AUSTRALIAN HIGHLAND CATTLE SOCIETY

A COMPREHENSIVE GUIDE TO GENETIC DEFECTS & REQUIREMENTS FOR HIGHLAND ANIMAL REGISTRATIONS

EFFECTIVE FROM AUGUST 2024

WWW.AUSTRALIANHIGHLANDCATTLE.ORG

Genetic Defects

INTRODUCTION

To preserve heritage and integrity of the Highland breed, the Society has introduced restrictions on registrations of animals that have a genetic defect adversely affecting an animal's phenotype, physiology or function that is:

- caused by DNA abnormalities;
- proven to be present in the Highland breed; and
- can be conclusively DNA tested for.

The following genetic conditions are now recognised by the Society:

- Chondrodysplasia (congenital dwarfism) - BD1, BD2
- Myostatin Mutation (double muscling gene) - nt821
- Crop Ear
- Hypotrichosis (Rats Tail Syndrome)

The action taken by the Society on these genetic conditions and the limitation on registrations are clearly documented in the AHCS Regulations, Item 9. Genetic Defects. The Regulations were adopted at the Annual General Meeting of the AHCS on 25 May 2024 and are effective as of 25 August 2024.

This handbook is designed to provide members with information that supports the Regulations, to give understanding to requirements for animal registration and the testing and recording of genetic defects within the Highland breed.

Members are encouraged to consider this information as complementary guidance to the Regulations effective as at 25 May 2024. The AHCS Regulations prevail in all circumstances.

The information included herein has been prepared by the Australian Highland Cattle Society in accordance with the AHCS Regulations effective as at 25 May 2024.

Members requiring assistance with the definition of each genetic condition or the requirements for registration and testing are encouraged to contact their State Representative, a Councillor or the AHCS Office for support.

DEFINITIONS

Carrier: An animal heterozygous for a recessive gene. There is no visible way of telling that one copy of the gene is present, because you need two copies to have a phenotype. These animals can pass the mutation to their offspring.

Free by Inheritance Status: means an animal proven to be free of a known genetic defect by being positively parentage verified to proven non-carrier parents of the same condition. Evidence of the non-carrier status of the parent animals must be provided by either DNA testing or extended 'free by inheritance status'. There shall be no generational limit to the 'free by inheritance status'.

Genetic Defect: A heritable trait that adversely affects an animal's phenotype, physiology or function and is caused by DNA abnormalities, proven to be present in the Highland breed and has been deemed undesirable by the Society.

Genotype: The complete set of genetic material of an organism in their unique sequence of DNA. Also used to refer to the alleles or variants an animal has inherited from each of their parents for a particular gene. An animal can be heterozygous or homozygous for a particular gene. Note, an animal can be heterozygous for one gene (eg: coat colour), and homozygous for another gene (eg: eye colour).

Heterozygous: Each offspring inherits two copies of each chromosome at fertilisation. One copy is from the father and one from the mother. Each chromosome holds one copy of every gene required for life. When the copies inherited from the mother and father are different for a particular gene the animal is known as 'heterozygous'.

Homozygous: When an offspring inherits two matching copies of a particular gene.

Mutation: A 'misread' made in the normal DNA sequence when DNA is copied before cells divide. If it happens in a critical section of the sequence, a mutation can lead to a change or loss of function of a gene. When this happens in gametes (egg and sperm cells), this becomes an inherited trait or condition.

Partially dominant mutation: A type of genetic mutation that results in a specific trait or characteristic being expressed in an individual, even if only one copy of the mutated gene is present. Partial or incomplete dominance concerns the production of heterozygotes that possess intermediate traits between the two homozygous traits. These heterozygous organisms have phenotypes that are a blend of the phenotypes of their homozygous traits. The trait developed is neither dominant nor recessive. Eg: Chondrodysplasia BD1, BD2 (congenital dwarfism) and Crop Ear.

Phenotype: The physical expression of a genotype – what you can "see".

Recessive mutation: A type of genetic mutation that occurs in a gene and results in a specific trait or characteristic where the expression is suppressed, or not expressed. The recessive trait may be expressed when the recessive genes are in homozygous condition or where a dominant gene is not present. Recessive alleles are often represented by lowercase letters. Eg: Myostatin mutation nt821 (double muscling).

CHONDRODYSPLASIA

(congenital dwarfism)

KEY POINTS

Refer AHCS Regulations: Item 9.1

Animals must be free of Chondrodysplasia to be eligible for registration.

Members must declare the animal's status in relation to Chondrodysplasia upon registration.

Testing is only required for animals exhibiting the phenotype and suspected of carrying the BD1 or BD2 gene.

