



Cat Coat Color Genetics Part 1

In this, and the next edition of the ADL newsletter we will be covering the fascinating field of cat coat color genetics. The following article focuses on the genetics that give rise to the vast variety of cat colors, while in the next edition we will introduce the genetics behind the various patterns and markings found on cats. We hope that you find this series of articles both interesting and informative.

Basic Colours

Cats from all over the world display a great variety of colors.

Basically there are four major cat coat colors.

Those colors are;

Black

Chocolate

Cinnamon

Red

The basic color in a cat's hair is due to the pigment called melanin. Melanin forms tiny granules in the cat's hair that can vary in size, shape and orientation that can give rise to a multitude of colors and patterns.

Chemically, melanin comes in two forms. One is eumelanin, that gives rise to black (or intense brown) pigmentation, while the other is phaeomelanin which gives rise to a red-yellow pigmentation.

Continued page 2

DNA Question Corner—win free tests

Animal DNA Laboratory gives all readers the opportunity to ask questions relating to animal genetics. The best question each issue will win 2 free DNA tests and be published in the ADL newsletter. So if you have a question simply send it to

dnaquestion@animalsdna.com

This quarter's winner is R Beca from Auckland New Zealand who asked. "I'm really interested in how you get genetic information of my cats from samples taken using those little brushes, Can you please tell me how this happens?"

Dear Mr Beca, when you brush the inside of your animals mouth with those little swabs we provide, cells lining the inside cheeks are collected onto the little plastic bristles.

**STOP
PRESS!**

**DILUTION
TESTING
COMING!**

Inside this issue:

DNA QUESTION	2
CORNER CONTINUED	
CHOCOLATE/CINNAMON	2
RED	3
DILUTE	3
NEW MEMBERS	4
WHITE	4

New DNA tests can identify the carriers of either chocolate or cinnamon.

DNA Question Corner

After a period these cells containing the animals DNA dry out and firmly stick to the brush. The DNA in this form is very stable and in fact can be stored for many months in this form at normal room temperature.

This is of course the reason why you can simply put the brushes into the mail and send them to anywhere in the world.

Once we receive the brushes containing your animals dried cheek cells in our laboratory, we briefly soak them in clean sterile water to re-hydrate the cells, allowing them to fall off the plastic bristles.

After this we collect the cells into a small plastic tube and add chemicals that both break open the cell, as well as release the DNA into solution.

We then process the DNA by ridding it of any attached proteins that may interfere with our testing procedure.

At this stage the DNA is ready for testing, or for simple storage at either 4 degrees Celsius, or at minus twenty degrees Celsius for more prolonged storage.

Chocolate and Cinnamon

Recently, it has been shown that mutations in the DNA sequence of the tyrosine-related protein 1 gene (TRYP1), which is involved in the production of melanin, can result in the black pigmentation granules being laid down differently.

This results in the colors known as chocolate and cinnamon.

The normal type or allele of

this gene, which is designated B, is genetically dominant over the other alleles for either chocolate (b) or cinnamon (b^l).

This means that cats that are found to be genetically B/B, B/b or B/b^l cannot be distinguished visually.

Hence the benefit of new DNA tests that can identify carriers of either chocolate or cinnamon.

It is also of interest to note that the chocolate (b) allele is dominant over the cinnamon (b^l) allele, meaning that cats found to be either b/b or b/b^l will both be chocolate in color.

Red—the story continues

Of course the story doesn't end there because another color is found in cats, and that is red.

The red coloration, sometimes called orange is due to the Orange gene, which still remains to be found (hence no DNA test yet).

The orange gene is found on the X-chromosome, and as such the color is called a *sex-linked trait*. This is be

cause the X and Y chromosomes determines the sex of a particular animal.

The Orange gene comes in two types or alleles that is, orange (O) or non-orange (o). The O allele leads to phaeomelanin production replacing that of eumelanin (the black pigment).

Because the gene is found on the X-chromosome

males (who have only one X chromosome) can either be O or o, whereas females (two X chromosomes) can be OO, Oo or oo.

Male O and female OO cats are red in color. Females that are Oo present as the pattern known as tortoiseshell, with coats containing both areas black pigmentation and red pigmentation.

Interesting to note

The non-orange allele (o) is recessive to the black color gene, while the dominant orange allele (O) overrides or masks the black gene, converting black/brown color to orange.

Cat DNA tests currently offered:

Polycystic Kidney Disease (PKD)
Chocolate Coat Colour
Cinnamon Coat Colour
Colourpoint Restriction (Siamese & Burmese)
AgoutiDNA
Profiling
Parentage Verification by DNA

Dilute

Another gene called the Dilute gene, affects the distribution of melanin granules within the hair.

The dominant or dense allele (known as D) produces a dense pigmentation of the hair, while the recessive dilute allele (d) results in the pigment clumping creating

areas in the hair with no pigment granules.

This later effect causes the cats coat color to dilute or lighten.

Therefore cats that are dd for the dilute gene will have their primary hair colors diluted, hence

Black dilutes to Blue,

Chocolate to Lilac,

Cinnamon to Fawn

and Red to Cream.

Animal DNA Laboratory will in the next month be providing tests for the dilution gene test for cat coat color.

**In the next month
Animal DNA
Laboratory will
be providing tests
for the dilution
gene test for cat
coat color.**

P.O Box 13313
William Street
Melbourne
Vic 8010
Australia

Phone:
+613 9517 6792

Fax:
+613 9670 5822

E-mail:
contact@animalsdna.com

White

Finally white hair occurs in the absence of pigmentation. Totally white cats can occur in three very different genetic circumstances.

One, a totally white cat can be an albino. An albino occurs when a cat inherits two copies of the major albino gene (cc) resulting in a total lack of pigmentation in both hair and eyes. In these cats their hair is totally white and they have pink eyes. There is another rare variety of albino that results in a small amount of pigment being produced, resulting in eyes that appear as a very pale-blue.

The **second** type of totally white cat is one that has complete white spotting. White spotting can occur with any coat color. The spotted allele (S) creates white spots. Cats that are genetically Ss, that is they carry only one copy of the spotting gene, typically have white spots on their feet, nose, chest and belly, whereas cats that are genetically SS, that is they have two copies of the gene, have white spots covering more than half their bodies. In fact some of these cats may appear to be totally white. Areas of white spotting are due to the absence of the melanin

-producing cells called melanocytes.

The **third** type of white cat is due to a gene known as the dominant white gene (W). The dominant white gene overrides all other color genes and produces a white cat. This occurs because the dominant white gene blocks the production of melanin-producing cells called melanocytes.

We will be adding new tests in the next few months so keep an eye on;

www.animalsdna.com

Animal DNA Laboratory offers a 10% discount to the members of clubs and Associations that have registered with us. Some clubs or Associations that have recently registered are

COAWA—Cat Association of Western Australia www.coawa.optiic.com/index.htm

Colourpoint Cat Club (United Kingdom) www.colourpointcatclub.co.uk/links.htm

Feline Control Council of Victoria www.hotkey.net.au/~fccvic/fccv15.htm