

The G-locus – Blue and Blue Agouti

BY ANNALIE PRINSLOO (APRIL 2015)

Origin

One of the weirdest things of blue rats are that they were discovered in pet shop stock in at least three different countries at almost the same time. We know of blue rats discovered in the 1990's in the UK, USA and South Africa. Unfortunately, I could not establish the exact discovery of the Australian blue, if they also came from pet shop stock and when they first appeared. Another curiosity of all blue rats, apart from that they look almost exactly the same in colour and breed true to each other, is that they all have the same health problems. It almost looks as if the blue rats in the world are either all the same mutation oddly appearing on four different continents or that they are all alleles of the same locus. Personally, I lean to the allele theory but all four types of blue rats need to be scientifically studied in order to find out exactly how their genetics work.

A note on nomenclature of blue rats: There are two methods to go about naming blue rats. The first method, which is used in this article, is to name blue rats according to the place of origin where each different type of blue is discovered (e.g. American blue, British blue, Australian blue and Cape blue). The second method is to name blues according to the different shades the blue colour comes in (e.g. slate blue, powder blue, sky blue and smoked blue). The first method is rarely used, but is of value when considering a blue rat's genetic background. The second method is based on visual appearance and not the genetic background of a blue rat.

AMERICAN BLUE

The first blue rat on American soil was discovered in 1990. Her name was Tinker and she was found in a petshop in Southern California by Sheryl Leisure (Royer, 1996). American blue has been scientifically described in 2010 (Kuramoto, *et al.* 2010).



American blue berkshire buck

BRITISH BLUE

The first British blue was discovered in 1990 in a pet shop in the UK by Roger and Joan Branton (Mays, 1997). British blue hasn't been scientifically described yet.

CAPE BLUE

Angeleen Rossouw of Wheatfields rattery first saw blue rats in 1989 in a pet shop, but they were a lighter shade than the ones which looked like the Cape blues we know today, which she first saw in 1993. Samantha Brown of Settican rattery first saw a Cape blue rat owned by a friend in 1996. Both early sightings occurred in the Cape Province, resulting in the naming “cape blue”. It seems Cape blue originated in the Western Cape Province and later spread from there to some of the other provinces in South Africa. Cape blue hasn’t been scientifically described yet.



Cape blue self doe

AUSTRALIAN BLUE

Australian blue is yet another blue mutation which appeared in Australia. The Australian fancy rat population is unique in that they are completely isolated from other rat populations in the world. Australian laws forbid any importation of rats. Therefore the Australian blue is not descended from any of the other blue rats in the world but a spontaneous mutation which occurred in their own local populations. Australian blue hasn’t been scientifically described yet.

South African History

In South Africa we have two of the four types of blue rats. One is the local variety named the Cape blue and the other is the imported variety named American blue.



Cape blue hooded bucks

CAPE BLUE

The Cape blue is a local mutation found in petshops in Cape Town in the 1990's.



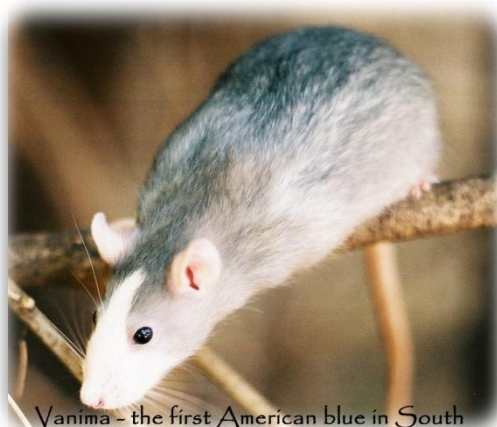
Cape blue hooded doe



Cape blue hooded buck

AMERICAN BLUE

American blue was imported with the rats of the 2006 import. The American blue rats came from the MS Blue x MS Raven cross. Both MS Blue and MS Raven carried the blue gene and in their first litter they had two babies that expressed the blue gene. One was MS Anastasia a russian silver blazed berkshire doe and the other MS Vanima a blue blazed berkshire doe. Liezel kept MS Anastasia and I took MS Vanima. Some of the other babies from the MS Blue x MS Raven cross also carried blue.



