Protoporphyria

Most cattle breeds have a genetic defect caused by a recessive gene mutation.

In the Limousin breed there is a condition called protoporphyria caused by a defective gene.

In its normal form the gene is responsible for the formation of the enzyme ferrochelatase which is involved in the combination of iron and protoporphorous to form haem, a component of haemoglobin.

If two defective genes are present (homozygous defective) the animal is likely to exhibit protoporphyria.

Clinical Signs of Protoporphyria

Calves suffering with the defect have a very acute form of photosensitisation. The result is hair loss and/or development of ulcers on areas exposed to sunlight e.g., the ears, nose, udder and along the midline. As a result of the chronic inflammation of the skin some affected animals fail to thrive and are destroyed or sold to slaughter before finishing. Some affected animals recover, mature and will breed.

Affected calves are first seen to frequently lick their lips and nose soon after birth. Close examination of the nose will reveal developing ulcers. It would seem that the lip-licking is a result of itchiness/pain. Later behaviour of affected calves could also be explained by sunlight causing itchiness and pain as they seek the shade of trees, sheds or even their mothers. Reluctance to leave the shade can lead to problems with mustering affected calves and their mothers.

How is Protoporphyria Inherited?

The disorder is inherited as a double recessive gene. Photosensitive calves have inherited a defective gene from both parents. The parents of affected calves carry the defective gene but do not necessarily show untoward effects. Such animals are known as heterozygotes or carriers.

When two carriers are mated 25% of the progeny will inherit the defective gene from both parents (homozygous defective) and may show the disease, 50% will be carriers i.e., have one normal and one defective gene (heterozygous), and the remaining 25% will have two normal genes (homozygous normal). When carriers are mated with non-carriers, 50% of the progeny will be carriers and the remaining 50% will be homozygous normal.

The important points to remember are:

a) The disease only occurs when carriers are mated.

b) Both parents of affected calves are carriers of the defective gene.

c) Half the progeny of carriers will also be carriers. The genotype of the other half will be dependant upon the genotype of the other parent.

If only one copy of the defective gene is present the animal shows no clinical signs of protoporphyria but is known as a "proto carrier".

Since 1994 there has been a DNA test available for the detection of "proto carriers".

In 1995 it was made compulsory for all AI sires owned or part-owned by a member to be DNA tested for protoporphyria.

The protoporphyria status of all tested animals and animals with tested animals in their pedigree is shown as a suffix as follows:

PN: DNA tested normal

PF: Proto normal by pedigree

PC: DNA tested as a carrier of one defective gene

PS: Proto suspect - the parent of a diseased calf or carrier calf when the other parent is known to be normal (highly likely to be a carrier).

How to Test for the Defective Gene

About 20 hairs are taken from the switch of the tail ensuring that the hair roots are intact.

The hairs are placed in a normal envelope which is clearly labelled with the animal’s full identification number.

The envelope(s) should be sent to ALBS with a request for a "proto" test.

These are dispatched on a monthly basis and normally attract a batch rate of $35.00 per test.

Where urgent tests are submitted directly to the laboratory the rate is considerably higher at $44.10 per test.

What is the Incidence of Protoporphyria?

It is estimated that about eight percent of Limousin cattle are carriers of the defective gene.

If all females were mated to proto normal bulls there would be no progeny with protoporphyria (homozygous for the defective gene).

If eight percent of the bulls used were proto carriers the incidence of diseased animals would be only two in 1,000. Given the reluctance of breeders to use proto carrier AI sires the incidence of diseased animals is now probably lower than two in 1,000.

However, if the daughters of a proto carrier bull are joined to another carrier bull the incidence of diseased animals would be as high as 15 percent.

This could occur in a commercial herd where first cross Limousin females from a carrier bull were mated to another carrier bull.

However, where Limousin bulls are used as terminal sires over another breed there will not be any diseased progeny.

Should I test my Herd?

If you wish to have all sale progeny designated as proto normal (PN) or proto normal by pedigree (PF) you will need to get all of your breeding cows to PN or PF status. By using only PN or PF sires all progeny will be proto free by pedigree (PF) without the need for further testing.

Alternatively you can ensure that none of your calves are diseased by always using PN or PF sires. Some calves could be proto carriers PC if their mothers are proto carriers but this is generally not a problem for bulls sold into commercial herds.

As a minimum it is wise to test all bulls which are not PN or PF and to test all donor cows for ET programs.