

COLOUR IN BULL TERRIERS – Part 2 – Inheritance of Colour – Full Version

As discussed in “Colour in Bull Terriers – Part 1 –Expression of Colour”, the colours and colour patterns we observe in Bull Terriers are created by the interactions of just four genes. A restricted gene pool and selective breeding have removed the effect of the ten other coat colour genes for dogs in the Bull Terrier breed.

Just as a reminder, there are 14 loci – particular locations on specific chromosomes where genetic material influencing coat colour can be found.

The loci that are identical in all Bull Terriers are:

The B-Series Locus – Black/Brown Pigment Series

All Bull Terriers are believed to have the genotype *BB* i.e. they have black pigment of the nose, eye rims and mouth.

The C-Series Locus – Pigment Depth or Albino Series

All Bull Terriers are believed to have the genotype *CC* i.e. they have full colour expression with no dilution.

The D-Series Locus – Pigment Density Series

All Bull Terriers are believed to have the *DD* genotype resulting in normal pigment density and no dilution.

The G-Series Locus – Progressive Greying Pattern

All Bull Terriers are believed to have the genotype *gg* i.e. no progressive greying pattern is exhibited.

The P-Series Locus – Pigment Dilution

All Bull Terriers are believed to be *PP* which means that both melanin pigments are not diluted at all.

The I-Series Locus – Intensity Dilution

All Bull Terriers are believed to be *II* i.e. intense colour with no dilution of the phaeomelanin pigment.

The M-Series Locus – Merle Pattern

This locus has no effect in Bull Terriers as all Bull Terriers are believed to be *mm* – no merle pattern.

The H-Series Locus – Harlequin Pattern

The *H* allele is only expressed if the *M* allele causing the merle pattern is also present. As all Bull Terriers are *mm* for no merle pattern, so they are also *hh* for no harlequin pattern.

The T-Series Locus – Ticking Pattern

As ticks are a fault as laid out in the Standard of the Bull Terrier, this phenotype has been selectively bred out. All Bull Terriers should have the *tt* genotype with no ticking.

The R-Series Locus – Roan Pattern

Roan often occurs in dogs which also show ticking. Future research may reveal that it is a variation of ticking rather than a separate pattern. At present, Bull Terriers are believed to be *rr* i.e. no roan pattern.

Remember genotype is the combination of alleles the dog possesses while its phenotype is what it actually looks like. Thus all Bull Terriers for these loci should have the following genotype: *BBCDDgghIIImmPPrrtt*. Of course in all of these loci, mutation of a gene could, and does occur,

causing a change from these genotypes. However as mutation is a random occurrence, it should not have any influence on the overall Bull Terrier population especially when selective breeding against these traits is being exercised.

The four loci which cause variation in colour in Bull Terriers are:

The A-Series Locus – Dark Pigment Pattern or Agouti Series

While there are five alleles possible in the A-Series loci, only two of these occur in the Bull Terrier breed. These two alleles are A^y and a^t . A^y is completely dominant over a^t . This results in three genotypes and their corresponding phenotypes:

$A^y A^y$ – causing a red/fawn phenotype;

$A^y a^t$ – causing a darker red/fawn colour;

$a^t a^t$ – black and tan pattern.

Basically there are two base coat options for a Bull Terrier: the red/fawn colour or a black pattern over the red/fawn colour where the red/fawn colour is visible as marks on the eyebrows and cheeks and edging the black on the chest and lower legs and on the bottom under the tail.

The K-Series Locus – Brindling Pattern

While there are three alleles possible in the K-Series loci, only two of these occur in the Bull Terrier. These two alleles are k^{br} and k^y where k^{br} is dominant to k^y . This results in three genotypes and their corresponding phenotypes:

$k^{br} k^{br}$ – A-Series colour with brindling pattern on the tan/sable;

$k^{br} k^y$ – A-Series colour with brindling pattern on the tan/sable;

$k^y k^y$ – A-Series colour with no brindling pattern at all.

