extension
ALABAMA A&M & AUBURN UNIVERSITIES

Beef Conformation Basics

► Learn the proper skeletal structure and conformation of beef cattle as they relate to an animal's ability to function in a herd. Proper conformation is a key element in selection of replacement bulls and heifers. Without proper conformation, cattle will be eliminated from the herd at an earlier age.

Beef cattle producers now have more tools than ever to help them evaluate the genetic merit of animals to be used as parents of the next generation. A balance between visual appraisal and genetic potential is key to successfully selecting for the next calf crop. One element that cannot be left out of the selection equation is structural soundness. A farmer may produce cattle that excel in muscle, maternal ability, and feed efficiency, but if the cattle cannot walk easily from feed source to water source, then all else has been in vain.

Though each cattle herd may need different selection criteria to produce cattle that meet herd goals, one of the few characteristics important to all cattle is structural correctness. With input costs steadily increasing, today's cattle farmers must minimize expenses wherever possible. Selecting cattle that are performance oriented and structurally sound will decrease the number of cattle leaving the herd for various lameness issues. This will increase the longevity of the cowherd, justifying money spent on developing or purchasing replacements.

Hooves

The hoof is one of the more complex aspects to consider when evaluating structural soundness. Problems with the hoof, such as excessive or uneven toe growth, may be caused by genetic, nutritional, or environmental factors or may be indicative of other concerns the animal may face structurally. The ideal hoof is free of cracks and other abnormalities and has two symmetrical claws that both point forward. The hoof shown in Figure 1 is an example of good structure in regard to symmetry and toe alignment. Adequate attention should also be paid to the amount of heel depth because cattle with too much angle to their hocks and pasterns can be very shallow in the heel. The hoof should be dense and able to support the weight of the animal without cracking, as this can lead to lameness.

Another condition to look out for when evaluating the hoof is corkscrew claw, or screw claw, which is

Figure 1. Example of proper hoof structure

Figure 2. Female exhibiting clinical signs of corkscrew claw

the twisting of the toe in a way that places the side wall of the hoof in direct contact with the ground. Sometimes the condition begins to show itself with the toes pointing inward instead of forward. The feet shown in Figure 2 exhibit the classical symptoms of this disorder, which is usually seen in cattle more than 2 years old. It can affect all hooves or be present in just one hoof. Although the mode of inheritance is not completely understood, this disorder is believed to be a heritable trait. The condition can lead to lameness due to improper distribution of weight within the toe. Cattle with this disorder should be culled and eliminated from the herd as soon as possible.

Figure 3. Calf exhibiting a lack of appropriate angle to his pastern

Figure 4. Calf exhibiting a considerable amount of angle to his pastern

Pasterns

Pasterns are also important to consider when evaluating structural correctness in beef cattle. The pastern is generally understood to be the joint between the cannon bone and the hoof. They play a role in both providing cushion and support as cattle walk and stand. The ideal slope of the pastern is between 45 and 47 degrees. Cattle whose pasterns have an angle between 45 and 47 degrees are more desirable because this allows the joints to function properly. Figures 3 and 4 show two calves at opposite ends of acceptability. The calf in Figure 3 is minimally acceptable in terms of having enough angle to his pasterns to provide enough cushion and support. The calf in Figure 4 has considerably more angle to his pastern, which in turn provides more flex and cushion when walking.

If the pastern angle becomes greater than what is seen in Figure 4, support can become an issue as the animal gains weight. Of the two extremes, cattle that lack enough angle, or set, to their pasterns (Figure 3) generally will have more lameness issues and decreased longevity in the herd when compared to cattle with too much set. The pastern shown in Figure 5 is closer to what should be considered ideal. It is critical to closely evaluate feet and leg structure of all cattle in the herd because these are the foundation of every animal. Poor structure will quickly force an otherwise genetically superior animal out of the herd.

Figure 5. Calf exhibiting the appropriate amount of angle to his pastern

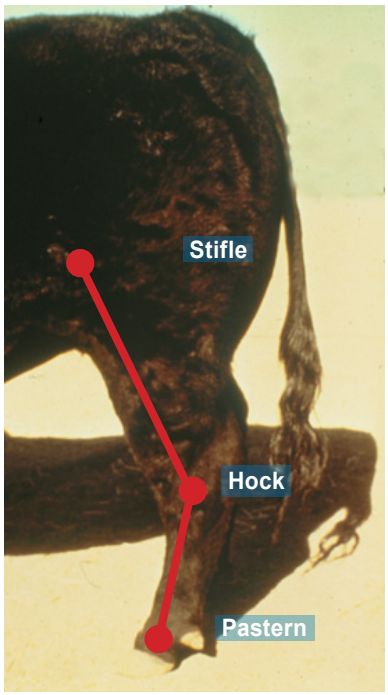

Figure 6. Example of a sickle-hocked steer

Figure 7. Example of a post-legged female

Hind Legs

Hind leg structure is one of the primary indicators of an animal's ability to move efficiently. Evaluating cattle while they are walking is one of the most efficient ways to gauge structural soundness. One way to determine if the angle of the hock is correct is if the rear foot is placed in the tracks left by the front foot when the animal is moving forward. Cattle with the ability to do this are usually structurally sound in regard to their hind leg conformation.