Vanima - the first American blue in South Africa (she was an American blue blazed berkshire doe)



American blue self kitten

Description

BLUE

"Colour is an even slate grey. When fur is parted slate grey colour should be down to the skin. Belly colour to match top. Eye colour is black." – S.A.R.F.C Standards



Dumbo American blue self doe



Cape blue self doe

I have worked with both Cape Blue and American blue, keeping the lines separate and only crossing them in test matings to figure out the genetics of the Cape blue. The one problem with these two types of blue rats is that they are so close to each other in colour that the best way to distinguish them is to physically hold a Cape blue and a American blue against each other. The main differences between Cape blue and American blue are listed in the table below:

Cape blue	American blue
Whiskers are grey in colour	Whiskers are whitish in colour
Undercoat is grey like the top coat	Undercoat is white
Coat colour is an intense slate grey colour	Coat colour is a soft powdery slate grey colour



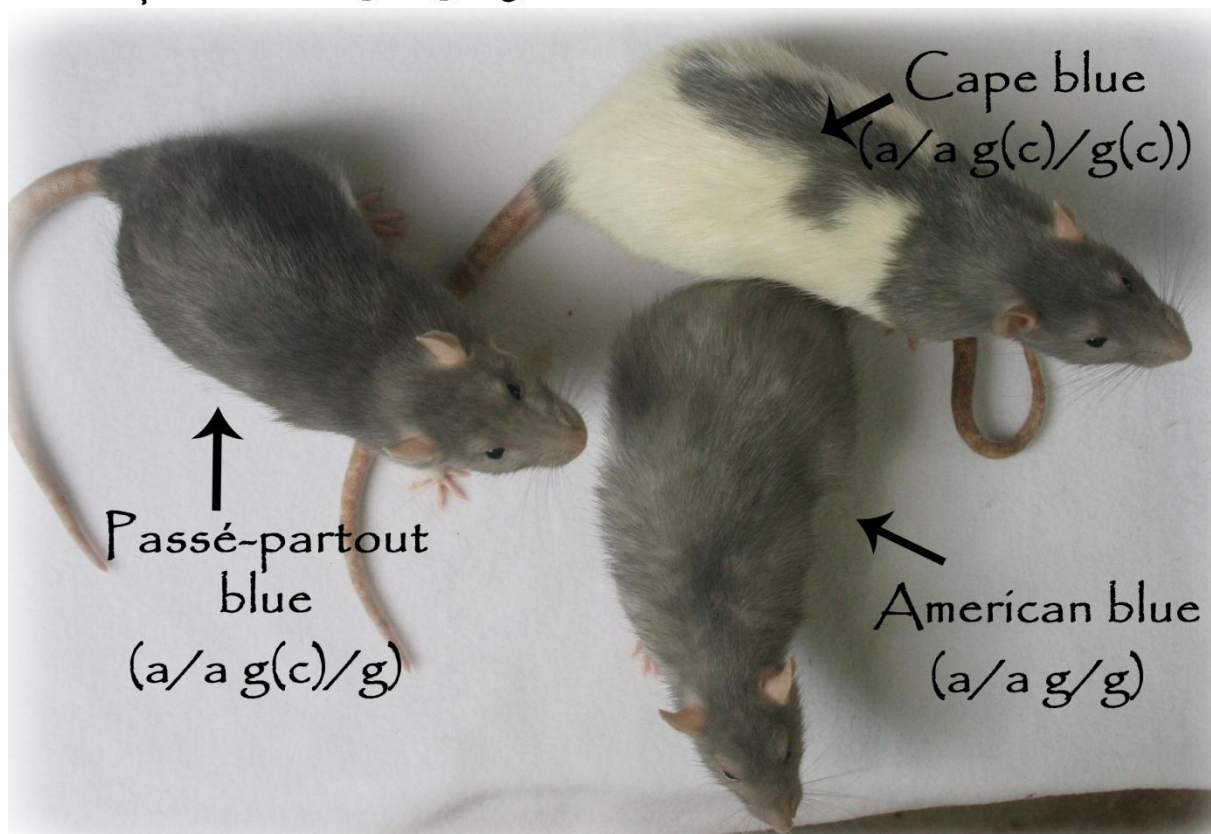
American blue undercoat (a/a g/g)

