HEALTH & CONFORMATION POLICY

NORWEGIAN FOREST CAT

INTRODUCTION

The Norwegian Forest Cat is a natural breed originating in Scandinavia. Norwegian Forest Cats are large, heavily muscled, and slow-maturing cat. Their longhair coat, adapted for the cold climate of their home area, consists of a top coat of glossy, long, water-shedding hairs and a woolly undercoat for insulation, and is reasonably easy care.

The Norwegian Forest Cat does not have any permitted outcrosses in the NZCF.

This policy was approved October 2019 to take effect on 1 June 2020.

HEALTH

ERYTHROCYTE PYRUVATE KINASE DEFICIENCY

SITUATION

- Genetics known or mode of inheritance accepted.
- Rare or only seen in a specific country / group / line.
- DNA test available.

DETAILS

Erythrocyte pyruvate kinase deficiency (PK deficiency or PK-def) is an autosomal recessive inherited haemolytic anaemia that has been identified in a number of cat breeds and in random-bred domestic cats. It has high variability in age of onset and in severity of clinical symptoms.[1] Pyruvate kinase is an enzyme which is important for red blood cells and a deficiency or absence of it can cause anaemia which may range from mild and intermittent to severe and life-threatening.[2] A DNA test is available.

NZCF TESTING REQUIREMENTS

- DNA testing.
- Mandatory (One Parent Rule).
- Identity breeder certified using microchip number.

To register kittens with the NZCF one parent must either have clear DNA test results recorded with the NZCF or be 'clear by parentage' (where the NZCF holds sufficient ancestor DNA test results to ensure that the parent is itself clear of the gene).

GLYCOGEN STORAGE DISEASE, TYPE IV

SITUATION

- Genetics known or mode of inheritance accepted.
- Recognised or acknowledged within the breed.
- DNA test available.
- NZCF registration requirement.

DETAILS

Glycogen storage disease, type IV, (GSD IV), glycogenosis, is an inherited abnormality of glucose metabolism that is seen in NFOs. It is inherited as a simple autosomal recessive trait. Abnormal glycogen accumulates in muscle, liver and neurons causing progressive organ dysfunctions. Affected kittens may die at or soon after birth, but a few can appear clinically normal till about 5 months of age. These juveniles develop a persistent fever and later show signs of muscle tremors. The signs progress to generalized muscle atrophy and eventual death.[3]

Estimates are that the frequency of the disease is about 15%.

NZCF TESTING REQUIREMENTS

- DNA testing.
- Mandatory (One Parent Rule).
- Identity breeder certified using microchip number.

To register kittens with the NZCF one parent must either have clear DNA test results recorded with the NZCF or be 'clear by parentage' (where the NZCF holds sufficient ancestor DNA test results to ensure that the parent is itself clear of the gene).

REVIEW

With the aim of removing all carrier cats from breeding programmes the ‘Mandatory (One Parent Rule)’ requirement of this policy should be reviewed 2 years from date of issue to consider whether the ‘Mandatory (Two Parents Rule)’ should be applied.

HYPERTROPHIC CARDIOMYOPATHY

SITUATION

- Genetics known or mode of inheritance accepted.
- Recognised or acknowledged within the breed.
- Testing (non-DNA) is available and generally accepted.

DETAILS

Hypertrophic cardiomyopathy (HCM) is a hereditary disease caused by a defect in an autosomal dominant gene that affects many species including man. It is the most common heart disease in cats including non-pedigrees and does occur in some Norwegian Forest Cat lines.

The disease shows a highly variable clinical course; in severe cases death from heart failure can occur but some cats with mild HCM never show clinical disease and have a normal life span.

Unfortunately no commercial DNA test is available in the Norwegian Forest Cat. Where HCM is suspected in a line the screening of breeding cats by cardiac ultrasound is recommended with affected cats being removed from the breeding program.

NZCF TESTING REQUIREMENTS

- Specialist cardiac ultrasound screening at least 2-yearly in all breeding cats from 1 year of age until age 7.
- Recommended (where there is reason to suspect the disease is present).
- Identity vet certified.

Breeding cats must be screened if they show signs of cardiac disease or if offspring are diagnosed with or die from confirmed HCM. Screening must be done by a suitably qualified or experienced vet. Cats diagnosed with HCM must not be bred from.

CONFORMATION

ISSUE

None identified.

SOURCES & REFERENCES

SOURCES

- L A Lyons
- UC Davis
- GCCF
- CFA
- Wikipedia
- petmed.com
- icatcare.org
- General web searches, breeder websites, etc.