Large angles at the hock can seriously restrict the animal's length of stride as far as the hind legs are concerned. When the angle of the hock is too large, the stifle, hock, and pastern are all pulled into a formation that is too linear to allow for adequate flexibility and proper function. Animals that suffer from this condition are said to be post legged. This condition causes problems for both market and breeding animals.

Both males and females that are post legged are usually less efficient and less durable in a pasture. In conditions in which cattle need to cover large areas for forage, structural integrity is of utmost importance. A similar statement can be made in regard to feedlot settings in which cattle need to be structurally sound in order to compete for feed. In regard to reproduction, bulls that are post legged can face issues when it comes to breeding due to the extreme angle of their hind legs and the fact that these legs support the bull's weight during the act of breeding. These bulls may also face issues when it comes to traveling the distances associated with covering large groups of females in larger pasture settings.

Just as the angle at the hock can be too large, it can also be too small, or acute. Cattle with this condition are commonly referred to as sickle hocked. With this condition, the angle of the hock is too small, and cattle usually have their hind legs and hooves placed too far underneath them. Cattle that are sickle hocked can sometimes overstep the hoof prints left by their front hooves. Although sickle-hocked cattle can also have an abnormal gate, this condition is far less detrimental to longevity and mobility than the short, inefficient strides seen in post-legged cattle.

The importance of being able to assess hind leg structure in beef cattle is vital to assessing potential longevity of the animal as it relates to structural integrity. Although no method is fail-safe, evaluating the pastern, hock, and stifle in order to see how they align is a solid step. Ideally, these three joints will align in an angle between 140 and 145 degrees. The calves shown in Figures 6 and 7 are examples of sickle-hocked and post-legged cattle, respectively. Figure 8 shows a 145-degree angle between stifle, hock, and pastern, which would fall into the ideal range.

