



# DOUBLE MUSCLING

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*This is the sixth in a series of articles designed to acquaint Angus breeders with genetic defects, problems which occur in every breed of every species.*

**T**he philosophy among many breeders seemed to be that, if a moderate amount of muscling is good, then more muscling is better. The era of the great muscle hunt began and with it an upsurge in the incidence of double muscling in all breeds of cattle of European origin."

That was in the early 1960s when demand for leaner beef led to the "meat-type" steer concept, and trim cattle with thick bulging muscles were pictured as ideal slaughter animals. Which in turn created great demand for heavily muscled bulls.

Double muscling existed long before the 1960s, though. It probably originated with cattle native to western Europe and was seen as early as 1804 in cattle developed in England. The first U.S. case was recorded in 1934, and it's been encountered in every beef breed of European origin.

Double muscling is genetically controlled, inherited by a single pair of recessive genes. But carrier animals are usually different in conformation than normal animals, indicating that it's incompletely recessive to its partner gene for normal muscling.

## Rare in Angus

It's not lethal and occurs very rarely in Angus cattle but is included on the American Angus Assn.'s list of Class I defects because most affected cattle have reproductive problems that severely limit their usefulness in registered or commercial herds.

The defect's correct name is muscular fiber hyperplasia, and the term double muscled actually is misleading. Affected animals don't have twice as many muscles as normal animals. Instead, each muscle has about twice as many fibers, and the animal appears to have what the French call "explosive" muscles.

Double muscling involves several characteristics that together lower the overall fitness of an animal. Affected animals usually can be identified by appearance;

however, no one individual is likely to express all of these traits.

Muscle development is accented more in males than females (except as young calves), because males normally are heavier, and the defective gene tends to magnify the sex difference in muscling.

These cattle become physically mature sooner and usually are smaller at maturity.

## Expression Varies

The degree of expression of double muscling varies considerably, indicating that other genes interact to cause some animals to show the traits more strongly than others. Also, signs of the defect will be less evident after sexual maturity and calving.

Environment also plays a role in degree of expression. Superior environment and high level of feed cause muscular enlargement to be more pronounced.

The appearance of carrier animals also varies considerably. In general, carriers express the same traits as double-muscled cattle but to a lesser degree. In most cases, carriers look distinctly different than normal or double-muscled animals; but some may be almost as extreme as pure double-muscle animals, while others may look almost normal.

Double-muscled cattle boast some advantages over normal cattle. They grow faster and are more feed efficient up to one year of age. In general, they have a higher dressing percentage, higher yield of edible meat, less fat and bone, and their meat may be higher in protein than that of normal cattle. In fact, people in some European countries prefer meat from these cattle, and it's usually tender and palatable.

## Dressing Percentage

Average dressing percentage (hot carcass weight divided by live weight) is higher for affected cattle because bone and nearly all dress-off items weigh less. That includes hide, digestive tract, kidney fat, brain, stomach, lungs, blood, etc.

Cutability obviously is increased because of increased muscle mass and the severe reduction of fat. Some double-muscled carcasses have almost no intramuscular fat (marbling), outside covering or internal fat. (With prolonged feeding of high-concentrate rations, they will put on fat. But they can't handle certain fatty acids in roughages and need high-concentrate rations or milk for optimum gain.)

There's also an increase in total nitrogen percentage, associated with the decreased amount of marbling, that indicates an increase in protein.

However, the meat merits a lower quality grade, has much less energy, and the scanty fat covering (especially over the round) allows the meat to dry out readily, reducing its keeping quality for shipping and storing.

Carriers tend to be intermediate in carcass traits, corresponding closely to the ideal "meat-type" animal in muscle development and fat deposition. But at present there isn't an economical way to produce carriers for slaughter animals.

## Plagued by Problems

But carcass cutability advantages are offset by a list of reproductive problems.

Double-muscled females are slow to reach sexual maturity. In the Texas A&M research herd, average age at first breeding of these cows was about 22 months. One extremely double-muscled cow didn't conceive until 30 months of age, and some never conceived.

