LABOKLIN

LABOR FÜR KLINISCHE DIAGNOSTIK GMBH & CO. KG

NEWSLETTER 3/2009

Dear cat breeder,
here you find our second newsletter on genetics in cats. This version is dedicated to genetic fingerprints and parentage testing as well as to genetics on coat colours. All of these issues are undoubtedly easy to perform using the genetic methods. Results generated are both extremely secure as well as affordable nowadays due to modern technologies. We hope you will enjoy the information we put together!

Dr. Elisabeth Müller

DNA-Profiles

The underlying principle of DNA profiles is that looking at various highly variable regions within the genome in an individual will result in very unique patterns that are both: extremely specific for each individual and unchangeable throughout life. These variable regions within the genome are called microsatellites. Starting with a buccal swab or a blood sample a DNA profile will be performed and listed within a DNA data base. LABOKLIN hands on profiles according to the ISAG (international society of animal genetics), thus providing you with data that are internationally accepted and usable to compare with results from other labs within the ISAG group. Thus, offspring from animals living and analysed in different countries can be examined without troublesome and costly analytic repeats. ISAG standard is accepted by all animal genetic specialists. Probability of two not related animals to show the same genetic pattern using this method is 1 to 1 billion.

Parentage verification

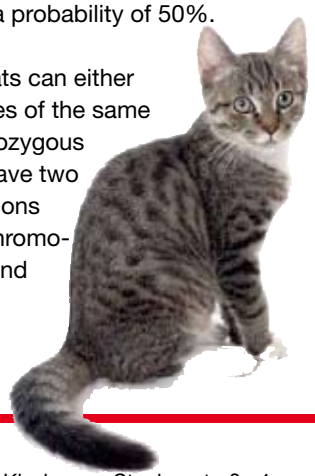
For each DNA location a pair of two alleles characterises an individual animal. Knowing that one of them will originate from the mother, the other from the father a comparison of probable parents and offspring can reveal matching or mismatching results. The probability of a concluded parentage is given to be extremely high (nearly 99.9 %).

Hair length

Coat colours, patterns and texture are determined by the combined action of several genes, only one gene - FGF5 - determines hair length in cats. To date four different mutations in the FGF5 gene have been identified that are associated with the hair-length differences (M1-M4). Three of them are fairly breed specific (M1-M3), M4 is present in all long-haired cat breeds and crossbreeds.

Long-haired coat length is inherited as an autosomal recessive trait, therefore cats that are carriers of the long hair mutation will appear to be normal (short hair) themselves but will likely pass on the long-hair mutation with a probability of 50%.

Long-haired cats can either carry two copies of the same mutation (homozygous recessive) or have two different mutations one on each chromosome (compound heterozygous).



Coat Colours - Useful tests

The modern-day domestic cat displays a wide variety of coat colours and patterns all depending on the basic coat colours seal/black, red and white. Responsible for that are different genes which light up the basic coat colours or produce ascertained patterns and markings.

Classification of these can be confusing sometimes because different registries or associations may name the same phenotype differently. LABOKLIN offers tests for the Agouti, Brown and Colour genes. These tests assist owners/breeders with identification of coat colour and provide information about the genetic make-up of their cats. Results from these tests can be used to make informed breeding decisions to produce or avoid production of particular colours.

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LABOKLIN's colour tests

Agouti

The Agouti gene produces a protein that regulates the distribution of black pigment (eumelanin) within the hair shaft. The wild type allele A is dominant and produces hair shafts with alternating bands of yellow and black colour, ending with black tips (similar to the coat of a wild mouse or rabbit). The recessive allele a produces a cat that is self-coloured (solid) when 2 copies of a are present. Another system of pigmentation in cats produces the tabby patterns of dark stripes interspersed with the lighter agouti tipped hairs. Hairs in the darker stripes do not have the shift between black and yellow pigment production and remain uniformly dark. The effect of the agouti protein on orange pigment is limited, thus tabby striping may still be seen on cats that are a/a for agouti.

Brown (Chocolate and Cinnamon)

The Brown gene affects the amount of black (eumelanin) pigment produced. Mutations responsible for brown and cinnamon colours in the cat have been identified in this gene. The wild-type B allele produces normal, black colouration. The b allele produces the brown (chocolate) phenotype and the bl allele produces a light brown or cinnamon phenotype. These form an „allelic series" with B dominant to b, and b dominant to bl.

Siamese and Burmese (Colourpoint Restriction)

Mutations in TYR have been associated with temperature-sensitive pigment production that results in colours known as Burmese and Siamese. The wild type phenotype is full colour. The Siamese pattern (cs/cs) represents a mild form of albinism. This temperature-sensitive mutation produces normal colour pigment only at the cooler extremities of the body, causing a "mask" of the face as well as darkened paws and tail. The Burmese pattern (cb/cb), the mildest form of albinism, is characterised by a normal pigmentation of the extremities and a slight shading of normal body colour.

Coat Colour Dilution

The dilute gene is responsible for the intensity of the coat colour by affecting the amount of pigments in the hair shaft. The pigment granules are clumped and distributed unevenly along the hair shaft, resulting in a clear colour. The „dilute" phenotype in domestic cats affects both eumelanin and phaeomelanin pathway. The dilution of seal/black results in a grey („blue") phenotype, while dilute combined with orange appears as a cream colour, chocolate results in lilac and cinnamon in fawn. The dilute coat colour phenotype is caused by a single basepair deletion and is inherited as an autosomal recessive trait.

Amber

The Amber gene lights up the basic coat colour black especially in Norwegian Forest Cats. Kitten have a black phenotype at birth, then they lighten during their first year of life until they appear almost cinnamon. Only the tip of the tail remains black throughout life. The mutation responsible for the Amber phenotype is located at the extension-locus which controls the generation of pheomelanin also in other species.

All coat colours and coat colour variants are inherited as an autosomal-recessive trait. The DNA test offers the detection of hidden colours or colour variants of these colours.

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