Cat breeds: the hidden problem of inherited diseases

Pedigree cats are far less widely kept compared to pure-bred dogs, but there are signs that this may be beginning to change, writes Pete Wedderburn BVM&S CertVR MRCVS, Brayvet, Co. Wicklow who details the inherited disorders that are common in these breeds

While around 90 per cent of pet cats are still classified as cross-bred (either domestic short-haired or domestic long-haired) pedigree cats are increasingly popular. As with pedigree dogs, they have an element of predictability, with strong personalities and distinctive appearances. And as with any situation where there is an increase in interest and numbers of a particular type of cat, there is likely to be an increase in problems. Just like pedigree dogs, pedigree cats can carry inherited problems that can mean illness and suffering for afflicted individuals, a challenge for the vets recruited to treat them, and expensive veterinary bills for their owners.

HISTORY AND BREEDS

Dog breeds have a longer tradition in human society compared to cats. Specific types of dog have been bred for many centuries, producing animals that have particular appearances and types, for purposes such as hunting, herding or just being 'lap-dogs'. This has led to the proliferation of a wide number of well-known breeds over many hundreds of years.

The breeding of pedigree cats has a far more recent history, going back just over 100 years. Even breeds that now seem well-established and popular are relatively recent arrivals in the cat world. As examples, the Burmese cat was first recognised in the UK in 1952, and full recognition was only given to the Balinese cat in the 1980s.

Vets in Ireland should be aware of the formal pedigree cat body in this country, the Governing Council of the Cat Fancy of Ireland (GCCFI) was founded in 1968 and relates to cats as the Irish Kennel Club relates to pedigree dogs.

The GCCFI is concerned with the welfare of all cats, both pedigree and non-pedigree, granting licences to affiliated clubs to run shows under strict rules of procedure. The GCCFI deals, through its registrar, with the registration and transfer of pedigree cats and kittens, the issuing of certified pedigrees for cats being exported and the verification of titles claimed as a result of winning certificates at shows. The GCCFI is also responsible for the organisation of the Supreme Show which is held annually. Cats must qualify for this show by winning at the Club Championship Shows.

The different pedigree cat breeds recognised by the GCCFI mirror those recognised by their counterpart in the UK, the Governing Council of the Cat Fancy (GCCF). A list of breeds, with photos is available at https://www.gccfcats.org/Cat-Breeds.

As in the dog world, new cat breeds regularly crop up, with breeders choosing to breed from individuals with specific attributes, creating a new breed within decades. The Munchkin breed is a good example: this was developed after an unowned, short-legged, black cat was found living under a trailer in Louisiana in 1983. This cat was pregnant when she was taken in, and it turned out that half of her kittens were born with abnormally short legs. One of the kittens was then used for breeding, becoming the founder of a breeding programme that went on to establish the new cat breed in North America.

The challenge in this type of situation is that development of a new breed like this requires rapid, high-turnover, selective breeding, with the main focus on conformation and visible traits. It is inevitable that less visible, under-the-surface traits will accidentally be maintained in the new breed, and that is where the problem lies. It is no surprise that new breeds like this have a high incidence of breed-related, genetically linked abnormalities and diseases. When the genetic background of the Munchkin breed is examined carefully, it's apparent that the breed was only possible because of a genetic mutation causing achondroplasia. As well as causing cats to have short legs, they are also prone to joint problems, joint pain and arthritis.

Figure 1: A Scottish Fold kitten.

INHERITED DISEASES

Vets in practice may not be deeply involved in the pedigree cat world, but due to the high incidence of inherited diseases in these animals, it makes sense to be informed about the various inherited disorders affecting different cat breeds. This is not an easy task, given the increasing number of unique cat breeds, and the wide range of genetically linked conditions. Some of the inherited conditions of pedigree cats are so serious and common that vets should be aware of them without any need for consulting reference books or other resources. For example, all Scottish Fold cats suffer from

variable degrees of painful degenerative joint disease, which results in fusing of the tail, ankles and knees (separately, not together). This can be seen clinically as lameness; short, misshapen distal limbs; and short, thick inflexible tails. While kittens with only one Scottish Fold parent have a milder form of the condition, kittens with two Scottish Fold parents are severely affected. As a result, the breed is not accepted by the GCCF in the UK, nor by the GCCFI. However, examples of the breed may still be seen in Ireland; refusal of recognition by registration bodies does not necessarily make a breed any less popular with the kitten-buying public.