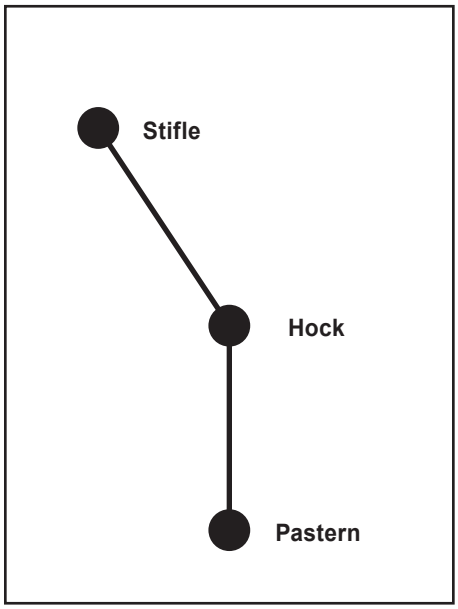

Figure 8. Correct structure desired for angle between stifle, hock, and pastern

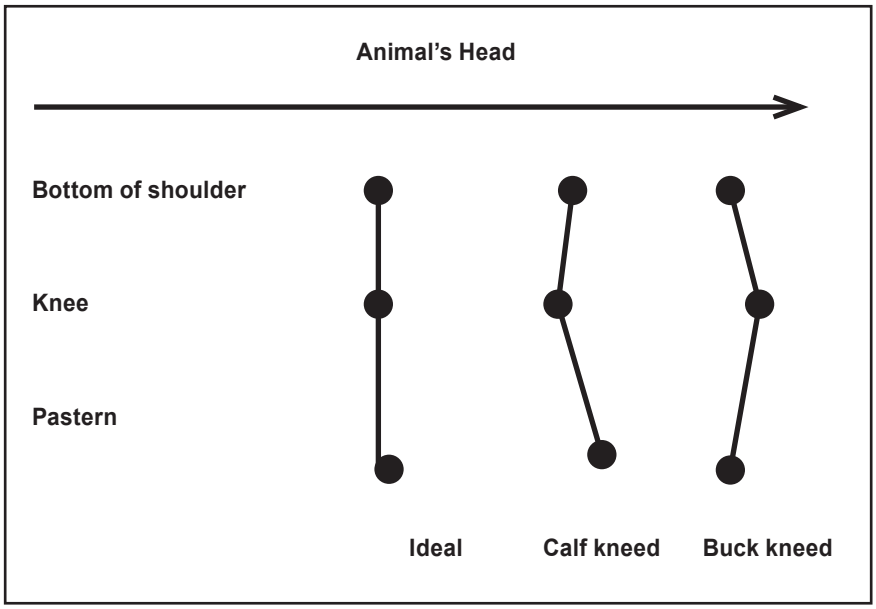

Figure 9. The different joint alignments associated with conditions seen in the front leg

Front Legs

The alignment of joints in the front leg also plays a considerable role in the structural correctness and mobility of a beef animal. More than 50 percent of the animal's weight must be supported and carried by its front two legs. In order for that to be done effectively, the joints must be able to provide some shock absorption and allow considerable range of motion. The ideal angle for the scapula, or shoulder, in relation to the ground is approximately 45 degrees. This angle allows for the appropriate range of motion and is usually associated with the front legs being placed squarely beneath the scapula. As the angle becomes larger, range of motion is restricted, and the result is the animal taking shorter, less efficient steps. Larger angles can also affect the knee and result in the animal being buck kneed. This condition occurs when the animal's knee is pitched forward in relation to the rest of the foreleg. This condition can also be associated with cattle being too straight in their front pasterns.

When the angle of the scapula is too small, the usual result is the animal being calf kneed. This condition occurs when the knee is positioned behind the outline created by the front leg. This condition is less damaging to the front leg function than is the buck-kneed condition. In some situations, such as when cattle are being confined on concrete, this condition may be considered more ideal as it provides more cushion for the front limb. Figure 9 shows the joint alignments seen with these conditions.

Evaluating the slope of the shoulder can be one of the more challenging tasks when it comes to gauging soundness of beef cattle. The point of shoulder and the spine of the scapula are two of the most important points to consider when making this evaluation. By distinguishing these two points and evaluating their relation to the ground, a reasonable assessment can be made as to what the slope actually is. Another helpful way to visualize the slope is to imagine a line from the point of shoulder straight down to the ground. As cattle become more vertical in terms of their scapula, the line from the point of shoulder straight down to the ground will be closer to the front leg itself. Other indicators as to whether an animal is too straight shouldered include the top of the scapula being visible above the animal's top line and shorter, more restricted steps when the animal moves.

The two animals in Figures 10 and 11 are examples of some structural differences when it comes to slope of shoulder and forelimb alignment. The calf in Figure 10 is considerably more vertical in terms of slope of shoulder as demonstrated by the line connecting the spine of the scapula, point of shoulder, and the ground. The line going from point of shoulder directly to the ground also indicates a steep shoulder as it is very close to the outline of the front leg. The female in Figure 11 is closer to ideal in regard to slope of shoulder and has considerably more space between point of shoulder and her front leg.