Animals that test positive to Chondrodysplasia (one or more copies of the BD1 or BD2 gene) are ineligible for registration into the AHCS Herdbook.

CHONDRODYSPLASIA

Chondrodysplasia is a **partially dominant mutation** which is expressed to some degree in any animal that carries one copy of the mutant gene (carrier or heterozygous) and has a lethal impact in affected (homozygous) animals.

Chondrodysplasia is a genetic condition affecting the growth plates. The Bulldog Dwarfism (BD) mutations have been identified in Highlands, likely introduced by early crossbreeding with Dexter cattle. BD has a severe **phenotype**; animals have disproportionately short legs and overall stature defect.

As the BD mutation is **partially dominant**, out-crossing Chondrodysplasia mutant animals to normal stock will still result in heterozygous Chondrodysplasia mutant offspring with a phenotype.

The prevalence of the condition in Highland Cattle in Australia is unknown but suspected to be low in number.

A DNA test is available for Chondrodysplasia, both BD1 and BD2.

WHAT DOES IT LOOK LIKE?

Chondrodysplasia has a severe phenotype.

Animals are abnormally small size.

Any breeder would be able to identify animals by their disproportionately short legs and overall stature defect.

A Dexter bull exhibiting the BD phenotype.
Image Source: Shutterstock

Genetic Defects

CHONDRODYSPLASIA

INHERITANCE

Chondrodysplasia (BD) is a partially dominant mutation, meaning heterozygous animals will display a phenotype. For BD, when two animals both carrying the BD defective (mutant) gene are crossed, there is a 25% chance that the offspring could inherit both copies (be homozygous for the BD mutation) and will be non-viable.

The genetic probably of inheritance is further explained in the illustration to the right.

DNA TESTING FOR CHONDRODYSPLASIA

It is not a requirement for members to DNA test for Chondrodysplasia but testing is available in Australia for the BD1 and BD2 gene.

If a member has any doubt that their animals carry the gene, they are encouraged to undertake a DNA test.

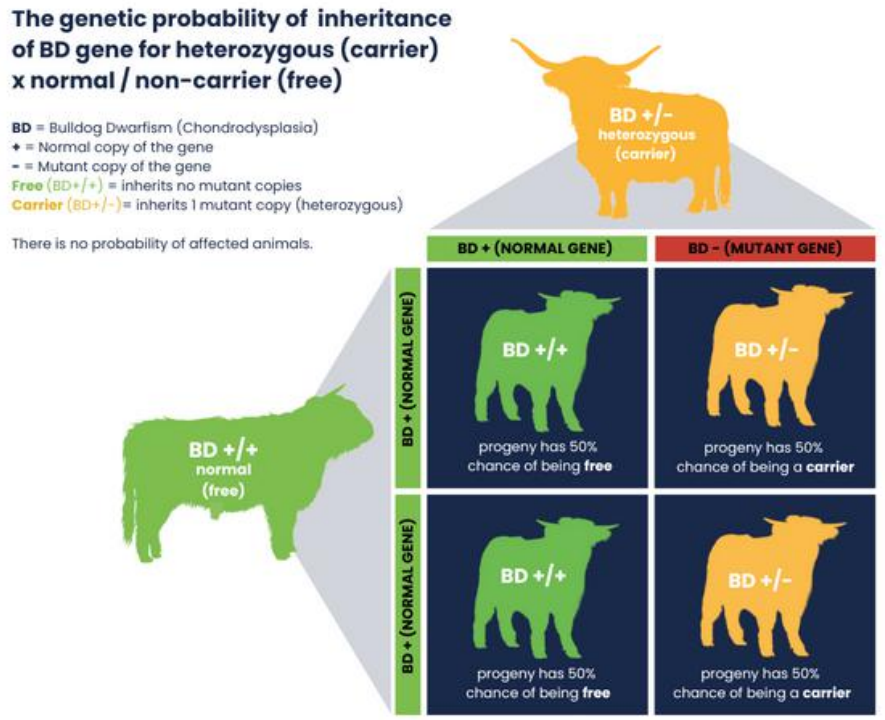
If Council suspects an animal may carry the gene, a DNA test will be required to provide conclusive evidence.

