BRITISH CHAROLAIS CATTLE SOCIETY

DNA TESTING

WEATHERBYS SCIENTIFIC

WHEN IS DNA TESTING REQUIRED?

CALVES & REGISTRATIONS TO THE HERD BOOK

All ET animals must be fully parentage verified upon registration

All animals with more than one possible sire must be at least sire verified upon registration

All randomly inspected calves must be fully parentage verified upon registration

Any animal subject to a Society inpsection must be at least sire verified

All animals being registered late (over the age of six months) may be subject to an inspection, to include DNA testing and at least sire verification

All imported animals and semen must be DNA tested unless they have a valid SNP DNA profile prior to being entered into the herd book

SOCIETY SALES

All animals entered into a Society sale must be at least sire verified.

All animals' samples must be either already being processed by the lab or have their DNA profile already completed at the time that they are entered into a Society sale

Furthermore, if the DNA profile, parentage verification and myostatin tests are not complete prior to the sale catalogue going to print (usually approximately three weeks before the sale) then the animal will not be permitted to attend

Having a pending sample stored at the Society office, will not count as the sample being processed at the lab, therefore it is the responsibility of the member to check that the animal's sample has been sent to the lab prior to entering the animal into a Society sale

All animals will have its parentage verification status displayed in the sale catalogue as either PV, SV or DV. In addition the parentage verification status will also be displayed on pen cards. This will be displayed in one of the following:

Fully parentage verified

Sire verified

Dam verified

PRIVATELY SOLD ANIMALS

All animals sold privately to pedigree herds must be tested and at least sire verified before they are transferred. This will be at the vendors cost unless, at the discretion of the society, the animal has been purchased from a non member, a membership which has ceased, or prior to this rule bring implemented on 01/03/2020.

PURCHASED BULLS

To further improve the integrity of the herd book, if you purchase a bull, either privately or through a Society sale, from 01/06/2021, in order for him to be transferred into your ownership he must be fully parentage verified wherever possible. If he has only been sire verified the society will cover the cost of DNA testing his dam and then verifying his pedigree.

SIRES & DAMS

All animals (if not already tested) will be tested and at least sire verified upon the registration of their first calf

TESTING REQIUREMENTS

All animals which are SNP DNA tested, will also be tested for the two Myostatin variants found within the breed: Q204X & F94L. If an animal is registered as polled, it will also be poll tested as standard when testing takes place.

DNA TESTING PRICES

Test Type	Costs	
	Pending Sample	Full Price
SNP Parentage & Myostatin	£27.00 + VAT	£32.00 + VAT
SNP Parentage, Myostatin & Polled	£29.00 + VAT	£34.00 + VAT
Additional Sires & Dams	£4.00 + VAT	
Sire Search	£9.00 + VAT	
Profile Certificate	£3.50 + VAT	
Imported Animal Profile	£3.50 + VAT	
Progressive Ataxia	£20.00 + VAT	

WHAT IS A PENDING SAMPLE?

If you have submitted a pending sample to the office before the calf reaches 10 months of age for us to hold, the price you pay for the DNA test when it is conducted at a later date will be discounted.

Anyone wishing to DNA type their whole herd in order to learn their myostatin status' can request sample bags from the Society. These tests will also be charged at the reduced pending sample rate.

WHY AM I BEING CHARGED FOR ADDITIONAL SIRE & DAM TESTS AND SIRE SEARCHES?

When we first send your sample for DNA testing we can submit up to three parents in total at this stage without incurring any extra charges. This may be the dam and two possible sires or three possible sires.

If there are more than three parents to test the additional fee will apply for each further sire or dam.

Any parents submitted at a later date, for example if there is a parentage exclusion, will be subject to the additional parentage charge.
In cases of sire exclusions, it may be necessary to conduct a sire search to determine the sire - this can only be done if the dam has been DNA tested.

WHAT ARE PROFILE CERTFICATES & IMPORTED ANIMAL PROFILES?

