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

First results, February 2016

Dr Marie Abitbol,
Lyon School of Veterinary Medicine, France

« Unverified-color », « Pink-eye dilution », « Ukraine-chocolate » in Donskoy cats

First results, February 2016

Dr Marie Abitbol, Lyon School of Veterinary Medicine, France

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.

Marie Abitbol, DVM, PhD
Assistant Professor in Genetics
Lyon School of Veterinary Medicine
1 avenue Bourgelat
F-69280 Marcy l'Etoile, FRANCE

Philippe Bossé, DVM
Professor in Zootechny and Genetics
Alfort School of Veterinary Medicine
7 avenue du Général de Gaulle
F-94700 Maisons-Alfort

For any information about this research program, please feel free to contact Dr Marie Abitbol: marie.abitbol@vetagro-sup.fr