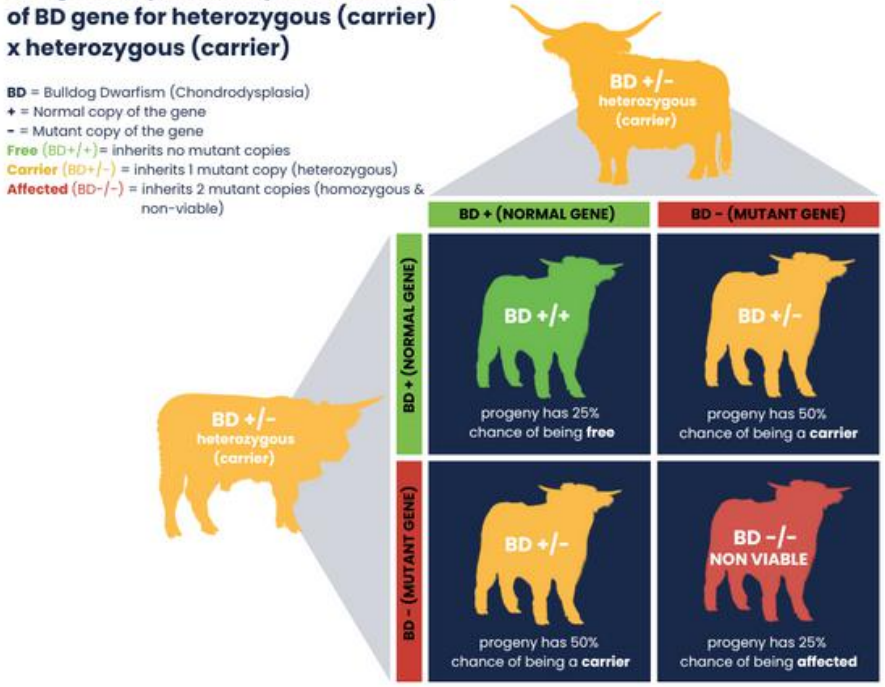
DNA testing for the BD1 and BD2 gene is available at the Elizabeth Macarthur Agricultural Institute (EMAI).

NSW DPI is the preferred testing lab for Chondrodysplasia as they offer testing for both the BD1 and BD2 gene. Tail hair and TSU samples are acceptable. Test requirements and pricing can be sourced from:

Elizabeth Macarthur Agricultural Institute
PMB 4008, Narella NSW 2567
Email: emai.genetics@dpird.nsw.gov.au or call: (02) 4640 6417.

Neogen offer testing for the BD1 gene only.
Zoetis do not currently offer testing for BD.





Genetic Defects

CHONDRODYSPLASIA

REQUIREMENTS FOR REGISTRATION

All animals must be free of Chondrodysplasia to be eligible for registration.

Members will be required to declare that the animal “does not exhibit the BD phenotype” on the animal registration form.

AI SIRE AND ET DAM ACCREDITATIONS

For AI Sire and ET Dam Accreditations, certified proof the sire or dam is free of Chondrodysplasia by Statutory Declaration or DNA Test is required. Refer Rule 13 (AI Sires) and Rule 14 (Embryos).

WHAT HAPPENS IF BD IS SUSPECTED IN AN ANIMAL?

Per Regulation 9.1.3, Council may suspend the animal registration until evidence is provided of the Chondrodysplasia status of the animal by DNA test.
The Society will assist members in coordinating the required testing. Testing will be at the Society expense.

WHAT HAPPENS IF BD IS PROVEN BY DNA TEST IN AN ANIMAL?

If an animal is proven to carry the condition and was registered after 25 August 2024 it shall be deregistered including its progeny.

Above:
A calf exhibiting a Chondrodysplasia phenotype with short legs and stature.

Image source: Chondrodysplasia Dwarfism in Miniature Cattle

Genetic Defects

MYOSTATIN nt821
(double muscling)

KEY POINTS

Refer AHCS Regulations: Item 9.2

Bulls must be free by DNA test or free by inheritance to be eligible for registration.

FIB, P, A or B Females may be free or heterozygous (carrier) to be eligible for registration, either by DNA test or free by inheritance. All Grade C Females must be DNA tested free of nt821 to be eligible for registration.

Homozygous (affected) females are not eligible for registration.

DNA testing for nt821 is readily available through Zoetis or Neogen.

MYOSTATIN nt821

Myostatin is a protein which helps to regulate normal muscle development in animals by restricting muscle growth – therefore stopping muscles getting 'too big'. When **mutations** occur in the myostatin gene its function is disrupted, and excessive muscle growth is seen. There are many myostatin mutations found in cattle.

Only one mutation, nt821, has been found in Highland Cattle and its *influence is unknown*.

In Australia there are two identified carrier bloodlines discovered to date, and together with their progeny this is a potential pool of 300 total animals. How many animals have been tested thus far by members is unknown. It is possible additional bloodlines will be identified as DNA testing for nt821 takes place in Australia and internationally.

The Society deems the condition as undesirable and has implemented strategies that allow animals to be easily identified so members have the choice to breed away from the condition, and taken action to supress the condition to work towards eliminating the gene from the Herdbook.

