after cutting but before baling, an increase in CP concentration and a decrease in TDN concentration is generally observed. This happens because some of the soluble carbohydrates are washed out of the hay thereby increasing the concentration of the remaining components such as CP.

One of the biggest factors affecting forage digestibility and thus TDN concentration is plant maturity. As plants increase in maturity, lignin and fiber (plant structural components) concentrations increase and forage digestibility decreases. This results in both a decrease in TDN and CP concentration. To optimize both forage quality and forage yield it is commonly recommended that forages such as bermudagrass be harvested every 3 to 5 weeks and that forages such as sundangrass and sorghum x sudangrass hybrids be harvested before mature seed head production.

Another factor that has a major impact on forage quality of warm season grasses is temperature. As temperature increases, lignin deposition in the plant increases which in turn decreases forage digestibility. Lignin is the single most important factor affecting forage digestibility and utilization by ruminants. Remember, as lignin increases forage digestibility decreases. Because of this relationship between temperature and lignin deposition in warm season grasses, hay harvested in the spring and fall will typically be more digestible and have a higher TDN concentration than hay harvested during mid-summer.

A basic understanding of how these four factors affect hay quality and a basic knowledge of the amount of CP and TDN required by beef cows should help you be more effective in producing and purchasing high quality hay. However, a basic understanding of these factors is not a substitute for sending a hay sample to a good forage lab for analysis of crude protein and TDN content. Remember that producing or purchasing quality hay that meets or slightly exceeds the needs of your cows for protein and energy will eliminate the need for additional, costly protein and energy supplementation.

Table 1. Estimated CP and TDN requirements of cows at various stages of production*

Cow Stage of Production	CP, % of Dry Matter	TDN, % of Dry Matter
2-yr-old lactating cow	11	62
3-yr-old lactating cow	11.5	63
mature lactating cow, 25 lbs of milk	11.5	63
mature lactating cow, 15 lbs of milk	10	60
mature dry cow, 270 d pregnant	8	55
mature dry cow, 180 d pregnant	7	49

*Estimated dietary requirements to maintain cow body condition for Brahman influenced cows under typical production conditions (Beef Cattle NRC, 1996). These requirements will vary depending on numerous factors including animal weight, body condition, breed, environmental factors, and others.

Table 2. Typical effect of various agronomic and environmental factors on CP and TDN concentration in hay

Agronomic/Environmental Factor	% CP	% TDN
increased amount of nitrogen fertilizer	increase	minimal effect
hay rained on after cutting but before baling	increase	decrease
increased plant maturity	decrease	decrease
increased temperature during growth of warm season grasses	minimal effect	decrease

The goal of **BEEF TIPS** is to provide producers with the most current BQA information that can be applied to any operation.

1. To avoid residues from the use of cattle anthelmintics (i.e. dewormers), before treatment, make sure the cattle will not be marketed within the slaughter withdrawal time as outlined on the product's label. Slaughter withdrawal times vary by both chemical ingredient and method of application; the table below illustrates this concept for a few of the available injectable and pour-on macrocyclic lactone products. Always refer to the product label for specific guidelines for proper use of each product. Also remember that product selection should be based on proven product efficacy and not solely on differences in slaughter withdrawal times.

Pour-on	Product	Injectable
0 days	Cydectin®	21 days
45 days	Dectomax®	35 days
0 days	Ivomec® Eprinex	---
48 days	Ivomec®	35 days

*This table is not meant to include all available cattle anthelmintics and reference to trade name is made with the understanding that no discrimination is intended and no endorsement by the Texas AgriLife Extension Service is implied.

These tips are brought to you by:

www.texasbeefquality.com

Effects of Summer Heat Stress in cattle

Texas is a hot place in the summer and anyone who has to be outside everyday looking after cattle or doing other ranch work certainly knows that. Chances are, if you're feeling heat stress, so are your cattle. Though cattle sweat relatively little, they can cool themselves in other ways: They respire (pant) to cool themselves and we've all probably noticed altered grazing patterns in the summer, or maybe if it is hot enough, and they have a chance, you may even notice them standing in a pond or dirt tank. These things all help the animal cope but are they enough? That depends on a few other factors and how they interact. First, what stage of production are the cattle in? Are cows safely pregnant by June or July, or are they attempting to breed in those months? Bull fertility can suffer from heat stress as well. In what region of the state are the cattle located? Regions with both heat and high humidity are more stressful than those where lower humidity can allow some nighttime cooling. Breed type may also affect an animal's ability to cope.