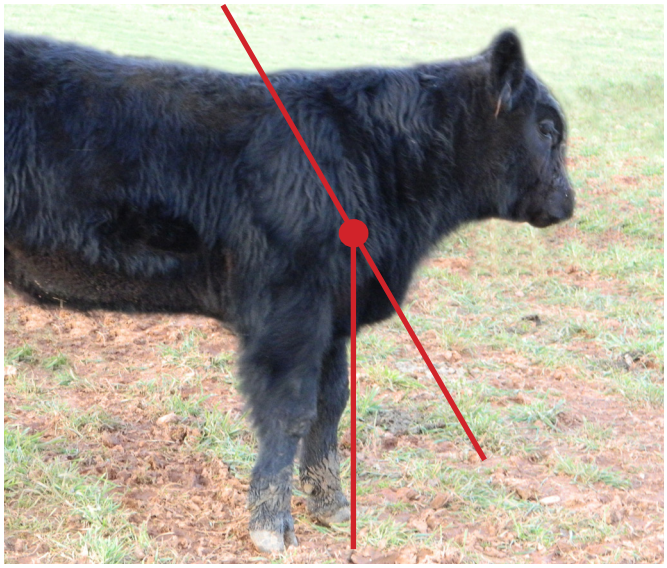

Figure 10. Steer exhibiting a steep or straight shoulder

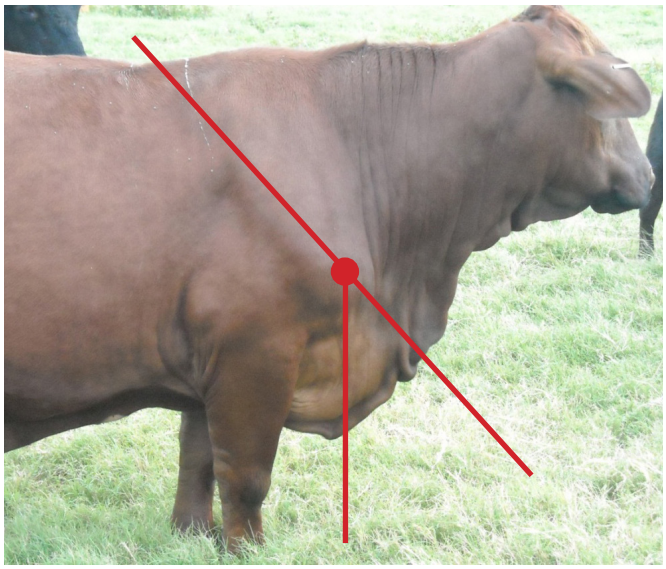

Figure 11. Female with the correct amount of slope to her shoulder

Evaluating Structure from the Rear

When evaluating beef cattle from the rear, hooves of the animal should point forward. However, that is not the case in a large number of beef cattle. In many instances, the hooves of the hind legs turn outward instead of pointing forward. Cattle with this condition are commonly referred to as being cow hocked. The hocks are also usually turned inward and can be closer together than the hooves in some extreme cases. In milder cases, cattle are unhindered in terms of normal productivity. The steer shown in Figure 12 is slightly cow hocked but would be considered normal, as anything less than a 10-degree angle is considered as normal. In some extreme cases, this condition can result in uneven toe growth and wear. Cattle more extreme in this condition are usually very light muscled as is the heifer shown in Figure 13.

Less commonly seen in beef cattle is the condition known as bowleggedness. This term is used to describe cattle whose hooves are pointed inward on their hind limbs. Though this term may also be used to describe a similar condition in the front limbs, it usually describes cattle that are farther apart at the hocks than at their hooves. This condition is considered more serious in terms of inhibiting proper mobility and is far less common in comparison to the cow-hocked condition.

Evaluating Structure from the Front

From the front, cattle whose hooves are faced forward are ideal. The steer shown in figure 14 is a good example of both hooves pointing directly forward. Much as it is with the hind legs, some angle in the outward direction is acceptable, and any angle of 10 degrees or less is accepted as normal. Functionality of the front end is normally not compromised until the outward turn approaches 30 degrees or more. Cattle with this condition are commonly referred to as being splay footed. Cattle that are splay footed can usually also be classified as being knock kneed. Figure 15 is a good example of a heifer having both of these conditions.

Another condition in beef cattle concerning the front limbs occurs when the front hooves point inward toward each other. Cattle exhibiting this condition are said to be pigeon toed. This condition is rarely seen and is detrimental to the functionality of the forelimbs.

