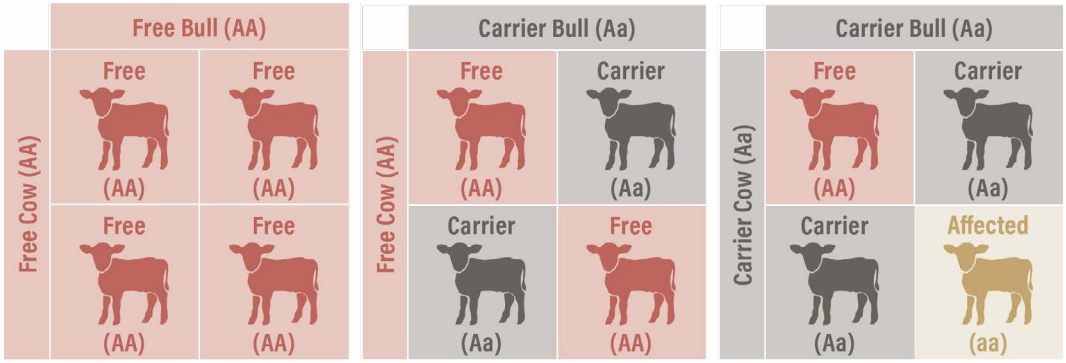
Introduction

In genetics, different variants of the same gene are referred to as alleles. Each individual has two alleles for every gene, one inherited from its father and one inherited from its mother. These two alleles can be the same (homozygous), or they can be different (heterozygous).

The DNA test detects three possible outcomes.

1. Homozygous for the normal DNA sequence (both chromosomes have the normal allele).
2. Heterozygous for one normal allele and one mutant allele.
3. Homozygous for the mutant allele (both chromosomes have the same mutant allele).

There are a number of different modes of inheritance for genetic conditions with the most common being autosomal recessive, where animals need to carry two copies of the mutant allele in order to express the condition. The diagram below shows the inheritance patterns for common recessive conditions.



Punnett square

Hypotrichosis (Hy)

What is Hypotrichosis?

Hypotrichosis in Hereford cattle is inherited as a simple autosomal recessive trait.

What are the symptoms of 'Hypo'?

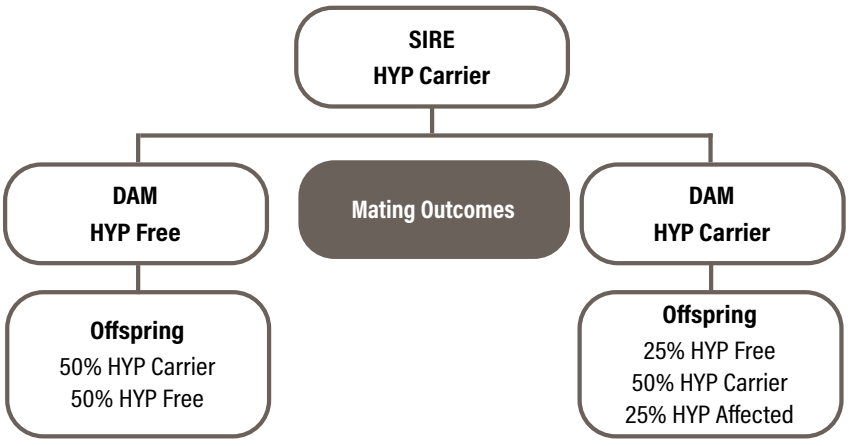
Hairlessness. It expresses itself as complete or partial loss of hair.

Will an animal identified as a carrier always sire a carrier progeny?

For an individual to be affected by the disease it must have 2 markers for the mutation (1 from the sire and 1 from the dam). Those individuals that carry 1 marker for the mutation and 1 normal marker will be unaffected by the disease, but can pass the mutation on to their offspring.

Can a calf have Hypo if only one parent is a carrier for Hypo?

No, for a calf to have hypo, both parents must be carriers. Even then, there is only a 25 percent chance of having an affected calf. Consequently, this mating profile would also yield a 25 percent chance of a Hypo-free animal and a 50 percent chance of a Hypo carrier.



Idiopathic Epilepsy (IE)

What is IE?

Idiopathic Epilepsy in Hereford cattle is inherited as a simple autosomal recessive trait.

What are the symptoms of IE?

The symptoms of Idiopathic Epilepsy (IE) generally start with affected animals seen recumbent on their side with limbs extended in a rigid state. The seizures may last from several minutes up to more than an hour. The age of onset of the first seizure can vary, from birth to several months of age. The occurrence and persistence of seizures may be modified by environmental stressors such as extremes of temperature or increased physical activity.

IE is predominantly seen in horned Herefords, but can be seen in polled Herefords with horned animals in their pedigree.

Will an animal identified as a carrier always sire a carrier progeny?

For an individual to be affected by the disease it must have 2 markers for the mutation (1 from the sire and 1 from the dam). Those individuals that carry 1 marker for the mutation and 1 normal marker will be unaffected by the disease, but can pass the mutation on to their offspring.