Profile certificates are sometimes required for BCMS or the ministry in the case of late registrations with them or if there is a dispute. They are also requested if an animal is exported or semen is being taken.

We request an imported animal profile when you import an animal which already has a SNP profile. **Additional import requirements can be found in the imports checklist document**

WHAT IS POLLED TESTING?

There are two types of polled gene – polledness from Celtic origin and polledness from Friesian origin and each of these traits are reported separately.

As with myostatin each animal has up to two copies of each gene and therefore, they are either non carriers (have no copies and are not polled), heterozygous polled (have one copy) or homozygous polled (have two copies) of each or either type. This means that a tested animal may be heterozygous polled for each type of polledness, but this does not make them homozygous polled.

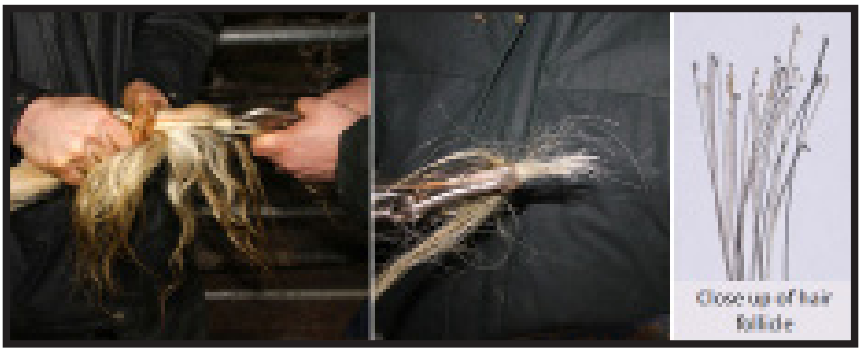
The results for poll testing are reported as follows:

Result	Description	Translation
Pc/Pc	Homozygous polled	two copies of the Celtic origin poll gene
Pf/Pf	Homozygous polled	two copies of the Friesian origin poll gene
N/Pc	Heterozygous polled	one copy of the Celtic origin poll gene
N/Pf	Heterozygous polled	one copy of the Friesian origin poll gene
N/N	Non-Carrier	Horned

HAIR SAMPLING FOR DNA TESTING

Please make sure that when taking hair samples, you pull them according to the Society instructions as we can no longer accept coat hair samples, and samples with no follicles do not contain suitable DNA.

Tail hair root follicles are an excellent source of DNA for genomic and routine parentage testing. However, the performance of samples processed and the reliability of the genomic results are dependent upon sample quality.



Pull at least 60 hairs from the tail switch – we no longer accept samples of coat hair. DO NOT CUT the hair - if the sample is missing the follicle (root), it will not contain DNA. If you don't have enough hairs, there will not be enough DNA for genotyping.

Gather at least 60 hairs, and grasp them tightly as close to the skin as possible with hands or pliers. As an animal gets older, the hair roots become harder to remove, so the use of pliers often aids removal.

Pull the hair slowly and firmly away from the tail, making sure to get the roots.

Do not collect shed hair for sampling, as the follicles will carry degraded DNA.

Ensure the hair is completely dry, and as clean as possible, otherwise the DNA will degrade before extraction.

When more than one animal is sampled, take extreme care to avoid cross contamination of hair roots between animals. Only put the hair from one animal in each sample bag.

Be sure there's no substance on the sample, such as sprays, detergents or other cleaning agents.

Only take hair samples from live animals.

Examples of poor hair samples which have failed to produce a result – insufficient hair and coat hair

Quality samples are the key to getting good DNA from your cattle – plenty of tail hair with strong follicles

Please ensure that the DNA sampling bag is labelled with the correct animal details or, if we have not provided the pre-labelled bag, please write the animal's name and full UK tag number on the bag with permanent marker.

Once you have placed the hair in the bag, seal it tightly ready for return.

Avoid prolonged exposure to direct sunlight.

SEMEN SAMPLE INSTRUCTIONS

If you wish to send a semen sample for testing, please contact the Society for a semen testing pack. Samples sent directly to the office will no longer be accepted.