REFERENCES

1. Robert A Grahn, Jennifer C Grahn, Maria CT Penedo, Chris R Helps, Leslie A Lyons; Erythrocyte Pyruvate Kinase Deficiency mutation identified in multiple breeds of domestic cats, 30 Oct 2012
2. Langford Vets, Pyruvate Kinase Deficiency, accessed 25 Oct 2016, www.langfordvets.co.uk/
3. Fyfe JC, Kurzhals RL, Hawkins MG, et al. (2007) A complex rearrangement of GBE1 causes both perinatal hypoglycemic collapse and late-juvenile-onset neuromuscular degeneration in glycogen storage disease type IV of Norwegian forest cats. Molecular Genetics and Metabolism 90:383-392.
4. Cornell University College of Veterinary Medicine, Hip Dysplasia, accessed 25 Mar 2018, www2.vet.cornell.edu/

NOTES ON THE POLICY

KEY

SITUATION

UNDERSTANDING

- Genetics known or mode of inheritance accepted.
- Strongly suspected as inherited.
- Possibly inherited or data is not strong or clearly defined.

FREQUENCY

- Recognised or acknowledged within the breed.
- Rare or only seen in a specific country / group / line.
- Managed condition (testing programme in place).

TESTS

- DNA test available.
- Testing (non-DNA) is available and generally accepted.
- No tests available or the costs are prohibitive.

TESTING PROGRAMMES

- International testing programme.
- NZCF testing programme or registration requirement.

NZCF TESTING REQUIREMENTS

COMPLIANCE

- Mandatory (Two Parents Rule).
- Mandatory (One Parent Rule).
- Highly recommended.
- Recommended (where there is reason to suspect the disease is present).
- Voluntary.
- No testing required.

IDENTITY

- Identity vet certified.
- Identity breeder certified.
- Identity breeder certified using microchip number.

NZCF TESTING REQUIREMENT OPTIONS

VOLUNTARY DNA TESTING

- **Voluntary**
  NZCF breeders are not required to do this test to register kittens.
- **Breeder Certified**
  The identity of the cat tested can be certified by the breeder with or without using a microchip for reference.
- **Microchip Not Required**
  It is not required that cats are microhipped for breeder certified tests.
- **NZCF Recording Available**
  Breeders are welcome to submit results to the NZCF for adding to the cat's records.
- **Review**
  Policies of voluntary testing may have a review date set for consideration of an upgrade to mandatory testing.

MANDATORY DNA TESTING - ONE PARENT RULE

- **Mandatory**
  Breeders must do this test for their kittens to be registered in the NZCF.
- **Breeder Certified**
  Individual testing programmes will specify whether the identity of the cat tested may be certified by the breeder, **or** must be

  Vet Certified (Microchip Required)
  Where the test sample must be taken by the vet who will certify the identity of the cat by microchip.
- **NZCF Recording Required**
  Breeders submit results to the NZCF for adding to the cat's records.
- **Breeding Requirements**
  To register kittens with the NZCF, one parent must either have clear DNA test results recorded with the NZCF, or be 'clear by parentage' where ancestor DNA results are recorded with the NZCF.
- **Review**
  Policies of mandatory DNA testing (one parent rule) must have a review date set for consideration of an upgrade to mandatory testing (both parents rule).

MANDATORY DNA TESTING - BOTH PARENTS RULE

- **Mandatory**
  Breeders must do this test for their kittens to be registered in the NZCF.
- **Breeder Certified**
  Individual testing programmes will specify whether the identity of the cat tested may be certified by the breeder, **or** must be

  Vet Certified (Microchip Required)
  Where the test sample must be taken by the vet who will certify the identity of the cat by microchip.
- **NZCF Recording Required**
  Breeders submit results to the NZCF for adding to the cat's records.
- **Breeding Requirements**
  To register kittens with the NZCF, both parents must either have clear DNA test results recorded with the NZCF, or be 'clear by parentage' where ancestor DNA results are recorded with the NZCF.
- **Review**
  Policies of mandatory DNA testing (both parents rule) breeder certified must have a review date set for consideration of an upgrade to mandatory testing (both parents rule) vet certified.

TYPES OF TESTING

DNA TESTING

DNA testing **is a one-off test** - either the harmful gene is present or not.

If the gene is a recessive gene then breeding with heterozygous carriers (one harmful gene, one normal gene) to clear partners is acceptable in the medium term as by doing this no affected cats will be born. However, to clear the harmful gene from the entire breeding population eventually only those cats testing homozygous clear (two normal genes) should be retained for breeding.

HEART SCANNING FOR HCM

In breeds where there is no genetic test for an HCM causing mutation or the test does not identify all cats who will develop HCM (because there's at least one more gene in the gene pool of that breed that causes it), the only means of reducing the likelihood of breeding with affected animals is cardiac ultrasound, preferably done by a specialist cardiologist vet or a radiology specialist vet.

Because HCM can be a slow developing condition **it requires testing at intervals during the cat's life** (for example, every 2 years). For meaningful results, cats should be screened until age 7 (which should catch late onset examples of the disease). Although there are documented examples of cats developing HCM later than this the aim is over time to develop a breeding population all of whose recent ancestors have scanned clear to 7, and then the likelihood of HCM then becomes much lower.