

WAT IS MYOSTATIN:

Myostatin gene word in alle soogdiere gevind en beïnvloed die proteïen produksie wat verantwoordelik vir spierontwikkeling is. Natuurlike mutasies binne hierdie gene produseer proteïene binne die spiere wat minder beheer oor spierproduksie uitoefen. Hierdie verminderde beheer lei tot 'n toename in spiermassa.

VARIANTE BY UNISTEL GETOETS:

Variant F94L:

Variant F94L, waarna ook verwys word as 'die profeitgeen', toon 'n hoër frekwensie in die **Limousin** en **Aubrac** rasse; baie van hierdie beeste het selfs twee mutante kopieë van die geen en is dus homosigoties vir F94L. Mutasies in die F94L geen veroorsaak 'n toename in spiervesels. Dit word nie geassosieer met kalwingsprobleme, lae vrugbaarheid of langslendigheid nie. Diere met 2 kopieë van die F94L mutasie toon tot en met 'n 20% toename in primêre snit gewig asook 'n opbrengstoename van tot en met 8%. Die gehalte van die vleis is tipies ook beter met toename in sagtheid, 'n afname in vet en 'n hoër persentasie poli-onversadigde vette. Diere met 1 kopie van die mutasie en 1 kopie van die normale geen vertoon ook hierdie karaktertrekke, maar nie tot dieselfde graad nie.

Variant nt821:

Hierdie variant word deur 'n kleiner persentasie van die populasie gedra. Variant nt821 is algemeen in die **Belgian Blue** en **Parthenaise** rasse, met 'n laer frekwensie in die **Limousin**, **Korthoring** en **Angus** rasse. Diere wat 2 kopieë van die mutasie het sal die karaktertrekke van die mutasie vertoon. Hierdie diere het groter lendediepte, verminderde vetdiepte en 'n groot, geronde kruis en bobene. Diere met 2 kopieë van die nt821 geen het 'n swaarder geboorte gewig wat potensieël kan lei tot kalwingsprobleme. Diere met 1 kopie van die mutasie en 1 kopie van die normale geen vertoon ook hierdie karaktertrekke, maar nie tot dieselfde graad nie. Draers van nt821 sal ook nie kalwingsprobleme ervaar nie.

Variant Q204X:

Variant Q204X word oor die algemeen waargeneem in die **Charolais** ras met 'n laer frekwensie in die **Limousin** ras. Hierdie mutasie word as gedeeltelik dominant gesien. Diere met 2 kopieë van die mutasie sal karaktertrekke soos groter lendediepte, verminder vet en sagter vleis vertoon. Hierdie diere het egter ook die risiko van swaarder geboorte gewig en laer melkproduksie. Diere met 1 kopie van die mutasie en 1 kopie van die normale geen (draers) vertoon ook hierdie karaktertrekke, maar nie tot dieselfde graad nie. Draers van Q204X sal ook nie kalwingsprobleme of verlaagde melkproduksie ervaar nie.

WAT IS DIE VOORDELE VAN MYOSTATIN?

Die aanwesigheid van die Myostatin mutasie lei tot die volgende voordeelige karkaseienskappe:

Vleisopbrengs: Die karkas dooiegewig van dubbelbespierung diere kan tussen 65 – 70% vergroot word weens 'n kombinasie van 'n toename in spiermassa, verminderde liggaamsvet, verminderde beenmassa en kleiner organe. Beeste met die myostatin mutasie kan 'n toename in spiermassa van tot 20% toon. Myostatinmutasie draende diere het ook beter voerdoeltreffendheid omdat hulle 'n groter toename in spiermassa per eenheid energie lewer in vergelyking met nie myostatinmutasie draende diere.

Vleisgehalte: Die vleis van myostatinmutasie draende diere is dikwels van 'n beter gehalte omdat die vleis 'n toename in sagtheid, 'n afname in vetinhoud en 'n groter persentasie poli-onversadigde vette bevat.

Hoekom dit van belang vir produseerders is: Myostatinmutasie draende diere produseer 'n groter porsie van gewenste verminderde vet vleissnitte. Die meerderheid van draers van die F94L mutasie vertoon hierdie gewenste karaktertrekke sonder enige van die nadelige nuwe effekte op geboorte gewig, kalwingsprobleme, vrugbaarheid, langslendigheid of melkproduksie.