WHAT DOES IT LOOK LIKE?

In **homozygous** (affected) animals there is an overgrowth of muscle. In extreme cases in other breeds where there are other factors at play, this can put pressure on cardiac and skeletal function, and result in reproductive difficulties due to narrowing of the pelvis and pressure from the muscling around the birth canal.

Far Left: A homozygous (affected) nt821 Highland heifer.

Top Right: A homozygous (affected) Belgian Blue cow.
Image source: Shutterstock

Bottom Right: A homozygous (affected) Limousin cow.
Image source: Shutterstock.

Genetic Defects

MYOSTATIN nt821

INHERITANCE

nt821 is a recessive mutation meaning **heterozygous** (carrier) animals will be carriers of the defective gene but will not necessarily display a phenotype.

When two animals both carrying the defective (mutant) gene are crossed, there is a 25% chance that the progeny could inherit both recessive copies, (be **homozygous** (affected) for the mutation) and we see the physical outcome of the mutation. A 50% chance exists for the progeny to be **heterozygous** (carrier) and inherit copy of the defective gene, and a 25% chance exists that the progeny will not inherit the defective gene and be free.

The inheritance probability of a **heterozygous** (carrier) animal with a **normal** (free) animal differs. Progeny in this scenario have a 50% chance of being **heterozygous** (carrier) and inherit copy of the defective gene, and a 50% chance they will not inherit the defective gene and be **free**.

The illustrations (right) include the genetic probability of inheritance for the above two examples - a carrier crossed with a carrier, and a carrier crossed with a normal (free) animal.