Sterility due to infantile reproductive tracts is common in extremely double muscled females. In those animals, the uterine horns and vagina are shorter than normal, and the uterus is larger. The vulva is small and located higher up on the rump

*\*Thanks to Nat M. Kieffer and T.C. Cartwright, professors of genetics at Texas A&M University, for allowing me to use parts of their research report ("Double Muscling In Cattle," Texas Agricultural Experiment Station Bulletin B-1325), including the first paragraph of this article as well as the illustrations.*

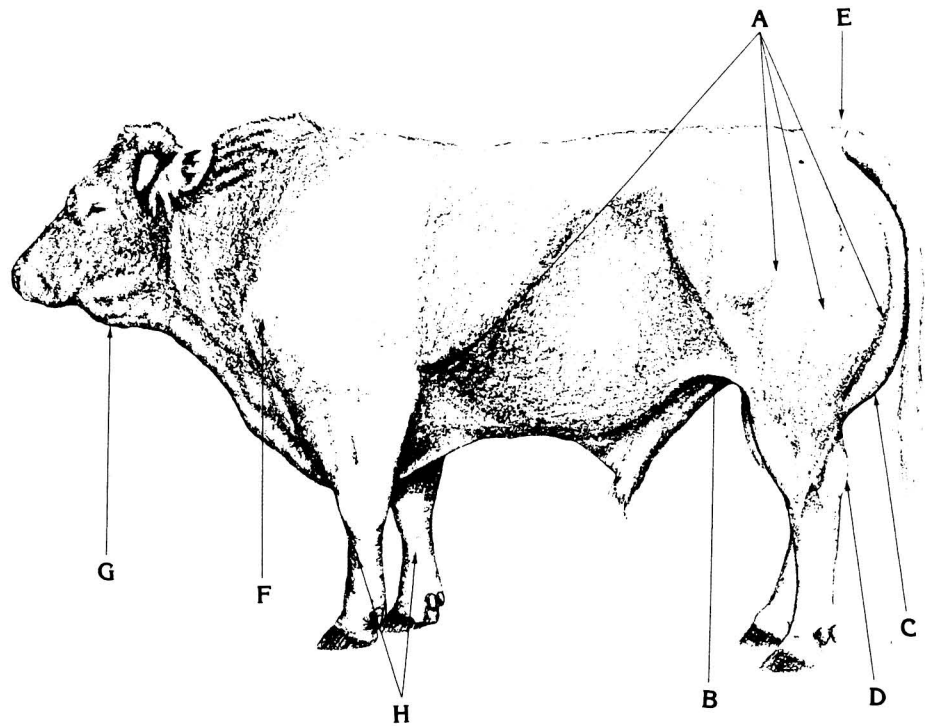
## Double-Musced Bull

The most obvious departure from normality of the double-musced animal is enlargement of the skeletal muscles. Although all muscles are enlarged, the increase in muscle mass is most apparent in the muscles of the rear quarters. In the figure at right, the muscles are delineated by deep creases (A). One of the reasons for the apparent sharp separation between different muscles is the almost total lack of external fat to smooth out the creases between different muscles.

The double-musced animal is very trim and is often "cut up" in the flanks (B). In profile, the rear quarters describe the arc of a circle (C). The hocks are often very straight (D), causing the animal to stand on its toes. This is called the post-legged condition, although the opposite or sickled-hocked condition is sometimes seen. The tail head (E) is attached farther forward than in non-double-musced animals.

The shoulders are prominent because of increased muscle mass (F). Double-musced animals often have "open" shoulders because muscles medial to the shoulder blades tend to push the shoulders away from the body.

Double-musced animals are light-boned, and the reduction in bone is most apparent in the cannon bones (H). The muscle which



occupies the space between the two halves of the lower jaw tends to sag prominently below the jaw bone (G). The head of the double-musced bull is often plain and "cow-like" and may lack the over-all masculinity of non-double-musced bulls.

Double-musced animals (both males and females) within a given breed are usually smaller at maturity than their contemporaries even though they may grow more rapidly than normal during the first 12 months of life.

