Unverified Color
Pink-eye dilution
Ukraine-chocolate
in Donskoy cats

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Hair pigmentation

We received hairs from five cats: two “pink-eyed” cats (unverified-color), a black self-colored cat, a brown (= black) tabby cat and a red cat. All were Donskoy cats. Additionally, we used hairs from a diluted cat (Chartreux blue cat, d/d for the D locus, MLPH gene and mutation) from our collection.

Upon gross examination, we first observed that hairs from the black cat were uniformly and deeply pigmented with a dark-brown to black color. Hairs from the brown tabby cat were deeply pigmented with a dark-brown color. In some hairs we noticed a light-gold band as expected for agouti hairs from a tabby cat. Hairs from the first “pink-eyed” cat were uniformly pigmented with a light-brown color. Hairs from the second “pink-eyed” cat included uniformly pigmented hairs and hairs with a light-gold band, both on a light-brown background. Therefore, we assumed that the second “pink-eyed” cat is a tabby cat with agouti banded-hairs.

Melanin granules from the “pink-eyed” cats appeared to be lighter in color than the brown granules observed in the brown tabby cat and the dark-brown granules observed in the black cat. We were not able to quantify the number of the granules and the size of the granules but we think that “pink-eyed” cats had less deeply pigmented granules than the black cat. Melanin granules seemed to be identical in shape between “pink-eyed” cats and the black cat. We never observed enlarged granules, as seen in the diluted cat. Distribution of melanin granules was regular along the hair of the self-colored “pink-eyed” cat as observed in the self-colored black cat. In contrast, in the diluted cat (blue cat), melanin granules were clustered and non-uniformly distributed along the hairs (as previously observed).

According to these observations, the color phenotype observed in the two “pink-eyed” Donskoy cats can be described as a modification of the background hair-color that affects mainly the dark pigment (eumelanin).

Genetic basis

Inheritance pattern

Breeders who have first observed and bred “pink-eyed” cats in the Donskoy breed have described a recessive inheritance pattern. Using genealogical data we confirm that the inheritance pattern of this new color is autosomal recessive. Males and females can be “pink-eyed”. “Pink-eyed” cats may be born to two fully pigmented cats who are carriers. Each kitten born to two carriers parents has a 25% chance to be “pink-eyed”. A “pink-eyed” cat who is mated to a non-carrier cat will produce only fully pigmented cats (who are all carriers). A “pink-eyed” cat mated to a carrier cat will produce 1/2 of “pink-eyed” kittens and 1/2 of carrier kittens.

A “pink-eyed” cat carries two copies of the mutation involved in the “pink-eye” phenotype. A carrier cat has only one copy of the mutation. A non-carrier cat has no copy of the mutation.
Gene and mutation

According to the inheritance pattern, the “pink-eye” phenotype is caused by a single gene. We have started to search for this gene and for the causative mutation, thanks to cheek-swab samples from “pink-eyed” cats that were sent by owners and breeders. DNA was extracted from cheek-swabs and was analyzed.

The Donskoy “pink-eye” phenotype closely looks like the “pink-eye” phenotype of the mouse or non-syndromic oculocutaneous albinism (OCA) in humans. We have analyzed the DNA from one “pink-eyed” cat, for 8 genes involved in OCA (including the gene involved in the “pink-eye” mutation from the mouse). We have found several variations in the DNA sequence from the “pink-eye” cat compared to the reference sequence of a fully pigmented cat. Only one variation was present in two copies in the “pink-eyed” cat (as expected for the causative mutation) and could have been involved in the phenotype. We have tested additional “pink-eyed” and fully pigmented Donskoy cats for this variation and unfortunately we have found two “pink-eyed” cats with only one copy of the variation. Therefore, we excluded this variation as the candidate mutation for the “pink-eye” phenotype.

Analyses performed on the 8 candidate genes have included the sequencing of the coding regions of these genes. In consequence, we can not exclude that the causative mutation lies in a non-coding region from one of these genes. But the mutation could also be present in another gene. To date, the causative mutation for the “pink-eye” or “unverified-color” coat color of the Donskoy cat remains undeciphered.

To further search for the “pink-eye” mutation we will need another approach that is called a “genome-wide” approach. For this purpose we will need several DNA samples from “pink-eyed” cats as well as from fully pigmented Donskoy cats related to “pink-eyed” cats (parents, grand-parents, littermates) and unrelated. To perform the genome-wide analysis we will need to use an expensive genomic tool called the Feline SNP-array. We will apply to a research grant in December 2016 to be able to access this tool. In consequence, for the moment, the search for the “pink-eye” mutation is postponed. Up to December 2016 we will collect additional DNA samples and pedigree data from Donskoy cats.

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