As the k^{br} allele is dominant, if a Bull Terrier has this allele, it will display the brindle pattern and can pass on the brindle pattern. The only exception is in a white Bull Terrier carrying the k^{br} allele, which can pass on brindle but doesn't display it due to the white mask.

The E-Series Locus – Pigment Extension

While there are three alleles possible in the E-Series loci, only two of these occur in the Bull Terrier. These two alleles are E and E^m where E^m is dominant over E . This results in three genotypes and their corresponding phenotypes:

EE – Solid colour as defined by A-Locus Series – no dark mask;

EE^m – Colour as defined by A-Locus Series but with a dark mask;

$E^m E^m$ – Colour as defined by A-Locus Series but with a dark mask.

Originally the brindle markings were believed to be controlled by the E-Series but now it has been found that the E-Series is only responsible for the black mask being present or absent in Bull Terriers. The mask causes darker colour on the muzzle mainly extending up towards the eyes and sometimes visible on the top of the back and tail and is known as smut marking. Before a dog could either be brindle or smut but not both. With the discovery of the K-Series controlling brindle patterns, Brindle dogs (in fact any colour) can also have smut markings even if they are not visible due to the dark overall colour. This gene is a difficult one to consider as the dark mask is only really properly visible in Red Solids (and Fawn Solids) causing Red Smut and Fawn Smut. In Red & White and Fawn & White dogs (and even in Brindle & White), the mask is covered by the white facial patches and can only be visible as black lip markings or black tear marks. In Brindle and Black & Tan colours, the dark mask is not seen unless in the case of Brindle, the brindle colour is very pale. The black facial mask may be much more common than it appears to be.

The S-Series Locus – White Spotting Pattern

This is a very interesting locus affecting the distribution pattern of coloured or of white areas on the body surface. While there are 4 established alleles, only three may occur in the Bull Terrier.

They are –

- S for solid colour – refers to self-coloured – or solid colour with little or no white
- s^i for irish spotting – variable white on the face, chest, underbody, lower legs and feet and tail tip
- s^v for extreme white – completely white, it may have some colour markings but these are confined to the head

Each of these alleles causes a certain amount of coloured and white areas and these fluctuate around an average colour distribution for each allele which the main gene tries to produce. Unfortunately this is a particularly complicated locus due to the effect of genetic modifiers. Modifiers are genetic factors independent of the main gene that act on the expression of the main gene. In this particular case, there are modifiers called 'plus' modifiers which cause more pigment in the phenotype than is expected for the genotype and there are modifiers called 'minus' modifiers which cause less pigment in the phenotype than expected for the genotype. This results in it being almost impossible to discern genotype from phenotype except in the case of the extreme white dog which would be $s^w s^w$. Even in this case, minus modifiers cause the dog to be completely white whereas plus modifiers cause coloured patches on the head.

The result of genetic modifiers is that there is huge overlap in phenotype between different genotypes. The genotypes SS , Ss^i , $s^i s^i$, Ss^w and $s^i s^w$ are indistinguishable from each other due to the action of the plus and minus modifiers. When looking at Bull Terriers, there are clearly three colour patterns as far as white markings are concerned: all white (with patches of colour on the head in some cases), strong white markings on the nose, chest, collar, neck, underbelly, lower legs and tail tip and minimal white markings (most likely on the toes, chest or nose). To simplify any genetic analysis we can assign the following genotypes to these phenotypes:





Genotype	Phenotype	Comment
$s^i s^i$	Little or no white confined to the blaze, chest and toes	This is the case in the so-called Solid Bull Terrier
$s^i s^w$	White blaze, chest, collar, underbelly, lower legs and feet and tail tip, white may only cross the back of the body at the neck	This is the case in the Coloured & White Bull Terrier
$s^w s^w$	All white – may have some colour markings confined to the head	This is the case in the so-called White Bull Terrier

We may be excluding the S allele and the SS , Ss^i and Ss^w genotypes but as they are indistinguishable from $s^i s^i$ and $s^i s^w$ genotypes when expressed, this has little effect on our genetic analyses. Rather it is the significant influences of the plus and minus modifiers on *all* of the alleles of this S -series gene and their possible genotypes that cause confusion between Solid-Coloured and Coloured & White Bull Terriers. Sometimes a genetically Solid-Coloured dog can have quite significant white on the chest – it proves it is genetically Solid-Coloured by an inability to produce White puppies. Alternatively, a dog with hardly any white marking can unexpectedly produce a White puppy thereby demonstrating that genetically it is actually Coloured & White.



