The Beef Shorthorn Cattle Society DNA Testing Guide

in association with

WEATHERBYS SCIENTIFIC

Eartag sampling for genomic and routine parentage testing

Once you have taken the eartag sample, please follow the guidelines below for your particular tag type:

Tag Type	Procedure
Dry Desiccant Tags	Keep in the fridge until you post to the Society. Must be sent first class in a padded envelope within three weeks of collection.
Gel Suspension Tags	Store between 15-24 c in a dark cupboard until you post to the Society. Send to the Society in a padded envelope within 5 ½ months of collection.
Liquid Suspension Tags	Store between 15-24 c in a dark cupboard until you post to the Society. Send to the Society in a padded envelope within one week of collection.

Semen sampling for genomic and routine parentage testing

If sending semen samples, thaw and place one straw in the packet provided. Then seal and send immediately to the Society.

Please so not send used straws, only full un-used straws of semen are suitable for testing, due to the amount semen needed for DNA extraction and risk of cross contamination.

Please send each sample in a separate bag to avoid cross contamination of samples.

Hair sampling for genomic and routine parentage testing

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 – please do not include 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.

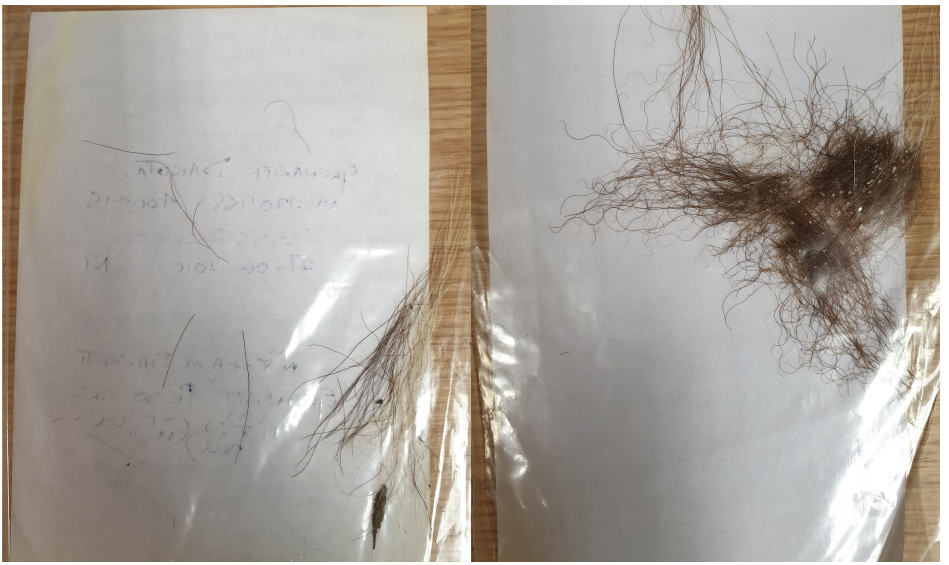
Be sure there's no substance on the sample, such as sprays, detergents or other cleaning agents.

Only take hair samples from live animals.

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.



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

Send your samples to:
The Beef Shorthorn Cattle Society, Society Pavilion, Avenue M, Stoneleigh Park, Kenilworth, Warwickshire, CV8 2RG.

Myostatin

This test is a registration requirement for all imported animals and embryo registration calves, regardless of gender and all bull calves.

The double muscle condition in cattle arises from a genetic abnormality in the production of 'myostatin', which is a protein that acts on muscle cells' autocrine function to inhibit myogenesis: muscle cell growth and differentiation. It is encoded by the MSTN gene. An animal with the defective gene lacks the myostatin protein and hence muscle growth is unregulated.

The most obvious departure from normal in the phenotype of a double muscled animal is the enlargement of musculature, particularly in the rump and shoulder areas. There are however other traits which may or may not be significant, more particularly where the syndrome is fully expressed:

- Prominent creases between muscle groups
- Minimal fat cover and modified fat composition
- Shorter, thinner and less dense bones
- Delays in puberty, reduced fertility and reduced milk production
- Increased likelihood of dystocia
- Enlarged tongues in new born calves
- Poorly developed genitals
- Increased susceptibility to respiratory disease probably due to increased demands on aerobic metabolic activity
- Increased meat tenderness and yield

There are nine known variants of the myostatin mutation, four of which are known to have occurred in the Beef Shorthorn:

- E226X The most common variant found in the Shorthorn and the Maine Anjou.
- nt419 sometimes found in Shorthorns and occurs in the Maine Anjou
- nt821 Occurs in the Belgian Blue, Blonde, Limousin and South Devon and the Angus. Occasionally occurs in the Beef Shorthorn
- F94L Common in Limousins and occasionally in the Shorthorn
- C313Y E291X Q204X D182N S105C. Unrecorded in the Beef Shorthorn

Test results are presented as having no copy present (0), one copy (1) or two copies (2).

The results of crossing between sires and dams, who do, and do not, have a mutation can be grouped as follows:

0 x 1	→	**50% no copy 50% one copy**
1 x 1	→	**25% no copy 50% one copy 25% two copies**
0 x 2	→	**100% have one copy**
1 x 2	→	**50% have one copy 50% have two copies**
2 x 2	→	**100% have two copies**

On the basis of current knowledge, the Beef Shorthorn Cattle Society recommends:

- that breeders continue to select for 'balanced' cattle that exhibit traits that the breed has historically been known for, and is increasingly sought after for, using traditional and modern techniques.