Similarly, any vet who sees a Manx cat should be aware of the Manx Syndrome, which happens when the mutant tail-less gene causes too much shortening of the spine. Clinical signs can include problems with the bowels, bladder, and digestion. In the past, this affected up to 20 per cent of Manx cats, although improvements in breeding programmes have significantly reduced the incidence.

Figure 2: Three Maine Coon cats.

OTHER ATTRIBUTES

Other common attributes of certain breeds, while not strictly speaking diseases, should be widely recognised and understood by vets. Hairless cats, such as the Sphynx, need regular baths to remove the oil that would normally be absorbed by the hair in a cat's coat, and this breed needs to be kept indoors all year round: sunburn is a hazard in summer, and hairless cats are prone to hypothermia in winter.

There's a long list of inherited problems in other pedigree breeds. Ragdolls and Maine Coons are prone to hypertrophic cardiomyopathy. Colour Point Persian and Birman cats have an increased risk of porto-systemic shunts. Almost 10 per cent of Bengal cats develop distal neuropathy. See Table 1 for a more detailed listing of common inherited problems in pedigree cats.

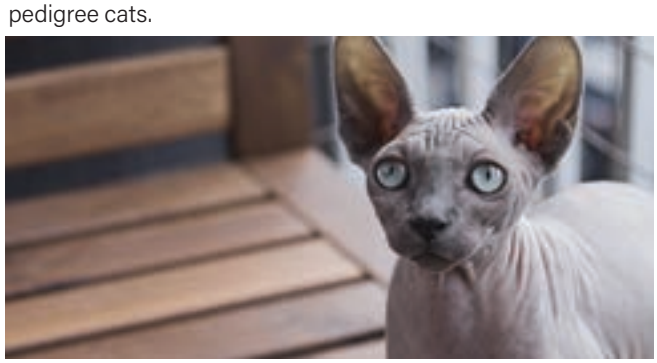

Figure 3: A hairless Sphynx cat.

Some of the more common and important inherited disorders of cats include
α-Mannosidosis
Blood group incompatibility or neonatal isoerythrolysis
Burmese Head Defect
Deafness
Devon Rex Myopathy
Gangliosidosis
Glycogen storage disease type IV
Hypertrophic cardiomyopathy
Hypertrophic muscular dystrophy
Hypokalaemic polymyopathy
Manx syndrome (spina bifida)
Mucopolysaccharidosis
Niemann-Pick Disease (sphyngomyelinosis)
Osteochrondrodysplasia or Scottish Fold disease
Polycystic kidney disease
Polydactyl cats
Progressive retinal atrophy
Pyruvate kinase deficiency
Scottish Fold disease – osteochondrodysplasia
Spinal muscular atrophy in Maine Coons

Table 1: Inherited disorders in cats (source www.icatcare.org).

RESEARCH

During 2005, the National Human Genome Research Institute (NHGRI) endorsed a whole-genome sequencing strategy for 26 mammals, including *Felis catus,* the domestic cat. The cat was included mainly to stimulate genome research on a species that provides a large number of important human medical models, with around 200 genetic diseases analogous to human disorders. This investigation of the feline genome has resulted in a profusion of genetic information about cats, much of which has not become common knowledge in the veterinary world

Recent advances in genetic investigation and testing mean that it is now possible to identify the gene defects associated with a number of inherited conditions, and in many cases to develop diagnostic tests to identify affected cats (and 'carrier' cats). Although some diseases have a simply genetic basis with the disorder being determined by a single pair of genes, in other disorders that may have a hereditary component, the inheritance can be much more complicated. Multiple genes can be involved in some disorders (polygenic) and there may be a combination of genetic and environmental effects in others. Despite the relative ease of international travel with cats, some genetic disorders may be seen in more commonly, or even exclusively, in particular geographical locations.