The $s^w s^w$ genotype is the one that James Hinks was originally breeding for in the 1800s. The effect of this genotype is a white mask over a Coloured Bull Terrier. All White Bull Terriers still have colour genetically and can pass these colours on to their offspring. As all White Bull Terriers have this double recessive, when bred with each other they will always only produce White puppies.

Putting these four loci and their different possible allele combinations together there are 27 different genotype options which would describe the 12 different phenotypes observed in Bull Terriers. Remember dominant alleles can mask the effect of a recessive allele so you can have two dogs which are phenotypically the same e.g. Black Brindle solids but genotypically they can be different e.g. $a^i a^i k^{br} k^{br} s^i s^i$ and $a^i a^i k^{br} k^y s^i s^i$. All possible genotype options for an observable phenotype have been included in the tables below. For simplification, it has been decided to leave out the effect of the E-Series locus as the effects of this are not visible in most of the phenotypes.



WHITE BULL TERRIERS

Phenotype	Option	Genotype	Possible Offspring Colours
White carrying Red/Fawn 	1	$A^y A^y k^y k^y s^w s^w$	- can produce White, Red & White and Brindle & White puppies depending on the colour of the mate.
	2	$A^y a^t k^y k^y s^w s^w$	- can produce Tricolour and Black Brindle & White puppies as well as all White, Red & White and Brindle & White depending on the colour of the mate.
White carrying Brindle 	1	$A^y A^y k^{br} k^{br} s^w s^w$	- can only produce all White and/or Brindle & White puppies no matter what colour the mate is.
	2	$A^y A^y k^{br} k^y s^w s^w$	- can only produce all White, Brindle & White and/or Red & White puppies depending on the colour of the mate.
	3	$A^y a^t k^{br} k^{br} s^w s^w$	- can produce all White, Brindle & White and Black Brindle & White puppies depending on the colour of the mate.
	4	$A^y a^t k^{br} k^y s^w s^w$	- can produce all Coloured & White options – Brindle & White, Black Brindle & White, Red & White and Tricolour as well as all White puppies depending on the colour of the mate.
White carrying Black & Tan 	1	$a^t a^t k^y k^y s^w s^w$	- can produce all Coloured & White options – Brindle & White, Red & White, Black Brindle & White and Tricolour as well as all White puppies depending on the colour of the mate.
White carrying Black Brindle 	1	$a^t a^t k^{br} k^{br} s^w s^w$	- can only produce all White, Brindle & White and/or Black Brindle & White puppies depending on the colour of the mate.
	2	$a^t a^t k^{br} k^y s^w s^w$	- can produce all Coloured & White options – Brindle & White, Black Brindle & White, Red & White and Tricolour as well as all White puppies depending on the colour of the mate.



RED BULL TERRIERS

Phenotype	Option	Genotype	Possible Offspring Colours
Red/Fawn Solid 	1	$A^Y A^Y K^Y K^Y s^i s^i$	- can produce Red Solid, Brindle Solid, Red & White and Brindle & White puppies depending on the colour of the mate.
	2	$A^Y a^t K^Y K^Y s^i s^i$	- can produce all Solid Coloured and Coloured & White options – Brindle Solid, Brindle & White, Red Solid, Red & White, Black Brindle Solid, Black Brindle & White, Black & Tan Solid and Tricolour puppies depending on the colour of the mate.
Red/Fawn & White 	1	$A^Y A^Y K^Y K^Y s^i s^w$	- can produce Red Solid, Brindle Solid, Red & White, Brindle & White and all White puppies depending on the colour of the mate.
	2	$A^Y a^t K^Y K^Y s^i s^w$	- can produce all colour options – Brindle Solid, Brindle & White, Red Solid, Red & White, Black Brindle Solid, Black Brindle & White, Black & Tan Solid, Tricolour and all White puppies depending on the colour of the mate.