In addition, breeders and their customers should be aware of the implications of using bulls or cows that carry the mutation. Breeders may wish to consider testing as many bulls or cows that they suspect may carry the mutation (single or double copy). They may also wish to check the status of any animal they buy. If no test result is available, then checking the pedigree may determine if there is a possibility of a variant being passed on. If a breeder feels they can manage the potential downsides of retaining a myostatin positive (single or double copy) female, we would encourage the use of a myostatin free bull and that the progeny be tested.

At present the regulations for all bull calves registered with the Society require that a hair sample is submitted for sire verification and myostatin testing. The myostatin test is carried out at the Society's cost and the results will be published on the database.

All stock sires of calves registered since 1st January 2018 will be tested for myostatin at the Society's cost. If insufficient DNA is available from a previously submitted hair sample breeders will be requested to resubmit samples.

In light of the genotype monitoring undertaken on the Society's behalf, the Directors of the Beef Shorthorn Cattle Society have issued the following directive:

- **As of 1st January 2020, all bulls, of any age, entered for sale at a Society sale must have their myostatin status listed in the catalogue.**

- **As of 1st January 2021, any bull carrying a double deletion of any myostatin variant, or single deletions of two distinct variants, will be ineligible for a Society recognised show class or a Society recognised or supported sale.**

- **As of 1st January 2021, any bull carrying a double deletion of any myostatin variant, or single deletions of two distinct variants, will be ineligible for registration in Coates herd book.**

- **These regulations will be kept under review.**

All cattle imported into the UK Herd Book and any progeny resulting from embryo transfer will also be myostatin tested as part of the registration process.

It should be noted that the Society is required by law to make all genetic testing information freely available. The Society is obliged therefore to publish the results on the ABRI database and to include new information as it becomes available. This applies whether testing is carried out by the Society or by an individual breeder.

DNA Sample Bags

Below is an example of a Society DNA bag. Please make sure to fill in all of the details, espcially multiple sire information.

BEEF SHORTHORN CATTLE SOCIETY DNA SUBMISSION FORM

BULL/COW/ET COW/CALF/ET CALF Sample
This packet contains hair (with root Follicles) from:

ANIMAL DETAILS

Name: ..... HB No: .....
Tag/National ID: ..... Type: Single/Twin
Date of Birth: ..... Sex: .....
Dam: ..... Tag No: .....
Sire: ..... Tag No: .....
Sire: ..... Tag No: .....
Sire: ..... Tag No: .....

I confirm that the enclosed hair/tissue sample came from the above animal. I also confirm that by submitting this sample to the Beef Shorthorn Cattle Society, I agree for a SNP profile to be created which will be used for the purposes of parentage analysis, to determine if required the myostatin status and the TH status and if specified below to determine the polled status. I agree that this sample or the resulting SNP profile, may be used by the Beef Shorthorn Cattle Society to conduct further tests in the future and that the data may used by other Beef Shorthorn societies and agencies.

Name of owner: .....
Address: .....
Owner's Signature: .....

Please place this packet in an envelope and send to:
Beef Shorthorn Cattle Society, Society Pavilion, Avenue M, Stoneleigh Park, CV8 2RG

Tests required (please tick as appropriate):

SNP Profile ☑ Myostatin ☐ TH ☐ Polled ☐

Sire Analysis ☐ Dam Analysis ☐ Parentage Analysis ☐

Before you send your sample check which tests are required

The Society requires some compulsory DNA tests to be carried out on certain types of animals, however you may wish to request non-compulsory tests for other animals.

The table below sets out the compulsory and optional tests for each type of animal and the table on the next page sets out the prices of each test.

DNA Testing Check List

	Imported Animals	*Imported ET Animals*	*Embryo Transfer Registrations*	*Bull Calves*	*Females with Parentage Queries*	*Females wanting Myostatin Only*
SNP Profile	■	■	■	■	■	■
Myostatin	■	■	■	■		■
TH	■	■				
Polled						
Sire Verification	■			■	■	
Parentage Verification		■	■			

Key: ■ Compulsory Test □ Optional Test

Beef Shorthorn Cattle Society DNA Tests

For pricing please refer to the Society website

SNP Profile

TH Trait Anaylsis - Society rules regarding TH can be found on the Society website

Myostatin

Polled Trait Analysis

Parentage Verification for up to three parents.
If you are not sure of the parent of any animal, it must be verified.

Additional Parents - Three parents are included in the cost of parentage verification as long as they are stated when you submit the animal. This fee will be charged per additional parent if there are more than three possible parents, or for any additional parents notified after submission.

External Profile transfer fee (to transfer DNA profiles which have been created at other laboratories, for example for animals purchased from abroad)

The Beef Shorthorn Cattle Society

Address for registrations, transfers and DNA only:
Society Pavilion, Avenue M, Stoneleigh Park,
Kenilworth, Warwickshire, CV8 2RG
Charity Number: SC010218
Tel: 02477 103406
Email: registrations@beefshorthorn.org
Web: www.beefshorthorn.org

Version 1
October 2019