Figure 12. A slightly cow-hocked steer that would be considered normal

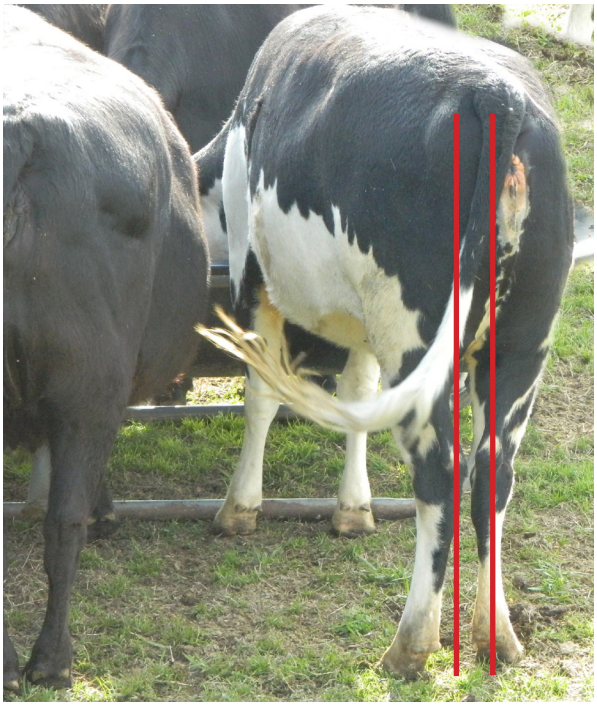

Figure 13. An extremely cow-hocked female who is also very light muscled

Figure 14. Steer with proper front leg structure

Figure 15. Female exhibiting the knock-kneed and splay-footed conditions

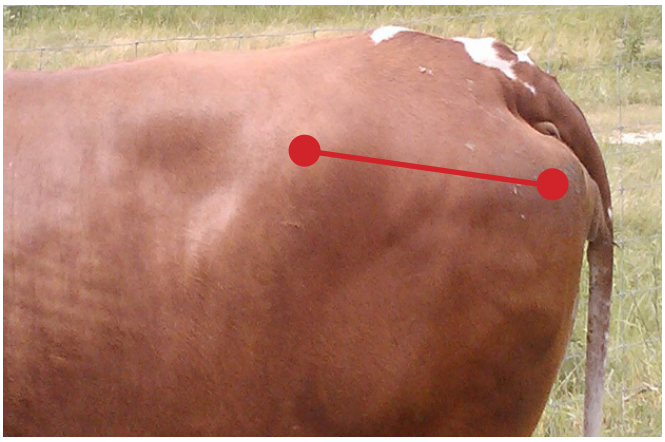

Figure 16. Female exhibiting a slight slope from hooks to pins

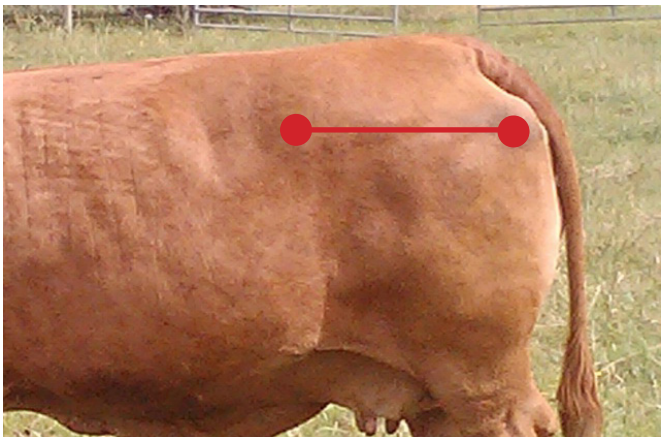

Figure 17. Female with ideal level hip structure

Hip Structure

The two points of reference to be aware of in evaluating the hip are the hooks and pins. Both points are identified in Figures 16 and 17, with the pins being the point beneath the tail head. Although some breeds, such as those influenced by Brahman genetics, are less likely to be level, the ideal beef animal would be nearly level from hooks to pins. Although it is not always the case, a level hip normally equals a longer, more muscular hip if for no other reason than length itself. Also, a level hip is normally considered more eye-appealing. As the hip becomes less level, it can become shorter and be associated with other issues such as cattle having their hind legs placed too far beneath them.

Some producers have defended cattle with a minor slope from hooks to pins by saying these cattle have an advantage when it comes to calving and expelling afterbirth. As long as the slope is not extreme, not much compromise is made in regard to structural correctness.

One of the more problematic arrangements of the hip can be found when cattle are higher at their pins than at their hooks. In females, this can lead to problems with calving and expelling afterbirth. Although the calving problem is only expressed in females, breeding bulls exhibiting this characteristic should be selected against as well in order to not perpetuate the characteristic.

Conclusion

Although structural correctness is just one aspect to consider when selecting for genetically superior cattle, it is a primary factor in the ability of cattle to perform their desired function. Just as is the case in other aspects of the beef cattle industry, there is an area of acceptability when it comes to structural correctness. This area becomes smaller or larger in regard to what end of the spectrum you are evaluating cattle. Animals retained or purchased for the purpose of breeding stock have a considerably smaller margin of error when it comes to structure, especially when compared to those cattle being sent to market. There is a line that, regardless of position in the cattle industry, should not be crossed when it comes to perpetuating cattle that are unfit.

Cattle used in breeding programs need to be correct in terms of structure to survive in a pasture-type setting as well as perform the functions required of breeding stock. The ideal time to evaluate structure is when identifying replacements for the breeding herd. At this time, detrimental characteristics can be avoided, thus reducing the risk of potential problems down the road. Avoiding structural issues initially is considerably easier than trying to remove them from the breeding herd later.

David L. Daniel Jr., Graduate Student, and **Lisa A. Kriese-Anderson**, *Extension Specialist* and Associate Professor, Animal Sciences, Auburn University.
Photo credits: Bob McGuire, figure 6; Jon C. Whitlock, figure 7; George M. Richburg Jr., figures 15, 16, and 17; David L. Daniel, all other figures.

For more information, contact your county Extension office. Visit www.aces.edu/directory.

New Feb 2013, **ANR-1452**

www.aces.edu