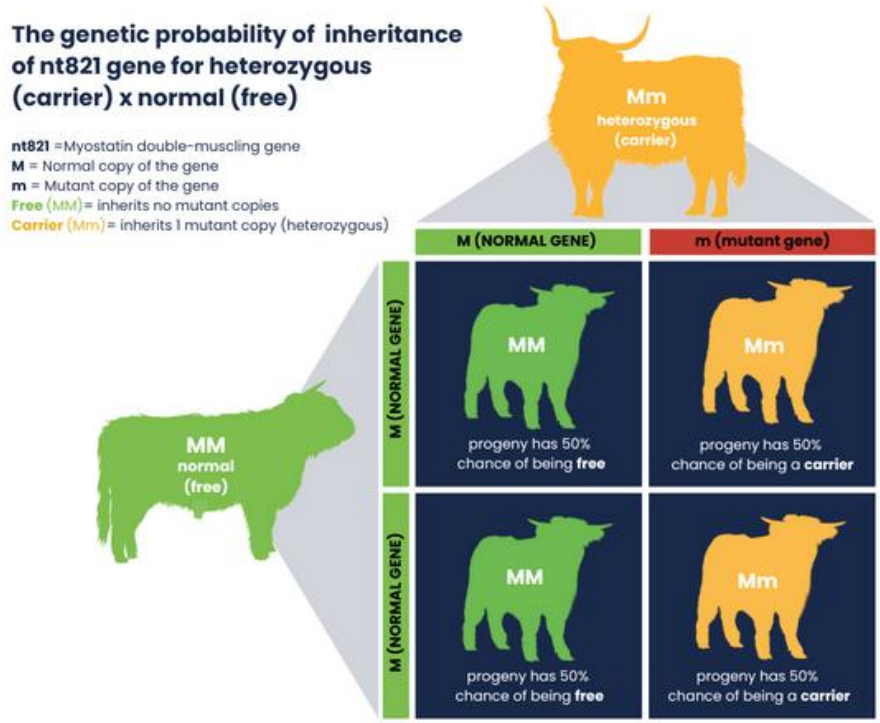
FREE BY INHERITANCE STATUS

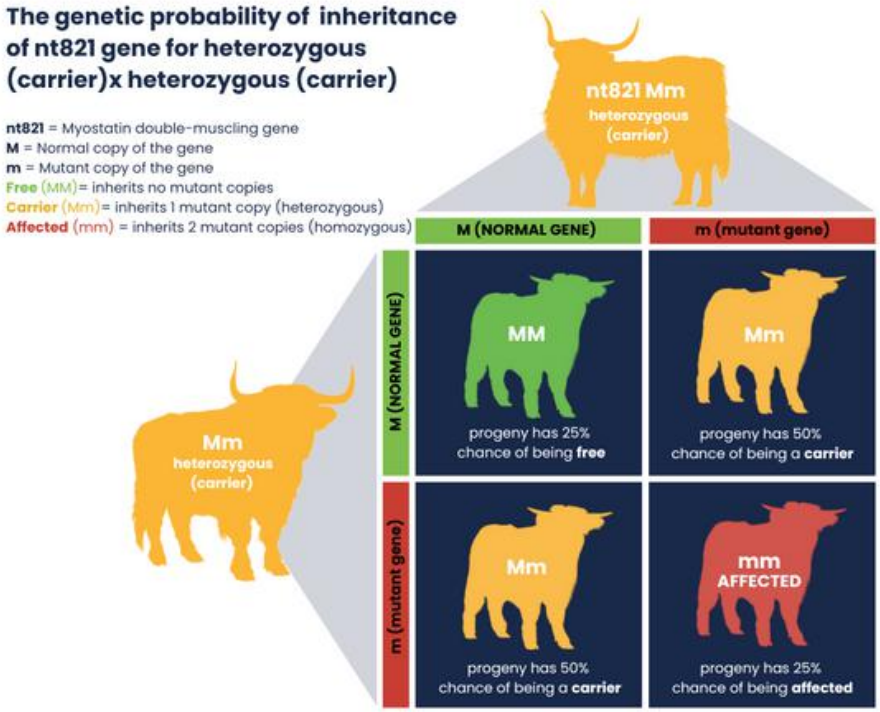
What does this mean?

For an animal to be determined as *free by inheritance* status, it must be positively parent verified to proven non-carrier parents.

Evidence of the non-carrier status of the parent animals must be provided either by DNA test or extended *free by inheritance* status.

There is no generational limit to the *free by inheritance* status.





Genetic Defects

MYOSTATIN nt821

REQUIREMENTS FOR REGISTRATION

Different requirements apply to different animal grades.

Bulls - **must be free** to be eligible for registration, either by DNA test, or determined as *free by inheritance* status.

Females inspected for Grade C - **must be DNA tested free** to be eligible for registration.

Females for FIB, Purebred, Grade A & B - may be free or heterozygous (carrier) to be eligible for registration either by DNA test or determined as *free by inheritance* status.

Homozygous (affected) females are not eligible for registration.

For AI Sire and ET Dam Accreditations, evidence the sire or dam is nt821 free by either DNA Test or free by inheritance is required.
Refer Rule 13 (AI Sires) and Rule 14 (Embryos).

DNA TESTING FOR MYOSTATIN

DNA Testing for Myostation (nt821) is readily accessible through Zoetis or Neogen. Members can select to test for the nt821 gene on the Test Request Form, either when a DNA sample is provided at the same time as completing a SNP Profile (SireTRACE or SeekSire) OR requesting the nt821 test on a done sample (where a profile already exists).

Zoetis (preferred supplier)
Members can contact Zoetis or the AHCS if they require assistance with nt821 testing.

Zoetis, PO Box 75, Banyo QLD
Email: genetics.au@zoetis.com or call: 1300 768 400

RECOMMENDATIONS

The most efficient way to move forward is to DNA test your breeding animals for Myostatin (nt821) and any breeding animal that is brought into your Fold that does not already have a Myostatin test result.

If the Sire and Dam of any animals you wish to register are already nt821 DNA tested free, this means that any progeny parent verified to nt821 tested free parents are eligible for the *free by inheritance status* and will not need to be nt821 DNA tested.

Members may still prefer to DNA test progeny that are free by inheritance, the results will be recorded in the Herdbook and status updated as required by the test result received.

If a member is using a tested nt821 Carrier animal, the progeny must be tested to determine its nt821 status. The DNA Test result must be supplied to the AHCS with the animal registration and will be recorded in the Herdbook.

		SIRE nt821 STATUS			
		DNA Tested Free	**Free By Inheritance**	**Carrier**	**Affected**
DAM nt821 STATUS	**DNA Tested Free**	Free by Inheritance	Free by Inheritance	Test to determine	Test to determine
	Free By Inheritance	Free by Inheritance	Free by Inheritance	Test to determine	Test to determine
	Carrier	Test to determine	Test to determine	Test to determine	Test to determine
	Affected	Test to determine	Test to determine	Test to determine	Affected

Genetic Defects

CROP EAR

KEY POINTS

Refer AHCS Regulations: Item 9.3

Members must declare that the animal is free of Crop Ear at the time of animal registration.

Where Crop Ear is suspected, Council requires the animal be DNA tested.

Animals registered after 25 August 2024 that are proven to carry the condition by DNA test will be deregistered, including that animals progeny.

A DNA test is available at the University of Bern in Switzerland.

CROP EAR

Crop Ear is a phenotypic mutation exhibition **partial dominance** and phenotypically animals have as little as a very slight notch in the ears through to severe “cropping” of the ears.

The prevalance of the condition in Highland Cattle in Australia is suspected to be free due to the efforts of members and the Society to eradicate it in time past.