TAG SAMPLE INSTRUCTIONS

1. Check that vial is properly sealed, do not break the seal, if the liquid leaks out in transport the tissue contained inside will not be suitable for testing;
2. While you are still in possession of the samples prior to sending them to the Society, please make sure that you keep them cool, store them at room temperature or in a refrigerator (below 24C, but do not freeze them);
3. Send samples to us at the Society ASAP for testing to the laboratory using the padded addressed envelope that has been provided by your tag sample provider;
4. They must be received by the Society within seven days of the sample being taken, overdue samples cannot be tested.

Keep all samples out of direct sunlight and send your samples to:
The British Charolais Cattle Society, Avenue M, Stoneleigh Park, Kenilworth, Warwickshire, CV8 2RG.

TIMESCALES FOR TESTS

We send batches of samples on from the office to via courier to Weatherbys on Mondays, so that they reach the lab on Tuesday's, they then start the process.

HOW THE PROCESS WORKS AT WEATHERBYS

0 days
Your sample is received at the Society office, we send samples to the lab in batches, once a week on Mondays

→

1 week
Samples are received at the lab and start the process on Tuesdays

↓

3 weeks
It takes up to 10 working days to create the SNP profile

→

4 weeks
It takes up to an additional five working days to read the myostatin and polled results and at the same time the parentage verification is checked

↓

4 weeks
Information on the profiles are reported to the Society, if the profile, parentage and myostatin is verified, we will update the database then write and inform you of the result

OR

4 weeks
If samples don't produce a suitable profile, we will write to you to request a new sample and once we receive it the process will begin again

↓

7 weeks
If there is a parentage exclusion it takes an additional 10 working days to rerun the sample to confirm the result, and for the lab to let us know. We will then contact you for information about other possible sires and dams. Once you inform us of other possibilities, we check to see if they are SNP profiled, if yes, we request that the lab check to see if they qualify

↓

9 weeks
If the new possible parents are not SNP tested, the progeny animal will need to be re-tested on MS so that it can be compared to the parents profile, this takes an additional 10 working days

BRITISH CHAROLAIS MYOSTATIN VARIANTS

WHAT IS MYOSTATIN?

Myostatin is a gene that influences the production of proteins which control muscle development. When an animal is identified as having one of the mutations it means that they have inactive genes which changes the dynamics of muscle growth, this can result in increased muscle mass. Currently in cattle, there are 19 known mutations of the gene and after extensive testing for the nine most common varients, we have concluded that the British Charolais cattle population only contains two - F94L & Q204X

WHY ARE WE TESTING FOR MYOSTATIN?

Knowing the myostatin status of your animals will help you to select bulls with the most appropriate myostatin traits for your breeding programme. This will lead to better calving ease and help with the ever-present trend to improve carcase conformation and quality. However, it is just one tool which should be used in conjunction with the wider information available such as Estimated Breeding Values (EBV's) – which predict the performance of the animal based on its back pedigree, accurate measurements and the performance of its herd mates – and your own judgement on type and pedigree.

HOW ARE THESE GENES INHERITED?

All reproducing species have two copies of each gene – called alleles. If your Charolais has one copy of the myostatin variant (one allele) it is classed as heterozygous, if it has two copies (two allele) it is classed as homozygous.

2 Homozygous Parents	→	100% chance of Homozygous offspring
1 Homozygous Parent 1 Heterozygous Parent	→	50% chance of Homozygous offspring 50% chance of Heterozygous offspring
1 Homozygous Parent 1 Non-carrier Parent	→	100% chance of Heterozygous offspring
2 Heterozygous Parents	→	25% chance of Homozygous offspring 50% chance of Heterozygous offspring 25% chance of non-carrying offspring
1 Heterozygous Parent 1 Non-carrier Parent	→	50% chance of Heterozygous offspring 50% chance of non-carrying offspring
2 Non-carrier Parents	→	100% chance of non-carrying offspring

BRITISH CHAROLAIS MYOSTATIN VARIANTS

F94L

Research conducted by Adelaide University in Australia concluded that the effect of the F94L mutation on birth and growth traits was not significant but was associated with an increase in meat weight and a reduction in fat depth. The results for the average effect of substituting a single copy of the variant F94L variant indicated an increase in silverside between 5.8 and 7.2% and meat weight of between 5.9 and 7.3%. There was also a reduction in P8 fat depth, intramuscular fat and carcass fat weight.

