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The Value and Use of Internal Pelvic Area Measurements in Beef Cattle

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An estimate of internal pelvic area is obtained by using special calipers to measure the vertical distance between the sacral prominence and the pubic symphysis. A second, horizontal measure is made between the widest points along the ilial shafts of the pelvis. Multiplying these two distances gives an estimated area of the internal pelvic opening.

Internal pelvic area influences the incidence and degree of calving difficulty (dystocia) in first-calf heifers. When the heifer has a small pelvic area and the calf has a high birth weight, the probability of dystocia is sure to increase. Research has shown that these conditions account for more than half the cases of dystocia in first-calf heifers (19).

Dystocia can cause the death of the offspring and/or dam, and poor rebreeding rates in surviving dams (3, 20). Therefore, efforts to avoid dystocia are part of proper heifer management. Internal pelvic measures can be helpful in making culling decisions because heifers with small pelvic areas are more likely to experience dystocia than heifers with large pelvic areas. However, research has documented that pelvic area, by itself, is not an accurate predictor of the chances that heifers will experience dystocia (17). The measurement should be used with other best management practices for beef herds.

Factors Affecting Dystocia

Other factors besides the dam's internal pelvic area influence dystocia. Calf shape is one factor. Calves with larger heart girths and wider hip measurements than average seem to present more problems during delivery. This may be because calves with large heart girths are also heavy at birth, and high birth weight is known to be more influential on dystocia than is calf shape (16).

A sire affects his offspring's birth weight, so it is important to use bulls with histories of producing lightweight calves.

Replacement heifers should be fed for adequate weight gain, which results in proper skeletal and pelvic area development. However, nutrition level during gestation, contrary to popular belief, has only a minor influence on dystocia. While excessive levels of protein in the dam's diet in the last trimester of pregnancy can increase calf birth weight and the incidence of dystocia, excessive energy in the diet is not regarded as a problem (1). Supplements for gestating heifers should be balanced nutritionally according to the heifers' weights, the desired rate of gain and the stage of gestation.

Because bulls are generally heavier at birth than heifers, more cases of dystocia are seen in dams giving birth to bull calves.

Gestation length influences birth weight, but only slightly (18). Some

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researchers have suggested that genetic selection for shorter gestation length could be used to reduce birth weight, thereby reducing dystocia. However, fetal growth rate in the last trimester of pregnancy averages 0.34 pounds per day (4), so shortening gestation by 10 days would reduce calf birth weight by only about 3.4 pounds. This small decrease is unlikely to have much effect on dystocia. Significantly shortening gestation could, of course, affect calf viability, and requires much more research.

As can be seen, the two most critical factors affecting dystocia are the internal pelvic area of the dam and the birth weight of her offspring. Fortunately, management practices can control these factors to reduce the incidence of dystocia.

Managing for Larger Pelvic Area

Achieving larger pelvic area in replacement heifers is not a difficult task. There is sufficient research to indicate that larger heifers at weaning and yearling age will have larger pelvic openings (6, 12); thus, retaining the largest replacement heifers will increase average pelvic area in the replacement herd. Furthermore, making sure heifers gain weight acceptably before and after breeding will promote proper pelvic area and skeletal development.

Genetic selection offers another tool for increasing pelvic area. The heritability estimate of pelvic area ranges from moderate to high in heifers (2, 8, 11, 13, 15) and yearling bulls (14), suggesting that selection can make a difference. Since age affects pelvic size also, measurements should be adjusted for age before making culling decisions.

Adjustment Factors for Beef Cattle Pelvic Areas (9):

For Males

Adjusted 365-day pelvic area = actual pelvic area in cm^2 + .25 (365 - actual age)

For Females

Adjusted 365-day pelvic area = actual pelvic area in cm^2 + .27 (365 - actual age)

There are moderate to high genetic correlations between pelvic area and hip height, yearling weight, weight per day of age (2) and mature weight (13). Therefore, selecting only for increased pelvic area also may increase the mature size. Since larger cattle require more nutrients than smaller cattle, forage and feeding management should be changed to provide these additional requirements. However, the problem with increasing the mature size of the herd is that birth weights also will increase (10), thereby negating the original intent of reducing dystocia through selection for increased pelvic area. The solution to this dilemma is to select for increased pelvic area while setting some upper limit for mature size. This limit is most often determined by the point at which productive and reproductive failures occur because of nutritional and environmental limitations.

Potential Standards for Pelvic Area in Heifers

Some scientists have suggested that yearling replacement heifers with pelvic areas of less than 140 square centimeters should be culled prior to breeding (7); this is a sound recommendation because heifers with such small pelvises are more apt to have calving difficulty. It also has been suggested that yearling pelvic area can be used in a ratio with expected calf birth weight as one way of predicting the likelihood of dystocia. The proposed minimum standard using this ratio is 2 square centimeters:1 pound of birth weight. In other words, a heifer with a yearling pelvic area of 180 square centimeters could easily deliver a calf weighing 90 pounds or less.

However, work with Angus and Hereford crossbred heifers suggested otherwise (21). The average yearling pelvic area was 200 square centimeters, while the average calf birth weight was 68 pounds. Of 110 head that had apparently adequate ratios, 42 experienced dystocia and required assistance at calving. Therefore, the recommended pelvic area: birth weight ratio of 2:1 appears questionable.

Managing for Light Birth Weight

Not only should heifers with small pelvic areas be culled, but the birth weights of the offspring should be kept low. Birth weights can not be accurately predicted because some factors which affect them are beyond the producer's control—blood flow to the uterus and weather, for example. However, bulls can be selected for expected progeny differences (EPD) in birth weight and for calving ease characteristics. (Most breed associations are now rating their bulls.) Currently the most effective way to keep birth weights at an acceptable level is to use bulls with high calving ease ratings and that produce offspring with light birth weights. In fact, the calving ease rating may be more important than the birth weight rating (5). This strategy, in combination with retaining heifers with large pelvic areas, will reduce, perhaps almost elimi-

nate, dystocia except in cases involving improper calf posture.

Attempts to lower birth weight by reducing the level of feed to the dam during her gestation period have been ineffective (1). This practice is not recommended because it reduces calf vigor, increases calfhood disease and reduces the dam's post calving reproductive performance.

Using Pelvic Measurements to Reduce Dystocia

Set minimum standards for yearling pelvic area size to use in making culling decisions, but don't select for this single trait. Mature size limits also must be set to avoid the potential production problems associated with larger cattle.

Culling yearling heifers with pelvic areas smaller than 140 square centimeters will improve the average pelvic area within the replacement herd. Adjust measurements for age if in a genetic selection program.

Ensure that heifers have adequate nutrition for acceptable weight gain and skeletal development.

Control birth weights of calves by using bulls whose EPD for birth weight indicates they will produce lighter weight calves. More importantly, use bulls whose calving ease ratings are high.

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