

Egyptian Mau Pattern and Color Genetics

by Constance A Carroll, PhD

Pattern: How did they get those spots?

The Egyptian Mau is the only spotted domestic cat that developed naturally, without deliberate hybridization between domestic breeds or domestic and wild feline species. Maus evolved from small African wild cats thousands of years ago as cats and humans became increasingly interdependent and cats played an integral, necessary part in the Nile agricultural ecosystem. The hallmark of the Egyptian Mau, retained from its ancient wild ancestry, is the dramatic, eye-catching spotted tabby pattern.

It is generally accepted that the spotted pattern occurs because of the presence of a dominant pattern modifier gene (Sp) that breaks up the pattern into smaller patches that manifest as spots. A cat that has only one copy of the dominant spotting modifier, in other words is heterozygous for spotting modifier, when paired with another cat that is heterozygous for Sp , can produce a full-patterned kitten, which in Maus is most commonly seen as a classic or blotched patterned kitten.

Given the current understanding of domestic feline pattern genetics, it is probably more correct to refer to a spotted cat that can produce full-patterned kittens as carrying for non-spotting (sp) that allows expression of the underlying classic or other pattern. The full pattern is already there, but is broken up by the spotting modifier (Sp) in Egyptian Maus.

All Egyptian Maus, no matter their color, will have genotype $SpSp$ or $Spsp$ and will display a spotted pattern. Any non-spotted kittens born to Egyptian Mau parents will have genotype $spsp$ and will display a classic or mackerel pattern.



For an interesting mathematical explanation of pattern evolution in all species, click the spots on the left.

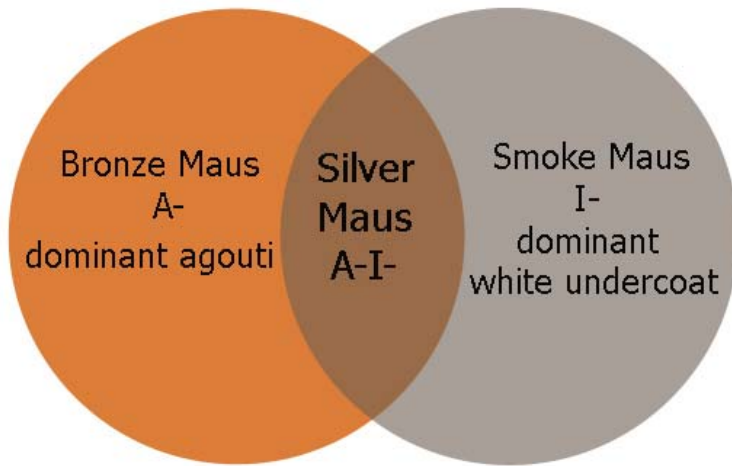
For an explanation of pattern inheritance in domestic cats by Dr Heather Lorimer, click the spotted tabby on the right.



Color: Are all Maus really black?

The Egyptian Mau is recognized for exhibition in three colors: *silver*, *bronze*, and *smoke*. The basic underlying color of all Egyptian Maus is black (B), and it is assumed that all Maus are homozygous for black with genotype BB. The best way to determine the underlying color of a Mau is to check the color of the tail tip and the paw pads, which should always be black.

There are two sets of genes that interact to produce the three black-based Mau colors: the dominant agouti gene (A) and the dominant color inhibitor gene (I).



DOMINANT GENES

Dominant Genes:

The agouti gene (A) does two things: it causes a lightening of the black pigment in the hair shaft, and it produces an alteration of color or banding in the hair shaft, which is known as ticking. These effects allow the pattern of the cat to be easily seen. Silver and bronze Maus both have a dominant agouti gene, so must have genotype AA (homozygous) or Aa (heterozygous).