Heat Index. Meteorologists use a formula to calculate a heat index to describe how hot the environment actually feels to people and to provide some guidelines for human activity and the risk of heat-related health problems. Researchers at Oklahoma State University have further refined this concept to develop the Oklahoma Mesonet Cattle Stress Index (which can also predict cold stress). See: http://agweather.mesonet.org/models/cattle/description.html

Cows and Heat Stress. Probably the biggest concern regarding cows are potential negative affects on fertility. Looking at cows in general (i.e. without heat-stress), most studies agree that fertilization is the rule, and failure to conceive is the exception (though it can and does happen; see bull section below). It is thought that about 30% of embryos die between conception and day 14; and another 5-10% or so during pregnancy recognition (day 14-19). After placental attachment at about day 42, losses become minimal. Total pregnancy loss in beef cows is thought to range from a low of about 42 % to a high of about 72%.

The point is that early embryo losses are high enough already without adding heat stress to the equation. Heat stress appears to exasperate losses during the same critical periods described above. Two studies showed that heat stressed dairy cows lost the majority of embryos before either day 7 or day 14 of conception. Another study reported that when rectal temperatures increased from 101.3 degrees to 104 degrees post-artificial insemination, that pregnancy rates fell from 42% to 0%. Some reasons for embryo death may include changes in uterine environment, changes in proteins critical for pregnancy, and reduced corpus luteum function by the ovary.

Failure to conceive can be another reason for reduced fertility in cows. Heat stress may cause ovulation or conception failure may due to reduced follicle quality or suppressed estrus. During heat stress cows sometimes fail to display normal estrus behavior or may show estrus more during the nighttime hours. The latter could be a consideration for AI programs. Overall reproductive rates from one OSU trial are shown in Table 1.

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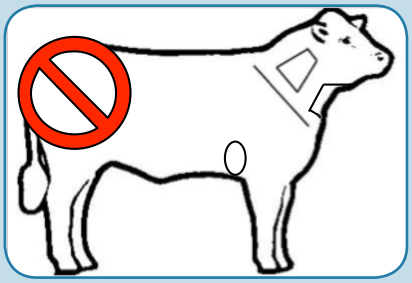
One of the biggest concerns regarding cows are potential negative affects on fertility.

The goal of BEEF TIPS is to provide producers with the most current BQA information that can be applied to any operation.

2. Give all intramuscular injections in the neck. Give all subcutaneous injections in either the neck, dewlap, or elbow pocket. See the diagram below for specific locations.



Texas Beef Quality Producer Training Dates:

July 24 - LaGrange
Oct. 17 - Robstown

Table 1. Effects of Imposed Heat Stress on Reproduction in Beef Cows (Biggers, 1986;Oklahoma State University)

	Control	Mild	Severe
Day Temp. (F)	71	97	98
Night Temp (F)	71	91	91
Rel. Hum (%)	43	27	38
Rectal Temp (F)	102	102.5	103.6
Pregnancy (%)	83	64	50

** Bulls may reduce their breeding activities during times of heat stress.*

Bulls and Heat Stress. It has been well documented that bulls experience reduced semen quality during summer months in many regions of the Southern U.S. Oklahoma researchers reported reduced motile sperm, reduced sperm production, and an increase in the percent of abnormal and aged sperm. In this study bulls were maintained in controlled chambers at 73 degrees for 8 weeks. Heat stressed bulls were then subjected to 88 to 95 degree temperatures for 8 weeks, followed by 8 more weeks of 73 degrees. Heat stressed vs. control bulls consumed 35% more water, respired 55% more, and had a rectal temperature one degree higher.

Producers with early fall breeding programs or with fall bull sales which include semen testing should be mindful of the potential effects of summer heat stress. It takes sperm cells about 60 days to mature in the testis. So for example, bulls that begin breeding on October 1 could have reduced semen quality due to heat stress which may have occurred back in August. It is also likely that bulls may reduce their breeding activities during times of heat stress.

Heat Stress and Calves. Calves that are heat stressed consume less feed and likely suckle less. Data on 8,000 calves from Texas shows reduced weaning weights for calves born May – September (Table 2).

Table 2. Effect of month of birth on adjusted weaning weight of calves (Sprott, 2000)

Month of Birth

Trial	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	388	427	430	417	416			374	424		478	465
2	477	491	477	467	432	424	434	414	398	432	447	474
3	361	394	415	438	396		341	314	320	349	359	357

Trial 1, Burleson Co. 1976
Trial 2, Webb Co. 1969
Trial 3, Calhoun Co. 1976-79

Managing Heat Stress. The most economically important effects of heat stress are on fertility and calf vigor. Therefore, the first management step for most of Texas, is to allow neither summertime breeding seasons nor summertime calving seasons. There may be regional exceptions in Far West Texas, or on the high planes where nighttime cooling is a regularity and/or summertime rainfall is likely. If cattle don't have access to shade, you may want to consider erecting some structures. Fly control may be important (i.e. ear tags, etc.) as cattle may avoid shade as a means of avoiding flies. Make sure cattle have adequate water at all times. Water consumption may double that of winter, approaching 2 gallons per hundred pounds of animal weight per day (i.e. 20 gallons for a 1000 lb animal). And finally, while no breed is immune to heat stress, select breeds of cattle that best tolerate your environmental conditions.