

Double Muscling Taboo in Breeding Herds

Muscular hypertrophy of cattle is a condition characterized by extremely heavy muscle development, reduced fat deposition and very thin skin. In the United States cattle with this



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condition are commonly called "double muscled" or "bottle butts." The affected animals are not actually double muscled. They have exactly the same number of muscles as normal cattle but each muscle is proportionately larger.

The English refer to such cattle as "Teeswaters" or "Yorkshires." The French use the term "Coulard" and the Germans speak of them as "Doppellenders."

Regardless of the terminology used to describe double muscling it **cannot** be tolerated in the majority of breeding herds because of negative effects on maternal traits. At least 10 percent of females with the condition never mature sexually and those that do exhibit late puberty low fertility, difficult calving often requiring Caesarean section) and poor milk production.

Likewise, double muscled bulls frequently show below normal scrotal circumference, small testicles and low semen volume and quality.

Carcasses from double

muscled cattle are quite thick with large ribeyes as would be expected. These carcasses are very lean with subcutaneous, seam, kidney and mesenteric fat deposits each considerably less than found in normal cattle. Likewise, marbling is practically devoid with double muscled carcasses never grading higher than USDA Standard regardless of how long the cattle have been fed. These lean, heavily muscled carcasses yield an extremely high percentage of edible portion (high cutability). However, the absence of outside fat allows extremely high shrinkage from evaporation of moisture during processing and shipment. Also, the absence of marbling results in a cooked product that is very dry and lacking in flavor and is rejected by retailers and consumers.

Obviously, the poor reproductive efficiency and low quality carcasses of double muscled cattle make them undesirable for most beef producers. As a result, most breeders have resisted emphasizing muscle in the selection of breeding stock for fear of causing double muscling. This concern is unfounded since the double muscled condition is carried on a single pair of genes. This fact explains why selection for muscle in a herd where the gene does not exist does not present a problem.

Degree of muscling is a highly heritable trait and so selection of the heavier muscled individuals results in more muscle and does not cause double muscling to occur. If the gene is present in the herd, selection for muscle will increase the gene's frequency and the carriers of the gene

can be identified and culled.

Muscle is beef and so it makes no sense for beef producers to select against muscle. There is no need to fear muscle — just avoid the gene for double muscling.

There is considerable disagreement among researchers as to whether the gene for double muscling is dominant or recessive or neither. The phenotypic expression (visual appearance) of the condition is quite variable with affected individuals showing wide differences in muscle development. In attempts to explain this variation geneticists hypothesize incomplete dominance, incomplete penetrance and various gene modifiers. Logic would suggest a simpler explanation.

It's the opinion of the author that double muscling in the bovine is controlled by a single pair of genes. Normal animals for this trait are homozygous for the normal gene and are symbolized as DD. Double muscled individuals are homozygous for the double muscled gene and are symbolized as dd. The heterozygous animal results from crossing a normal individual with a double muscled one and is symbolized as Dd and tends to be intermediate to its parents in muscular development.

The total muscular development of an individual is controlled by a large number of gene pairs — the chromosomal locations of which are unknown. This package of genetic material is unique for each individual and should be considered its genetic base for muscling. When two animals are mated each offspring receives a random one-half each

parents' genetic base. This explains the wide variation in degree of muscling that occurs among cattle.

The degree of genetic potential for muscular development of the normal animals involved determines the increase in muscling when the double muscled gene is introduced.

For example, if the double muscled gene is introduced into a population of thinly muscled dairy cattle, such as Holstein, the increase in muscling is less than if the gene is added to a population of heavily muscled cattle such as Charolais. The percentage increase in muscle is the same but the genetic potential base for muscle development is greater in the Charolais than in the Holstein population. This results in a mom extreme phenotypic expression of double muscling in cattle carrying a genetic base for heavy muscling.

In summary, the degree of expression of the double muscled gene is quite variable which makes accurate diagnosis of the condition difficult, particularly in the case of the heterozygous individual in a light muscled population.

Because of the negative effects of the double muscled gene on reproductive efficiency it must be avoided in commercial breeding females. Likewise, the gene can not be tolerated in the homozygous condition because of negative effects on carcass quality.