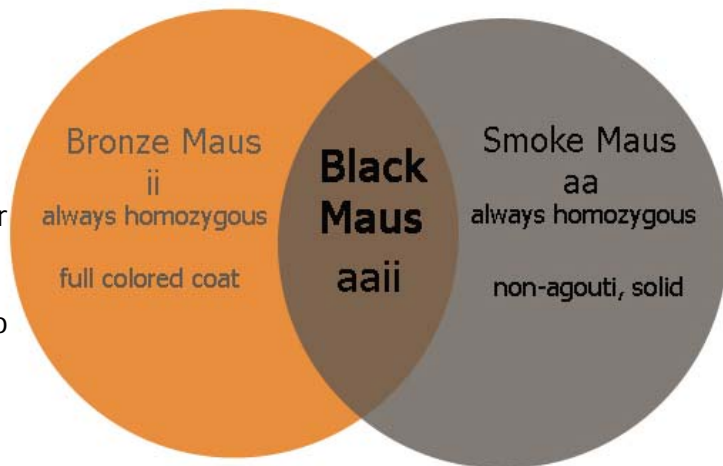
The color inhibitor gene (I) prevents the deposition of pigment in the hair shaft, especially at the base of the hair, thus producing a non-pigmented or white undercoat. Silver and smoke Maus both have a dominant color inhibitor gene, so must have genotype II (homozygous) or Ii (heterozygous).

When the dominant alleles, agouti and inhibitor, are both present the result is a silver Egyptian Mau: a spotted tabby with black markings on a pale ticked ground with a white undercoat.

Recessive Genes:

When the agouti gene is homozygous recessive, aa, the hair shaft has no ticking or banding, and this produces a solidly colored cat. In Maus this is seen in the smokes and the solid blacks. When the color inhibitor gene is homozygous recessive, ii, the hair shaft is fully colored from root to tip with no hypo pigmentation. In Maus this produces the bronzes and the solid blacks.

When the recessives of both agouti and inhibitor are present and homozygous, the result is a solid black cat.



RECESSIVE GENES

The smoke Mau is always homozygous for the recessive non-agouti genes and always has at least one dominant inhibitor gene, so the smoke is a non-agouti or solid cat with a white undercoat, *aal-*. The inhibitor gene brings out the visibility of the pattern in a smoke Mau. The bronze Mau always has at least one dominant agouti gene and is homozygous for the recessive full color genes, so the bronze is an agouti or ticked cat with fully expressed color, *A-ii*. The fur is colored from root to tip with ticking in the ground areas of the pattern.

Color Inheritance: Can only silver Maus have a rainbow litter?

Because silver Maus are the result of a combination of dominant genes, agouti and inhibitor, silvers can be heterozygous and carry non-agouti and full color as recessives. This means that in addition to the expected silver kittens, silver Maus are able to produce smoke, bronze, or even black kittens when bred to any other color Mau, be it silver, bronze, or smoke, depending on what recessives are carried and which gene combinations occur in the kittens.

Because bronze Maus have the dominant agouti gene and smoke Maus have the dominant inhibitor gene, when bronze and smoke are bred together, they can produce silver kittens as well as black, bronze, or smoke kittens. All the silver kittens resulting from this cross would have the genotype *Aali*, the bronze kittens would have the genotype *Aaⁱⁱ*, and the smoke kittens would have the genotype *aali*.

It is common to refer to some bronze Maus as “carrying for smoke” or smoke Maus as “carrying for bronze.” This is only true when the bronze or smoke that “carries” for the other recessive color is bred to a silver or the opposite recessive color. Bronze Maus that are heterozygous for agouti, i.e. that carry for non-agouti or solid (*Aa*), can produce smoke kittens when bred to a silver heterozygous (*Aa*) Mau or to a smoke Mau (*aa*), but when bred to another bronze, can only produce bronze or black kittens. Bronze Maus lack the dominant inhibitor gene, and therefore, they cannot produce either silvers or smokes when bred together. Smoke Maus that are heterozygous for inhibitor, i.e. that carry for full color coat (*Ii*), can produce bronze kittens when bred to a silver heterozygous Mau (*Ii*) or to a bronze Mau (*ii*), but when bred to another smoke, can only produce smoke or black Maus. Smoke Maus do not have the dominant agouti gene, so cannot produce either silvers or bronzes when bred together.

X	Silver	Bronze	Smoke	Black
Silver	Silver, Bronze, Smoke, Black	Silver, Bronze, Smoke, Black	Silver, Bronze, Smoke, Black	Silver, Bronze, Smoke, Black
Bronze	Silver, Bronze, Smoke, Black	Bronze, Black	Silver, Bronze, Smoke, Black	Bronze, Black
Smoke	Silver, Bronze, Smoke, Black	Silver, Bronze, Smoke, Black	Smoke, Black	Smoke, Black
Black	Silver, Bronze, Smoke, Black	Bronze, Black	Smoke, Black	Black



For a more detailed chart of Mau genotypes by Dr Melissa Bateson, click the DNA strand above.