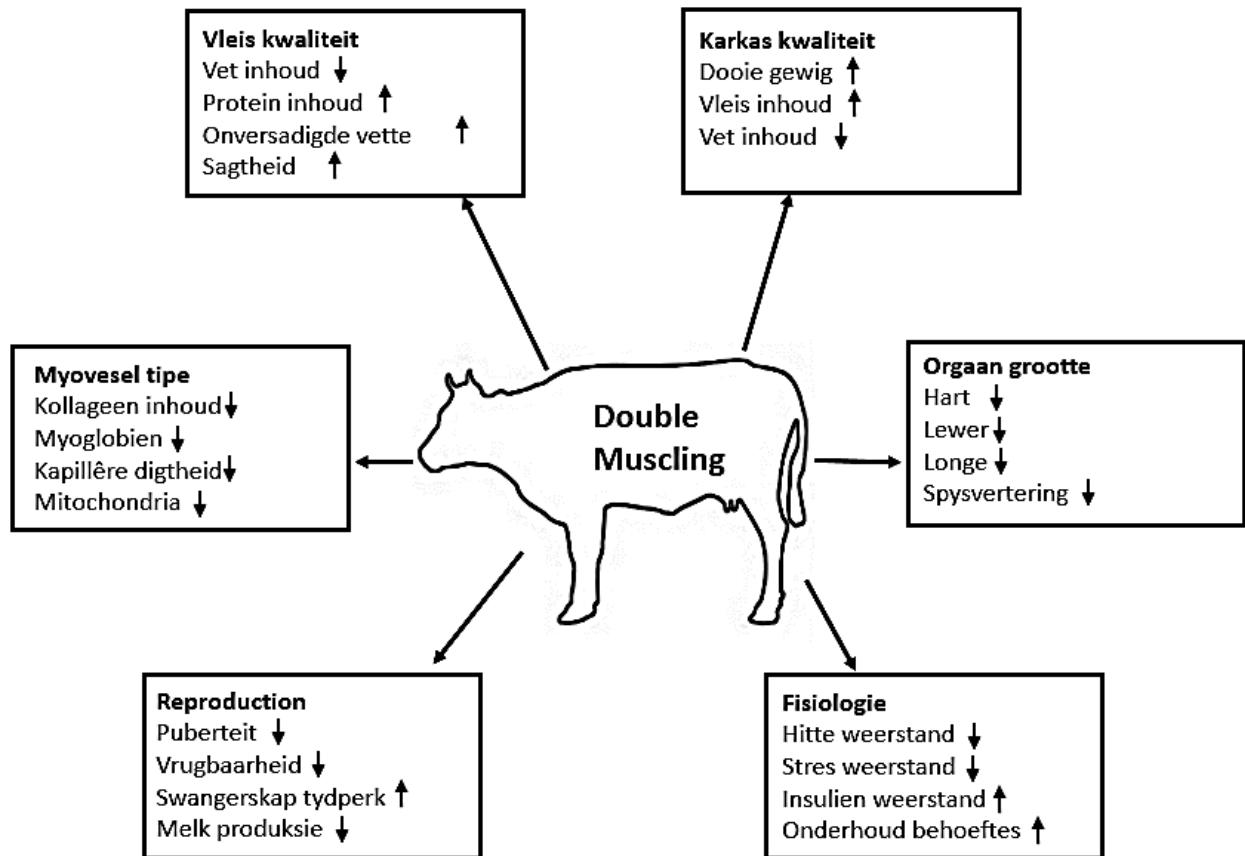
Hoekom dit van belang vir verbruikers is: Die vleis is sagter, bevat minder vet asook 'n hoër poli-onversadigde vet inhoud as nie-myostatinmutasie draende diere en is dus 'n gesonder opsie volgens die huidige voedingsriglyne.

WAT IS DIE NADELE VAN MYOSTATIN MUTASIES?

Bene: As gevolg van die vermindering in beenmassa (weens 'n verhoogte spier tot been ratio), kan diere verswakte bene hê, wat kan lei tot bros bene en beskadiging van die hakke.

Fisiologie: Diere is meer geneig om moegheid te ontwikkel (oefening stress) weens verminderde longkapasiteit (kleiner organe). Diere is ook minder weerstandig teen hittestres (weens verlaagde vlakke van tiroksien) en is meer vatbaar om voedingsstres (weens verminderde vetreserwes) en respiratoriese siektes te ontwikkel. Beeste met die mutasie kan ook 'n vergrootte tong hê wat soog kan bemoeilik.

Reproduksie kwale: Probleme wat kan ontstaan sluit in: vertraging in puberteit, verminderde vrugbaarheid (weens die verlies aan embrio's), langer swangerskappe, verhoogde kans op distosia ontwikkel (verandering in die bekken dimensies), verminderde melkproduksie, toename in kalf sterftes, onderontwikkelde manlike en vroulike geslagsorgane.



