MYOSTATIN AND TESTING IN BRITISH SIMMENTAL

Information note to all BSCS members - July 2024

Myostatin is a gene that influences the production of proteins that control muscle development. For many breeders, across the breeds, knowing the myostatin status of animals within herds is important for the choices and options it offers herd management and breeding programmes. For purchasers, and the wider industry, it allows choices to be made based on knowledge and understanding when buying cattle.

In world literature, and across Simmental herdbooks, there has been no extensive testing for myostatin in the Simmental breed that we are aware of to date. This year and through the Irish Cattle Breeding Federation, Simmental animals forward for sale at Irish Simmental Cattle Society sales have been Myostatin tested and with results published in the Irish Society's sale catalogues. This has raised additional awareness of myostatin with UK breeders, and the Society, as there is obviously a connectivity in breeding between the two herdbooks.

In conjunction with Weatherbys, the Society's DNA test providers, a random number of animals have been myostatin tested (with undisclosed names) just to take a first look at frequency within the breed. A number of Simmental breeders have also recently asked to have respective animals tested in their herds. Across this testing, less than 2% of animals tested have been found to have one copy of a myostatin variant, and with none having been found to have two copies.

Please see here some further information regarding myostatin, and please also see the Society Council's recommendations around testing and publication of results at the foot of this note.

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 economic interest, of the myostatin gene in cattle, some of which are breed specific and others which affect more than one breed. In testing of Simmental cattle to date there are three main variants with single copies of Q204X, and F94L being the most common, and with a very small number of single copies of NT821. Please see the notes here on Q204X and F94L with general explanations of these variations across beef breeds:

Variant Q204X

This is a 'partially dominant' mutation of the myostatin gene (please see paragraphs below). 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, in females, slightly reduced milking ability. Animals that are heterozygous (single copies) will still exhibit quality carcase characteristics but are less likely to be affected by larger birth weights and reduced milking ability. The majority of tested Simmentals, who are carriers, have a single copy of Q204X.

Variant F94L

F94L increases the size of muscle fibres with no associated increase in calving difficulty, no lowered fertility, or reduced longevity. Homozygous animals (two copies of F94L) have shown increases in primal cut weights, and overall Retail Beef Yield. Meat quality is also typically better with higher rates of tenderness, reduced fat and higher proportions of polyunsaturated fats. Again, Heterozygous animals (single copies) also exhibit these characteristics but not to the same degree.

Why test for Myostatin?

Put simply, testing for myostatin will increase all Simmental breeders' and buyers' knowledge of the potential performance of the stock they are selecting.

The most important factor to remember is that carcase 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 'exact science' or an absolute predictor of an animal's performance. Visually, animals with noticeable muscle will not necessarily carry myostatin genes, and vice versa.

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 herdmates and its relatives to predict genetic merit, and your own judgment on type and pedigree.

Breeding & Single Trait Genes

Where characteristics are controlled by single pairs of genes, the outcome of particular matings can be predicted once the status of both parents is known. Two main principles apply:

- Dominance: Most single gene traits have dominant and recessive forms of the gene. The combination of these in the pair of genes carried by each animal often determines what the animal looks like. For example, the polled gene in Simmentals is dominant and the horned gene is recessive. If an animal carries two horned genes (represented by pp) it will be horned. If it carries two polled genes (PP) it will be polled. If it carries one of each (Pp) it will be polled because the polled gene is dominant.

- Homo and Heterozygous: Using the example above, animals carrying two polled genes (PP) or two horned genes (pp) are known as homozygous. If the genes are different (Pp) the animal is heterozygous. While we know that all horned animals are homozygous for the horned gene (pp), we cannot tell if a polled animal is homo (PP) or heterozygous (Pp), without testing, since both types appear polled.

Predicting the outcome: Where both parents are homozygous, the outcome of a mating can be predicted with 100% accuracy. Where one or both parents are heterozygous, only the probability of the outcome can be predicted. For example, if a heterozygous polled bull (Pp) is crossed to homozygous horned cows (pp) all we know is that 50% of the progeny will be polled (Pp) and 50% will be horned (pp). Similar principles apply to myostatin.

Costs of myostatin testing

At the time of an animal being routinely DNA'd, **there is an option** for you to ask for it to be myostatin tested at the same time. This increases the costs of the standard DNA test by £5.50, and to a total of £33.00 + VAT.

***IMPORTANT: Myostatin testing from here and publication of results**

Again, as per above, testing for myostatin will increase all Simmental pedigree breeders' and commercial buyers' knowledge of the potential performance of the stock they are selecting and breeding with.

As a first step with this, the Society's Council of Management have put forward the following and which will be applicable immediately:

'Myostatin testing of pedigree Simmental cattle is optional for members of the Society. Where any animals have been tested, through the Society and/or independently, all test results will be shown in the herdbook, on printed certificates, and in all sale catalogues.' Provision for these inclusions have been made with ABRI Breedplan as the IT software providers. We very much hope that this first note is clear, informative, and helpful. If you have any queries then please telephone the Society office on 02476 696513 or email information@britishsimmental.co.uk

Please see the table below with a guide **to the traits that are likely to be evident in homozygous and heterozygous calves:**