Many different veterinary diagnostic laboratories now offer genetic (DNA) tests for a range of feline diseases. Some laboratories offer DNA testing for cat coat colours and cat parentage, as well as tests for inherited disorders. Many pedigree cat breeders have taken the initiative themselves in this area, sending off swabs and other samples directly to international laboratories without veterinary supervision. While it is easy to understand why this happens (for reasons of cost, convenience and perhaps because local vets do not have a strong interest in this area), it does represent a lost opportunity for vets to engage with an emerging area of professional interest.

BEST PRACTICE

The truth is that, when undertaking DNA testing of cats (to determine whether they are suitable for a breeding programme) a veterinary surgeon should always be present to supervise, and a reputable and reliable testing labratory should be used. Furthermore, whenever genetic tests are run on cats for the selection of breeding stock, the gene test result should be linked to a method of permanently identifying the cat that has been tested (eg. a standard, internationally recognised microchip number), and for the sake of accurate and trustworthy certification, a vet should collect the sample (blood sample or cheek swab) so that the identification (microchip number) can be checked and recorded on the submission form and the result.

With the exception of diseases for which open registries or health schemes exist, there is little data on the prevalence of many potentially inheritable conditions in different cat breeds, nor on the severity of the diseases' effect on the welfare for the animals. Such data are very hard to collect without a formal scheme in place.

There are a few clear examples where abnormalities of conformation or severe inherited conditions have such a high prevalence and/or such severe effects on welfare and morbidity that potential purchasers of a breed need to be warned about them: the Scottish Fold cat is an example. However, in practice, in most cases, a more moderate approach is recommended, and this is probably the best way for vets to engage with local cat breeders. If a breeder has a cat that develops a potentially inheritable problem, they should be advised to withdraw the affected cat from breeding, along with its parents and close relatives. Vets should counsel prospective owners to check with breeders as to whether their breed of cat has a history of heritable conditions or not, and to request information about possible clinical and/or DNA-based testing schemes.

A comprehensive list of cat breeds, along with the inherited diseases that are seen in each is available from: https://icatcare.org/advice/cat-breeds

REFERENCE

Pontius *et al.* Initial sequence and comparative analysis of the cat genome. *Genome Res.* 2007. 17: 1675-1689.

READER QUESTIONS AND ANSWERS

1. WHEN WAS THE BURMESE CAT BREED FIRST RECOGNISED IN THE UK AND IRELAND?

A. 1908
B. 1932
C. 1952
D. 1971

2. WHICH BODY IS INVOLVED WITH PEDIGREE CATS IN IRELAND?

A. The Cat Club of Ireland (CCI)
B. GCCFI (Governing Council of the Cat Fancy of Ireland)
C. The Irish Cattery Club (ICC)
D. Pedigree Cat Society of Ireland (PCSI)

3. WHAT DNA TESTS ARE COMMONLY CARRIED OUT ON SAMPLES FROM PEDIGREE CATS?

A. Cat coat colours
B. Cat parentage
C. Inherited disorders.
D. All of the above

4. WHAT SAMPLES ARE COMMONLY USED FOR GENETIC TESTING IN CATS (TWO OF THE FOLLOWING APPLY)

A. Nail clippings
B. Cheek swabs
C. Blood samples
D. Faeces samples

5. WHEN SUBMITTING SAMPLES FOR GENETIC ANALYSIS, IS VETERINARY SUPERVISION NECESSARY? (TWO OF THE FOLLOWING APPLY)

A. Veterinary certification of the process is not compulsory, but is strongly recommended
B. Laboratories will only accept samples if countersigned by vets
C. Owners are free to submit samples without veterinary involvement
D. Owners can send samples off, but results will only be sent to their vets

ANSWERS: C, B, D, B & C, A & C