Calves used for this study, carrying 2 copies of the variant F94L marker, produced carcasses with approximately 12 to 15% more meat and 16 to 33% less fat compared with calves with no copies of the variant F94L allele, while single carriers produced approximately 3% more meat weight, while fat depth measured on live calves was 9.8% lower. Therefore, the F94L variant appears to have many positive effects without correlated negative effects of some other myostatin variants.[1]

1 *A. K. Esmailizadeh, C. D. K. Bottema, G. S. Sellick, A. P. Verbyla, C. A. Morris, N. G. Cullen, W. S. Pitchford; Effects of the myostatin F94L substitution on beef traits, Journal of Animal Science, Volume 86, Issue 5, 1 May 2008, Pages 1038–1046, available at: https://doi.org/10.2527/jas.2007-0589*

Q204X

In a study published in the Oxford University Press Journal of Science on the effects of the Q204X gene in Charolais cattle, it was shown that the Q204X mutation leads to an increase in muscle mass. This creates a dramatic increase in saleable meat yield because of the improved dressing percentage, reduced carcass fatness, and fineness of the limb bones. In this study, animals with a single copy of a mutated allele were slightly heavier at birth, as a consequence of this calving difficulties also increased in heifers, but they found no effect with cows.

These animals showed consistently greater carcass yields, the thighs were thicker and the rib eye areas were larger. They were also markedly leaner, with less internal fat and less fat on the 6th rib. Therefore, the presence of even one copy of Q204X was shown to increase the beef value of these animals drastically. Regarding meat quality, trained taste panellists indicated that the meat of young heterozygous bulls was more tender. This better tenderness can be a consequence of a reduced collagen content and a smaller mean area of the muscle fibre section because both characteristics have been shown to be related to muscle tenderness.[2]

2 *S. Allais, H. Levéziel, N. Payet-Duprat, J. F. Hocquette, J. Lepetit, S. Rousset, C. Denoyelle, C. Bernard-Capel, L. Journaux, A. Bonnot, G. Renand; The two mutations, Q204X and nt821, of the myostatin gene affect carcass and meat quality in young heterozygous bulls of French beef breeds, Journal of Animal Science, Volume 88, Issue 2, 1 February 2010, Pages 446–454, available at: https://doi.org/10.2527/jas.2009-2385*

Below is a quick guide to the traits that are likely to be evident in homozygous and heterozygous calves born compared to calves with no myostatin:

	Increased Beef Yield %	Increased High Value Meat Area	Reduced Carcase Fat	Reduced Subcutaneous Fat Depth	Reduced Intramuscular Fat Depth	Increased Meat Tenderness	Increased Muscle Mass	Reduced Fertility in Females	Reduced Calf Viability	Reduced Calving Ease	Increased Birth Weight	Reduced Stress Tolerance
1 x F94L (Heterozygous)												
2 x F94L (Homozygous)												
1 x Q204X (Heterozygous)												
2 x Q204X (Homozygous)												
Key	Less → More											

BRITISH CHAROLAIS PROGRESSIVE ATAXIA

WHAT IS PROGRESSIVE ATAXIA?

Progressive ataxia (PA) is a neurodegenerative disease which is caused by a substitution of the KIF1C gene.[3]

Symptoms are only observed where there are two substituted copies of the gene as it is an autosomal recessive disease.[3]

The symptoms for double carriers present themselves as unsteady gait and stiff hind limbs, with a gradual worsening of the symptoms ultimately resulting in inability to stand and the animal permanently lying down, irregular urination and incontinence particularly in females can also be observed. There is currently no treatment for PA, so affected animals are euthanised.[3]

The first indications of the disease typically appear around 18–24 months, but it can present as early as 6 months of age or as late as 5 years old. It is important to note that there are various other neurodegenerative diseases that may present similar symptoms but ultimately not be progressive ataxia.[3]

WHO SHOULD CONSIDER TESTING FOR PROGRESSIVE ATAXIA?