The Society deems Crop Ear as undesirable and will continue to take actions to prohibit the condition in the AHCS Herdbook.

WHAT DOES IT LOOK LIKE?

Animals with Crop Ear present with ears with slight to severe notches on the tip of both ears. In some cases cartilage deformation can be seen and occassionally the external ears are shortened. It might be difficult to notice small notches. Crop ears are already present at birth and occur in both male and female cattle. (1)

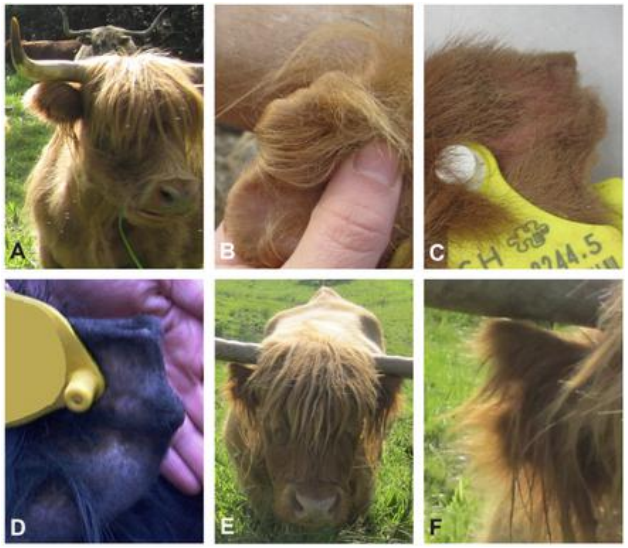


Image A:
Normal Ear

Image B, C and D:
Mildly affected ears, note the slight notches.

Image E:
A severely affected cow; note the shortened areas.

Image F:
Severely affected are with deep notches.

Reference (1) and Image source: Research Paper - A Non-Coding Genomic Duplication at the HMX1 Locus is Association with Drop Ears in Highland Cattle.

Genetic Defects

CROP EAR

INHERITANCE

Research suggests that the Crop Ear defect is inherited by a single dominant gene, however there is incomplete dominance meaning animals with the gene will show varying degrees to which they are affected.

Crop Ear will never be exhibited in progeny from two animals that are genetically free of Crop Ear, ie carrying the normal ear gene only (c).

If a calf is born with Crop Ear, then at least one of the parents must have had the dominant gene for Crop Ear ('C').

The follow graph shows the probability of inheritance of the dominant Crop Ear gene (C) and the normal ear gene (c).

c = the normal ear gene, resulting in normal ears.
C = the dominant Crop Ear gene, resulting in Crop ears.

		SIRE CROP EAR STATUS		
		CC	**Cc**	**cc**
DAM CROP EAR STATUS	**CC**	100% CC	50% CC 50% Cc	100% Cc
	Cc	50% CC 50% Cc	25% CC 50% Cc 25% cc	50% Cc 50% cc
	cc	100% Cc	50% Cc 50% cc	100% cc

CC - **Homozygous** (affected). Animals with two dominant genes will have Crop Ear in the most severe form and pass the dominant genes onto their offspring.

Cc - **Heterozygous** (carrier). Animals will have Crop Ear but with a variation in severity (mild to severe). There is a 50% chance of passing on the dominant gene (C) for Crop Ear to their offspring.

cc - **Normal** (free). Animals will not have Crop Ear. They will not give rise to an animal with Crop ear when bred to each other.

REQUIREMENTS FOR REGISTRATION

All animals must be free of Crop Ear to be eligible for registration.

Members must declare the animal status in relation to Crop Ear upon registration. This is a simple declaration that the animal to be registered is "free of Crop Ear".

WHAT HAPPENS IF CROP EAR IS SUSPECTED?
Per Rule 9.3.3, If Council suspects a registered animal to have Crop Ear from 25 August 2024, the animal may be suspended and a DNA test required to provide evidence of the crop ear status. The Society will assist the member to coordinate the required testing.

WHAT HAPPENS IF CROP EAR IS PROVEN BY DNA TEST IN AN ANIMAL?
Per Rule 9.3.4, if an animal is proven to have Crop Ear by DNA test and was registered after 25 August 2024 it shall be deregistered, including any progeny thereof.

AI SIRE AND ET DAM ACCREDITATIONS
For AI Sire and ET Dam Accreditations, certified proof the sire or dam is free of Crop Ear by Statutory Declaration or DNA Test is required.
Refer Rule 13 (AI Sires) and Rule 14 (Embryos).

DNA TESTING FOR CROP EAR

Members only need to DNA test for Crop Ear if Crop Ear is suspected.
A DNA Test for Crop Ear is available through the Institute of Genetics at the University of Bern in Switzerland.
A test does not currently exist in Australia.