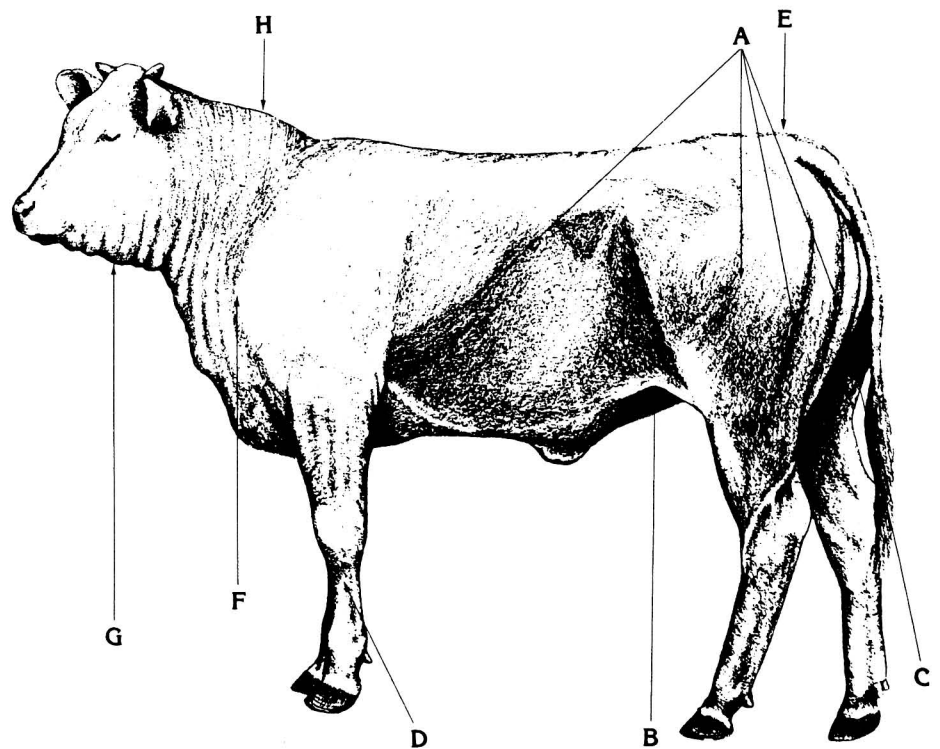
## Double-Musced Heifer

The over-all image projected by this heifer is one of coarseness of head and neck, trimness of body and excessive muscular development. Sparse external fat is indicated by distinct muscular creases and a very "tight" trim body.

Masculinity, which is characteristic of the double-musced female, is readily apparent in this heifer. There is excessive neck development (H), the head is bullish and the muscles occupying the space between the two halves of the lower jaw are excessively developed.

Fine bone is evident in the front cannon bones (D), but the rear cannon bones appear more nearly normal in development. The tail head setting (E) is placed much farther forward than for normal cattle.

In general, the double-musced female exhibits many of the same characteristics



exhibited by the male. However, muscular development is accented more in males than in females. This results because males

are normally heavier than females, and the presence of the double-musced gene tends to magnify sex differences in muscling.

at an acute angle from the ground, and natural breeding may be difficult.

Death of calves and/or cows due to dystocia (calving trouble) is frequent. Of 25 calves born to double-muscled cows at Texas A&M, nine were taken by cesarean, 10 were given a hard pull with a calf puller, two were assisted with hand pull, and four were born without assistance. Ten calves were born dead because of trauma associated with birth.

#### **Main Factors**

Two main factors cause this high incidence of dystocia. First is shape of the calf. The massive hips and shoulders of most double-muscled calves make it difficult to pass through the birth canal. Second, the birth canal of an affected cow is small. And those two factors combined lead to high death loss.

Reduced udder size and lower milk production are common in double-muscled cows. A 1965 study showed that average milk production of double-muscled cows during the first three months of lactation was only about half that of normal cows. At the end of the third month, milk production was less than half of what their calves would have eaten if more milk had been available, while normal and carrier cows still were producing very near the amount their calves would consume. It's not uncommon for double-muscled cows to be essentially dry 90 days into lactation.

Observations of affected bulls are that testes are thin and light in weight, but the bulls usually are fertile. Research indicates that size of testes is correlated to age that a bull's daughters reach puberty, which seems to hold true in this case.

Carrier bulls have normal size testicles, and carrier cows resemble normal cows in reproductive traits and milk production.

#### **Calves Face Problems**

Double-muscled calves face several problems, too. They often appear strong and vigorous at birth but soon become weak and unable to stand and nurse. They tend to have high blood acidity levels, and a buffer can help lower the acidity and increase viability.

But the most serious problem is a large thick tongue that may be partially or completely attached to the bottom of the mouth. In normal newborns, the tongue forms a cup so the teat can be grasped to nurse. But when the tongue is enlarged, this can't be done. While the calf has a strong hunger impulse, he soon becomes tired and weak. The tongue usually regresses in about three months.

Affected calves also appear more sensitive to stress and disease, and they have a higher death rate. Most double-muscled calves are obvious at birth (large hips and shoulders, large muscles delineated by creases, forward tail head attachment, etc.). Occasionally a calf will be genetically double muscled but will appear normal; however, the defect usually becomes obvious within a month after birth. 