DIE PLEK VAN DUBBELBESPIERING IN BEEHVLEISPRODUKSIEPROGRAMME:

‘n Terminale vaar teelprogram word voorgestel. Terminale telings behels twee (verskillende) rasse wat met mekaar gekruisteel word. Die vroulike nageslag van hierdie kruisings word dan met ‘n terminale bul van ‘n derde ras geteel, wat ‘n terminale kruisgeteelde dier oplewer. Dit word voorgestel dat ‘n normale koei met ‘n dubbelbespierung bul geteel word en dat alle nageslag van hierdie paring op ±118 dae geslag word. Vir kommersiele produksie, word dit aanbeveel dat alle koeie wat vir teeldoeleindes gebruik word, skoongehou word van die dubbelbespierung mutasies. Telers moet ook ag neem om nie meer as een tipe dubbelbespierungvariant in dieselfde teeldier te hê nie.

HOE KAN MYOSTATIN INLIGTING GEBRUIK WORD TYDENS DIE AANKOOP VAN ‘N BUL?

Die belangrikste faktor om te onthou is dat karaktertrekke soos karkasmassa-, kalwing- en melkproduksiekaraktertrekke in beeste deur verskeie gene beheer word. Myostatin is slegs een van vele gene en moet daarom nie as enigste voorspeller van die dier se potensiaal geneem word nie. Die dier se Myostatin status is dus addisionele inligting wat in samewerking met verdere inligting soos geskatte teelwaardes (EBVs), stoetprestasie inligting en eie oordeel gebruik moet word om oor ‘n moontlike aankoop ‘n besluit te neem.

WHAT IS MYOSTATIN?

The Myostatin gene is found in all mammals and influences the production of a protein that controls muscle development. Natural mutations of the gene produce proteins that are less effective at controlling muscle development, which results in increased muscle mass. There are nine known mutations of the Myostatin gene in cattle, some of which are breed specific and others which affect more than one breed. There are three main mutations that occur within all **Limousin** populations.

VARIANTS TESTED AT UNISTEL:

Variant F94L:

Variant F94L, sometimes called 'the profit gene' has a high frequency in **Limousin** and **Aubrac** cattle; many have two copies i.e. are homozygous. F94L increases the size of muscle fibres with no associated increase in calving difficulty, lowered fertility or longevity. Homozygous animals (two copies F94L) show increases in primal cut weights by up to 20% and overall Retail Beef Yield by up to 8%, this also leading to better rates of feed conversion. Meat quality is also typically better with higher rates of tenderness, reduced fat and higher proportions of polyunsaturated fats. Heterozygous animals also exhibit these characteristics but not to the same degree.

Variant nt821:

This variant is recessive and is carried by a lower proportion of animals in the breed. Variant nt821 is commonly found in the **Belgian Blue** and **Parthenaise** breeds with lower frequency occurring in the **Limousin**, **Shorthorn** and **Angus** breeds. Animals that are homozygous recessive will exhibit characteristics of the condition, hence larger loin depths, reduced fat depths and large, rounded rump and thighs. However, unlike F94L, homozygous animals (i.e. those with two copies of the gene) may also have slightly heavier birth weights bringing with it the potential for more difficult calving.

Variant Q204X:

This is a 'partially dominant' mutation of the Myostatin gene, and as with nt821, it is carried by a smaller proportion of animals. Variant Q204X is commonly found in the **Charolais** breed and with lower frequency in the **Limousin** breed. Animals that are homozygous (two copies of the Q204X gene) will exhibit characteristics of larger loin depth, reduced fat cover and greater meat tenderness. However, they may also have the potential to exhibit larger birth weight, and if females, slightly reduced milking ability. Animals that are heterozygous with F94L (i.e. F94L/Q204X), also known as 'carriers', will still exhibit quality carcass characteristics but are less likely to be affected by larger birth weights and reduced milking ability.

WHAT ARE THE BENEFITS OF MYOSTATIN?

The presence of Myostatin mutations confers carcass attributes and are as such advantageous for:

Meat Yield: The carcasses of double-muscled cattle dress out at between 65 and 70% due to a combination of increased muscle mass, reduced body fat, reduced bone mass and smaller internal organs. The carcasses can have an increase in muscle mass of up to 20%. When muscle weight gain per unit energy intake is taken into account, double muscled cattle have better feed efficiency than normal cattle.

Meat Quality: Meat from double muscled cattle tends to be of better quality due to a combination of increased tenderness, reduced fat content and a higher proportion of polyunsaturated fats. The colour and juiciness of the meat however, is not always improved.

Significance for Producers: Double-muscled animals produce a higher proportion of desirable cuts of lean meat with greater efficiency than do comparable, conventional cattle. The majority of animals carry the F94L mutation and exhibit all these characteristics without any detrimental effect on birth weight, calving ease, fertility, longevity and milk.

Significance for Consumers: This meat is more tender, and being lean and having a higher polyunsaturated fat content, conforms more closely with current nutritional guidelines than meat from other animals.

WHAT ARE THE DISADVANTAGES OF MYOSTATIN?