Institute of Genetics, University of Bern, Switzerland
For information on Crop Ear testing and the genetic testing form:
Email: cord.droegemueller@vetsuisse.unibe.ch

Access Testing Information on the University of Bern Website

HYPOTRICHOSIS

(Rats Tail Syndrome)

KEY POINTS

Refer AHCS Regulations: Item 9.4

The Society deems Rats Tail Syndrome as undesirable.

Members must declare that the animal does not exhibit the Rats Tail Syndrome phenotype at the time of animal registration.

Animals that exhibit the phenotype should not be registered.

The Society will focus on education of management strategies for suspect breeders.

There is no DNA test currently available for this condition.

HYPOTRICHOSIS

Rats Tail Syndrome (RTS) is an inherited hypotrichosis in cattle. It is a phenotypic mutation where animals have a less than normal amount of hair, and the condition is characterised by misshapen, curly and sparse hair, and missing hairs at the tail switch. It is only expressed in dun coloured animals.

The prevalance of Rats Tail Syndrome in Highland Cattle in Australia is unknown, there are a small number of suspected animals.

RTS is a complicated syndrome and no conclusive DNA test is currently available.

The Society deems RTS as undesirable and has taken actions to discourage members from breeding animals with the defect.

WHAT DOES IT LOOK LIKE?

Animals with Rats Tail Syndrome exhibit a sparse, coarse coat and an abnormal tail switch. There is possibility of reduced growth rates in weaners. Hair may be missing from the tail, ears and around the eyes in adult animals.

Suspected RTS in Highland Cattle (Left - as calf, Right - as adult). Note tail switch in calf, and hair missing from tail, ears and around eyes as adult.

Genetic Defects

HYPOTRICHOSIS (RTS)

INHERITANCE

The Rats Tail Syndrome phenotype is not caused by a single mutation but is rather an interaction between mutations in three genes which are all involved in controlling coat colour.

RTS animals are known to carry:

- At least one black gene;
- Be hetorozygous (carrier) for the dilution gene; and
- Possess another (currently unknown) recessive RTS gene.

Specific information on inheritance cannot be provided due to the complexity of RTS and unknown component of the syndrome.

DNA TESTING FOR RTS

RTS is a complicated syndrome and no conclusive DNA test is currently available for Highlands.

Should a conclusive DNA test become available in the future, Council will review its response.

REQUIREMENTS FOR REGISTRATION

Animals that exhibit the Rats Tail Syndrome phenotype should not be registered.

Members will be required to declare that the animal “does not exhibit the RTS phenotype” on the animal registration form.

WHAT HAPPENS IF RTS IS SUSPECTED?

As no DNA test exists, if an animal is suspected to have RTS or exhibits the phenotype, the following actions are encouraged to be considered by members:

- Consider mating choices of colours for suspect breeders - choose colours not likely to give rise to calves predisposed for the syndrome (eg mate with a homozygous red animal)
- Not registering animals that exhibit the Rats Tail Syndrome phenotype.

AI SIRE AND ET DAM ACCREDITATIONS

For AI Sire and ET Dam Accreditations, certified proof the sire or dam is free of Rats Tail Syndrome by Statutory Declaration is required.
Refer Rule 13 (AI Sires) and Rule 14 (Embryos).

AHCS BREED STANDARD

**The AHCS Breed Standard represents what is considered to be the perfect conformation traits of a Highland.
It is important for breeders to be familiar with and consider the breed ideal to protect the integrity and standard of the Highland cattle breed in Australia.**

Knowledge of the Highland breed standard may assist members in determining when an undesirable phenotype may exist.

Genetic Defects

HOW GENETIC DEFECTS ARE REPORTED IN THE ONLINE HERDBOOK

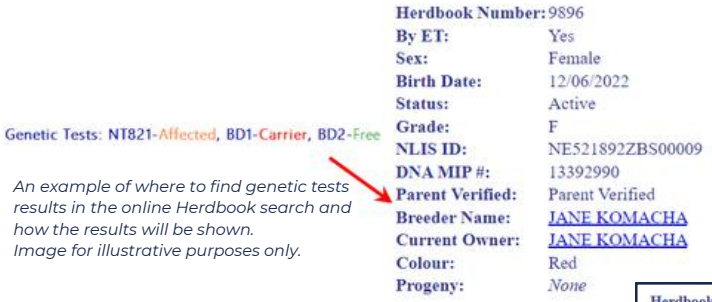
Members who supply results of DNA testing for genetic defects to the Society will have the results recorded in the AHCS Herdbook and displays in the online animal search.