Can a calf have IE if only one parent is a carrier for IE?

No, for a calf to have IE, both parents must be carriers. Even then, there is only a 25 percent chance of having an affected calf. Consequently, this mating profile would also yield a 25 percent chance of an IE Free animal and a 50 percent chance of an IE carrier.

Diluter Defect (DL)

What is Diluter?

This genetic defect is caused by the deletion of a small part of DNA and causes dilution to any black pigment or black hair. Herefords can carry the Diluter mutation but will show no outward signs of the syndrome as they do not have any black pigment.

What are the symptoms of Diluter?

This genetic defect is caused by the deletion of a small part of DNA and causes dilution to any black pigment or black hair. Herefords can carry the Diluter mutation but will show no outward signs of the syndrome as they do not have any black pigment.

The Diluter gene is inherited as a dominant gene so when a carrier Hereford is mated to an animal with black pigment, e.g. a Friesian or an Angus, 50% of cases they will produce offspring with a diluted coat colour - grey, smoky or chocolate in colour. In addition to the change in colour the dark areas can show signs of hair loss. The areas with white hair appear normal. A predisposition to cold stress and poor growth rate can occur, at least in the first year.

All genetic material in an individual animal comes in pairs, including the area of DNA where the mutation responsible for the Diluter gene in Hereford cattle occurs. Each individual has a pair of markers (alleles) for the Dilutor gene, and has inherited one from the sire and one from the dam. The purpose of this test is to detect those carrier individuals that carry 1 or 2 copies of the mutation responsible for Diluter.

Maple Syrup Urine Disease (MSUD)

What is MSUD?

MSUD is a lethal genetic abnormality and is a simple autosomal recessive gene. Affected calves have a defect in an enzyme that breaks down complex amino acids in the diet. The resulting buildup of these amino acids in the body causes lethal brain damage.

What are the symptoms of MSUD?

Affected calves are typically born without symptoms, but by 2 to 4 days old become slow, dull and eventually recumbent. The calf will often throw its head back and lie on its side, unable to rise. These calves may have some swelling of the brain at autopsy, but diagnosis requires laboratory investigation. This disease is also found in humans and is named for the smell of urine observed in human babies - the smell is not always noted in calves.

Will an animal identified as a carrier always sire a carrier progeny?

No, a carrier animal has a 50 percent chance of siring a carrier animal and a 50 percent chance of siring a noncarrier.

Can a calf have MSUD if only one parent is a carrier for MSUD?

No, for a calf to have MSUD, both parents must be carriers. Even then, there is only a 25 percent chance of having an affected calf. Consequently, this mating profile would also yield a 25 percent chance of an MSUD Free animal and a 50 percent chance of an MSUD carrier.

Mandibulofacial Dysostosis (MD)

What is MD?

It is a genetic defect which is an autosomal recessive, meaning an affected calf must have two carrier parents. The calf is born with facial deformities.

What are the symptoms of MD?

The anatomic features overlap with a variety of other facial defects and can include cleft palate, short jaw and crooked jaw or face. The calves' ears are sometimes slightly small and floppy.

Muscles of the jaw are underdeveloped and calves may have an elongate oral opening appearing as an exaggerated smile. The nursing reflex is present, but nursing is not vigorous. Calves with the additional cleft palate, severely shortened or crooked jaws are debilitated in ability to nurse.

Calves with the defect are live born but are not able to thrive.

Will an animal identified as a carrier always sire a carrier progeny?

No, a carrier animal has a 50 percent chance of siring a carrier animal and a 50 percent chance of siring a noncarrier.

Can a calf have MD if only one parent is a carrier for MD?

No, for a calf to have MSUD, both parents must be carriers. Even then, there is only a 25 percent chance of having an affected calf. Consequently, this mating profile would also yield a 25 percent chance of an MSUD Free animal and a 50 percent chance of an MSUD carrier.

Delayed Blindness (DB)

What is DB?

Sometimes known as CLN, is caused by retinal degeneration within the eye. DB is caused by a recessive gene, which means that affected calves will only occur when two carrier animals are mated together.

What are the Symptoms of DB?

Cattle affected by DB are not born blind, but vision loss is noticeable near or just after one year of age. Initial clinical signs may include the animal having difficulty navigating their surroundings, bumping into stationary objects, and slowly navigating unfamiliar terrain. These cattle will also lack a menace responsive (reaction to something being moved toward the eye). Cattle are remarkable at adapting; if in a stable environment vison loss may be severe when first noticed. Unless secondarily injured, the eye appears normal to the casual observer. A detailed ophthalmologic evaluation of the retina in the back of the eye can confirm retinal degeneration. Diagnosis can also be established by genetic testing.

Will an animal identified as a carrier always sire a carrier progeny?

For an individual to be affected by the disease it must have 2 markers for the mutation (1 from the sire and 1 from the dam). Those individuals that carry 1 marker for the mutation and 1 normal marker will be unaffected by the disease, but can pass the mutation on to their offspring.

Can a calf have DB if only one parent is a carrier for DB?

No, for a calf to have DB, both parents must be carriers.