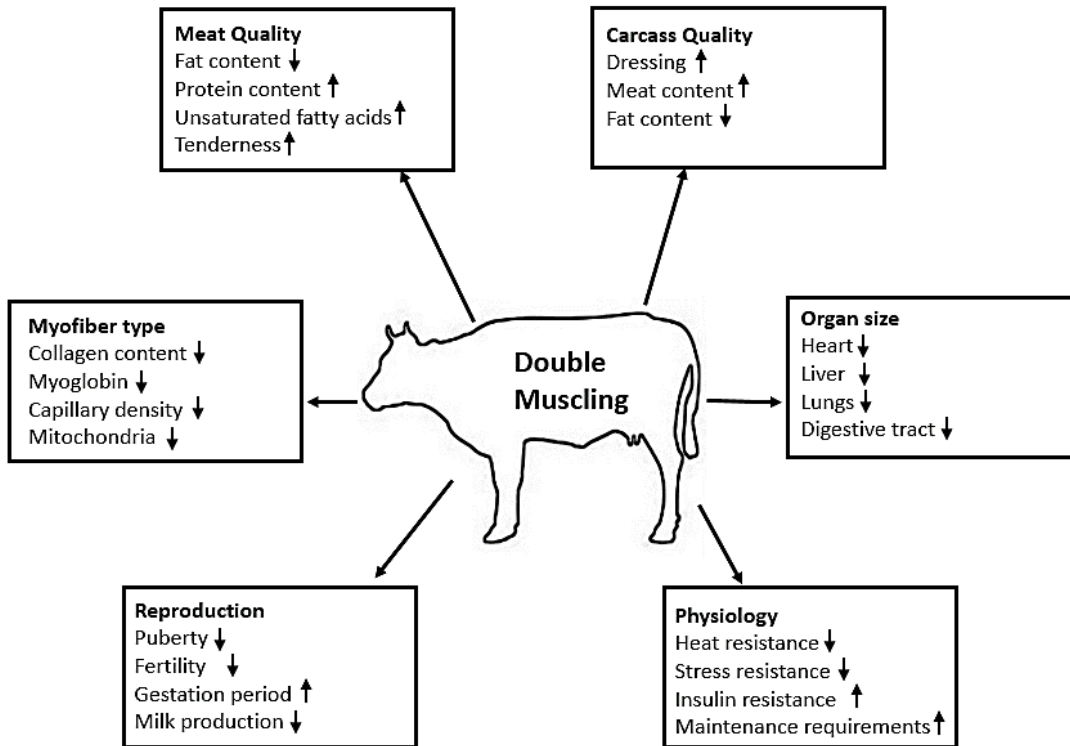
On a population level, because of the high frequency of F94L, there are no significant disadvantages to the presence of these mutations.

Some difficulties may present themselves at individual animal and herd level, however.

Bones: As a result of the reduced bone mass (due to a higher muscle to bone ratio), animals will have weaker bones, often leading to brittle bones and bone damage of the hocks.

Physiology: Animals are more predisposed to fatigue (exercise stress) due to their reduced lung capacity. They are also less tolerant to heat stress (due to lower levels of thyroxin) and are more susceptible to nutritional stress (due to reduced fat reserves) and respiratory disease that may require extra attention for accommodation and welfare. Animals can have enlarged tongues which could make it difficult for the calf to nurse.

Reproductive issues: Problems that may occur include: delays in puberty, reduced fertility (due to higher embryo mortalities), longer gestation period, increased incidence of dystocia (changes of the pelvic dimensions), reduced milk production, increased calf mortality, underdevelopment of male reproductive organs and underdeveloped female reproductive tract.



THE PLACE OF DOUBLE MUSCLING IN BEEF CATTLE PRODUCTION SYSTEM:

A terminal sire breeding system is suggested. Terminal breeding involves two (different) breeds of animal that have been crossbred. The female offspring of that cross is then mated with a male (the terminal male) of a third breed, producing the terminal crossbred animal. It is suggested that normal females are mated to double muscled sires and all progeny from those sires be slaughtered at ± 118 days. For commercial production, it is recommended that the breeding females be kept free from the double muscling genes. Breeders should also beware of having more than one double muscling variant per animal.

HOW SHOULD MYOSTATIN INFORMATION BE USED WHEN BUYING A BULL?

The most important factor to remember is that carcass traits (muscling, fat cover), calving traits and milk traits in cattle are controlled by MANY genes. Myostatin is only one of them and, as such, it is not an absolute predictor of an animal's performance. A Myostatin genotype is a further bit of information that may help your decision, but it should be used in conjunction with wider information such as Estimated Breeding Values (EBVs), which bring together information of actual performance from the animal itself, its herd mates and its relatives to predict genetic merit, and your own judgment on type and pedigree.