It is the member's responsibility to forward any testing results to the AHCS. The AHCS does not receive results direct from Zoetis or Neogen, unless the Society has coordinated the testing of the member's behalf.

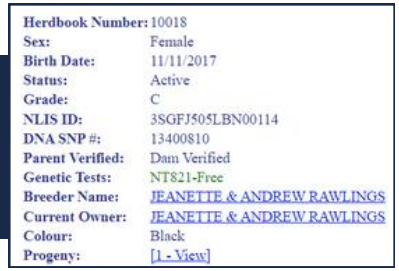
Any genetic tests completed for an animal will appear in the animal's information underneath their parent verification status.

The standard terminology for the display of results will be:

BD1 / BD2 - Chondrodysplasia (Bulldog Dwarfism)
nt821 - Myostatin double-muscling gene
Free - does not carry the gene, confirmed by DNA test
Free by inheritance - positively parent verified to parents who are proven non-carriers (free) of the same condition
Carrier - heterozygous, carries one copy of the gene
Affected - homozygous, carries two copies of the gene



An example of where to find genetic tests results in the online Herdbook search and how the results will be shown.
Image for illustrative purposes only.



An example of an animal that has been tested for Myostatin and results included in the AHCS Herdbook online animal search.
See "Genetic Tests" included and "NT821- Free".

ADDITIONAL RESOURCES & INFORMATION

AHCS	AHCS Regulations - Current AHCS Breed Standard: Represents what is considered to be the perfect confirmation traits of a Highland.
CHONDRO-DYSPLASIA (BD)	Report: Chondrodysplasia Dwarfism in miniature cattle BD1 & BD2 testing information can be obtained from EMAI at emai.genetics@dpird.nsw.gov.au
MYOSTATIN (nt821)	Review of published research literature: The relationship between the myostatin gene (nt821) and calving ease in beef cattle (ABRI) Myostatin nt821 & DNA testing with Zoetis
CROP EAR	Research article: A Non-Coding Genomic Duplication at the HMX1 Locus is Associated with Crop Ears in Highland Cattle University of Bern - Genetic Testing Form for crop ear in Highland Cattle
HYPOTRICHOSIS (RTS)	Research article: Epistatic interactions between at least three loci determine the "rat-tail" phenotype in cattle

Animal Registration - Chart of Requirements

This handy chart is useful to help members determine the information required for registration, including parent verification, DNA testing and/or declarations for genetic defects.

	BULLS FIB or P only	**FEMALES** FIB, P, A or B	**FEMALES** GRADE C	**STEERS**	**DNA TEST PROVIDER**
DNA & Parent Verification	SNP Profile + Parent Verification	SNP Profile + Parent Verification	SNP Profile only	None required	Zoetis (preferred) or an approved lab
CHONDRODYSPLASIA (Congenital Dwarfism)	Does not exhibit phenotype = register with declaration If suspected = DNA test	Does not exhibit phenotype = register with declaration If suspected = DNA test	Does not exhibit phenotype = register with declaration If suspected = DNA test	Does not exhibit phenotype = register with declaration If suspected = DNA test	EMAI (NSW DPI)
MYOSTATIN nt821 (Double muscling)	Must be free by DNA test or free by inheritance. Cannot be heterozygous (carrier) or homozygous (affected)	May be free or heterozygous (carrier) by DNA test, or free by inheritance. Cannot be homozygous (affected)	Must be DNA tested free. Cannot be heterozygous (carrier) or homozygous (affected)	No requirement	Zoetis (preferred) or an approved lab
CROP EAR	Does not exhibit = declare “free” at registration If suspected = DNA test	Does not exhibit = declare “free” at registration If suspected = DNA test	Does not exhibit = declare “free” at registration If suspected = DNA test	Does not exhibit = declare “free” at registration If suspected = DNA test	University of Bern, Switzerland
HYPOTRICHOSIS (Rats Tail Syndrome)	Does not exhibit phenotype = register with declaration Exhibits phenotype = do not register	Does not exhibit phenotype = register with declaration Exhibits phenotype = do not register	Does not exhibit phenotype = register with declaration Exhibits phenotype = do not register	Does not exhibit phenotype = register with declaration Exhibits phenotype = do not register	None available

NEED ASSISTANCE?

CONTACT YOUR STATE REP OR A COUNCIL MEMBER

All State Rep and Council contacts are listed on the AHCS website.

CONTACT THE AHCS

Genetic Hub
Email: admin@australianhighlandcattle.org
Mobile: 02 6933 1214

The AHCS takes no responsibility for any changes to pricing or information contained in this document, however will endeavour to keep the resource updated and members notified as required.

WWW.AUSTRALIANHIGHLANDCATTLE.ORG