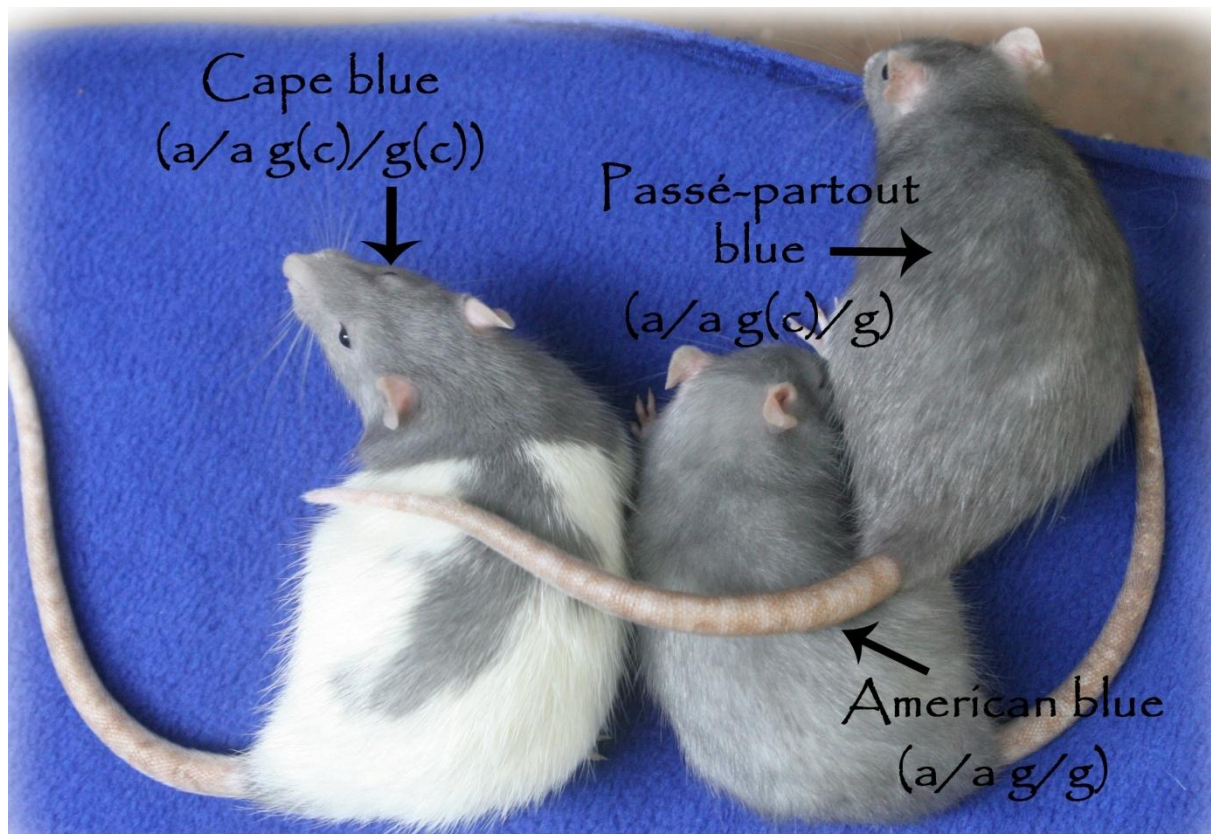


Cape blue undercoat (a/a g(c)/g(c))



Passé-partout blue undercoat (a/a g(c)/g)





The eye colour in both blue mutations is black. Both American blue and Cape blue can vary in colour intensity. I noted that the American blues varied the most in intensity up to a point that every kitten in a litter is a different shade of blue. In the USA they name the darkest shades of blue, "**slate blue**" and the lightest shades, "**powder blue**", whilst the medium shades ones are called "**sky blue**" (Royer, 1996).



Smoked blue with white undercoat (this rat is American blue based)

American blue can also be bred selectively to either increase or decrease the white undercoat. American blues with the whitest undercoats are called "**Smoked blue**". The "smoked" effect being from selective breeding and not from a separate gene acting on the blue coat. The S.A.R.F.C Standards describe the smoked blue as: "Same as blue except with whitish undercoat".



American blue variegated berkshire doe with white undercoat (smoked blue)

Both blue varieties are prone to faults such as rustiness of coat, patchiness of colour (especially when they are moulting) and silvering of coat colour. It is difficult to know exactly how a baby blue will look like as an adult as a light coloured baby may mould into a dark coloured adult.

BLUE AGOUTI

Blue agouti can be bred out of any kind of blue.



Blue agouti Berkshire buck (American blue based)



Blue agouti Berkshire doe (Cape blue based)

“A medium slate blue colour with a tan tip hair shaft, evenly ticked with blue guard hairs. Undercoat blue. Belly fur a silver blue colour. Eye colour is black.” – S.A.R.F.C. Standards



Blue agouti Berkshire doe (American blue based)



Blue agouti Berkshire kitten (Cape blue based)

Blue agouti rats are greyer and lighter than Russian blue agouti rats. Blue agouti rats are also prone to rustiness of colour. Blue agoutis can also vary somewhat in shade from individual to individual. Blue agoutis also have all the health problems associated with blue rats.

Genetics

BLUE

The biggest uncertainty about blue rat genetics lies with the question: Are the four types of blue alleles of each other or are they in fact all exactly the same mutation? Only science can answer this question and thus far only American blue has been scientifically studied.

AMERICAN BLUE

The American blue is a black based rat with the homozygous recessive blue mutation located on chromosome 8 (Kuramoto, *et al.*, 2010). In the USA the gene is symbolized as “g” and in the UK as “d”. We use the symbol g since d is also used to symbolize russian blue. Therefore an American blue is genetically a/a g/g.