Charolais crossed cattle remain unaffected regardless of an animal's PA status, unless the cattle being crossed with the Charolais Bull is more than ¾ Charolais, which is not common practice in the commercial industry.

Pedigree animals have a potential to be affected, but society tested samples as of 27.03.2023 indicate that <1% of the tested pedigree British Charolais population are double carriers, this correlates strongly with the French pedigree Charolais data which indicates 1-1.1%[3] where they have been testing for many years and have a much larger population.

Knowing the breeding status of your breeding females allows you to make sensible mating choices when choosing a new sire. The dynamics are very much the same as where mating is selected for myostatin trait Q204X, whereby the pedigree breeder wishes to avoid having more than one parent being a carrier or double carrier, eliminating their chances of affected progeny.

BRITISH CHAROLAIS PROGRESSIVE ATAXIA

WHO SHOULD CONSIDER TESTING FOR PROGRESSIVE ATAXIA?

CONTINUED...

Studies suggest that not only are the heterozygous animals not affected by the disease due to its recessive nature, but they are associated with better muscular development[3] and explains why it may have been inadvertently selected through many generations. This is very similar to the analogy of the Q204X Myostatin gene where the heterozygous state leads to benefits without the drawbacks.

It is recommended that Charolais Bulls being exported or having their semen collected for future sale are tested early on in the process as key pedigree markets require the status to be known.

HOW ARE THESE GENES INHERITED?

All reproducing species have two copies of each gene – called alleles. If your Charolais has one copy of the mutated progressive ataxia gene (one allele) it is classed as heterozygous, if it has two copies (two allele) it is classed as homozygous.

2 Homozygous Parents	→	**100% chance of Homozygous offspring**
1 Homozygous Parent 1 Heterozygous Parent	→	**50% chance of Homozygous offspring 50% chance of Heterozygous offspring**
1 Homozygous Parent 1 Non-carrier Parent	→	**100% chance of Heterozygous offspring**
2 Heterozygous Parents	→	**25% chance of Homozygous offspring 50% chance of Heterozygous offspring 25% chance of non-carrying offspring**
1 Heterozygous Parent 1 Non-carrier Parent	→	**50% chance of Heterozygous offspring 50% chance of non-carrying offspring**
2 Non-carrier Parents	→	**100% chance of non-carrying offspring**

BRITISH CHAROLAIS PROGRESSIVE ATAXIA

ADVANTAGES OF A HETEROZYGOUS ANIMAL

Studies show two main advantages:

Increased muscular development between 7 -30 months.[3]
Increased weight between 7 – 24 months.[3]

HOW ARE RESULTS REPORTED?

Results are normally reported as:

Non Carrier (Free) = 0 Copies
No copies, animal is not affected.

Carrier = 1 Copy
One copy, animal is a carrier and exhibits no symptoms.

Affected = 2 Copies
Two copies, animal is affected and will exibit symptoms which progressively deteriote in its lifetime.

3.Progressive ataxia of Charolais cattle highlights a role of KIF1C in sustainable myelination
Amandine Duchesne ,Anne Vaiman,Magali Frah,Sandrine Floriot,Sabrina Legoueix-Rodriguez,Anne Desmazières,Sébastien Fritz,Christian Beauvallet,Olivier Albaric,Eric Venot,Maud Bertaud,Romain Saintilan,Raphaël Guatteo,Diane Esquerré,Julien Branchu,Anaïs Fleming,Alexis Brice,Frédéric Darios,Jean-Luc Vilotte,Giovanni Stevanin,Didier Boichard,Khalid Hamid El Hachimi
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