American blue variegated
berkshire doe



American blue self kitten with
white undercoat (smoked blue)

CAPE BLUE



Cape blue self doe

In order to discover what Cape blues are genetically I cross Cape blue with American blue. To my surprise I did not get black kittens as I expected but whole litters of blue kittens. When crossing the F1 blue kittens with each other I got Cape blues, American blues and more blues that resembled the F1 blues (called *passé-partout** blues). From this I concluded that Cape blue is not a completely separate mutation but an allele to American blue. I gave Cape blue the symbol “g^c” to distinguish between the two kinds of blue available in South Africa. I also bred Cape blue as well as American blue to Australian mink to

produce platinum and this resulted in two clearly different coloured rats. I write Cape blue as a/a g^c/g^c. It seems that double dilute colours based on a Cape blue background is a bit darker than double dilute colours based on a American blue background.

*A French word meaning master key, pronounced paspa:’tu: Used in genetics to refer to a phenotype expressing the characteristics of both parent genotypes simultaneously. A passe-partout is the masterkey for two alleles.



(A cross between Cape blue and American blue: $g(c)/g$)



(A cross between Cape blue and American blue: $g(c)/g$)



American blue x Australian red eyed dilution



Cape blue x Australian red eyed dilution

AUSTRALIAN BLUE

Connie Perez from the USA also did test matings with American blue x Australian blue. The kittens in her litter were also all blue, showing that Australian blue and American blue are the same gene or alleles on the same locus (Perez, 2003).

BRITISH BLUE

I do not know of any deliberate crosses between British blue x any other kinds of blue in order to study the genetics of the British blue. Yet I suspect that crosses have unintentionally occurred many times between British blue and American blue since the UK and the USA often export rats to each other. If the cross of British blue x American blue gave black kittens showing that these two mutations are unrelated we would have heard about it by now.

BLUE AGOUTI (ALL KINDS)

Blue agouti is just the agouti version of any of the blues mentioned above. Blue agouti is written as $A/- g/g$.



Blue agouti self buck (American blue based)

Health problems

BLEEDING OUT

Caution should be taken when breeding with blue rats. All kinds of blue rats are “bleeders” which means they may bleed more than what is usual. What is dangerous about this is that females giving birth can actually bleed to death. There are many horror stories out there about blue rats bleeding to death. The bleeding problem is not the same intensity with every rat, but one is never sure which females bleed too much and which do not. It is recommended that one would rather breed from black females carrying blue to blue males to be on the safe side. If one must breed from a blue female, do it when she is very young (4 months old). One must also be on one’s guard when it’s time for her to give birth so that one can take her to the vet if needed.

We bred from MS Vanima and MS Anastasia when they were 4 months old and although both bled more than other females they did not bleed too severely giving birth. I do remember that Vanima was very pale and listless a day after giving birth. I never again bred from Vanima and after that I used only females that carry blue to breed from. Anastasia also had no severe problems with her first litter, but she bled excessively with her second litter, lost her babies and almost died herself. This was a clear warning for us concerning this mutation! Although Vanima and Anastasia were American blue types, it is also possible that Cape blues can bleed too much as well.

SHORT LIFE SPAN

Both Cape blue and American blue rats tend to have a shorter lifespan than what is usual for rats. Cape blues are the worst in that they often only reach about half the normal lifespan of a rat. There are some blues that do reach over 2 years of age.

POOR DISEASE RESISTANCE

Both kinds of blues have very poor resistance to lung diseases like mycoplasmosis. The American blues usually get mycoplasmosis when they are older while all the other rats in their groups are healthy. The poor resistance to disease is probably one of the reasons why blue rats do not live long.

SKIN PROBLEMS

It is reported that American blues are very sensitive to high protein diets. They get scabs when there is too much protein in their diet.

TEMPERAMENT PROBLEMS

American blues are reported to become aggressive sometimes, but this is mainly due to bad breeding practices where pet shops in the USA exploited this mutation and mass bred them without regard to health or temperament. It is very likely that the same can occur with our Cape blues since they also often come from pet shops that breed rats indiscriminately for snake food. Many of the other health problems are also often a result of poor breeding practices, where natural tendencies of this mutation is intensified rather than selected out of lines.

References

1. KURAMOTO, T.; YOKOE, M.; YAGASAKI, K.; KAWAGUCHI, T. KUMAFUJI, K. & SERIWAKA, T. 2010. Genetic Analysis of Fancy Derived Mutations. *Experimental Animals* 59(2): 147-155.
2. MAYS, N. 1997. The Proper Care of Fancy Rats. T.F.H Publications, United States of America.
3. PEREZ, C. 2003. New World Downunders. Available at: *Not online anymore*.
4. ROYER, N. 1996. The blue rat. AFRMA rat and mouse tales news magazine. Available at: <http://www.afrma.org/bluerat.htm>