BLACK & TAN/ TRICOLOUR BULL TERRIERS

Phenotype	Option	Genotype	Possible Offspring Colours
Black & Tan Solid 	1	$a^t a^t K^Y K^Y s^i s^i$	- can produce all colour options except White – i.e. Brindle Solid, Brindle & White, Red Solid, Red & White, Black Brindle Solid, Black Brindle & White, Black & Tan Solid and Tricolour puppies depending on the colour of the mate.
Tricolour 	1	$a^t a^t K^Y K^Y s^i s^w$	- can produce all colour options – Brindle Solid, Brindle & White, Red Solid, Red & White, Black Brindle Solid, Black Brindle & White, Black & Tan Solid, Tricolour and all White puppies depending on the colour of the mate.

BRINDLE BULL TERRIERS

Phenotype	Option	Genotype	Possible Offspring Colours
Brindle Solid 	1	$A^y A^y k^{br} k^{br} s^i s^i$	- can only produce Brindle Solid and/or Brindle & White puppies no matter what the colour of the mate is.
	2	$A^y A^y k^{br} k^y s^i s^i$	- can produce Brindle Solid and/or Red Solid, Brindle & White and/or Red & White depending on the colour of the mate.
	3	$A^y a^t k^{br} k^{br} s^i s^i$	- can produce Brindle Solid, Black Brindle Solid, Brindle & White and/or Black Brindle & White puppies depending on the colour of the mate.
	4	$A^y a^t k^{br} k^y s^i s^i$	- can produce all colour options except White – i.e. Brindle Solid, Brindle & White, Red Solid, Red & White, Black Brindle Solid, Black Brindle & White, Black & Tan Solid and Tricolour puppies depending on the colour of the mate.
Brindle & White 	1	$A^y A^y k^{br} k^{br} s^i s^w$	- can only produce Brindle Solid, Brindle & White and/or all White puppies no matter what the colour of the mate is.
	2	$A^y A^y k^{br} k^y s^i s^w$	- can produce Brindle Solid, Red Solid, Brindle & White, Red & White or all White puppies depending on the colour of the mate.
	3	$A^y a^t k^{br} k^{br} s^i s^w$	- can produce Brindle Solid, Black Brindle Solid, Brindle & White, Black Brindle & White and all White puppies depending on the colour of the mate.
	4	$A^y a^t k^{br} k^y s^i s^w$	- can produce all colour options – Brindle Solid, Brindle & White, Red Solid, Red & White, Black Brindle Solid, Black Brindle & White, Black & Tan Solid, Tricolour and all White puppies depending on the colour of the mate.

BLACK BRINDLE BULL TERRIERS

Phenotype	Option	Genotype	Possible Offspring Colours
Black Brindle Solid 	1	$a^t a^t k^{br} k^{br} s^i s^i$	- can only produce Brindle Solid, Black Brindle Solid, Brindle & White and/or Black Brindle & White puppies depending on the colour of the mate.
	2	$a^t a^t k^{br} k^y s^i s^i$	- can produce all colour options except all White – i.e. Brindle Solid, Brindle & White, Red Solid, Red & White, Black Brindle Solid, Black Brindle & White, Black & Tan Solid and Tricolour puppies depending on the colour of the mate.
Black Brindle & White 	1	$a^t a^t k^{br} k^{br} s^i s^w$	- can only produce Brindle Solid, Black Brindle Solid, Brindle & White, Black Brindle & White and all White puppies depending on the colour of the mate.
	2	$a^t a^t k^{br} k^y s^i s^w$	- can produce all colour options – Brindle Solid, Brindle & White, Red Solid, Red & White, Black Brindle Solid, Black Brindle & White, Black & Tan Solid, Tricolour and all White puppies depending on the colour of the mate.

It would very useful for the Bull Terrier breeder to know what colours could be expected from the matings of different coloured parents. To do this, the breeder needs to know the genotypes of their breeding dogs and bitches. Remember – a particular phenotype may result from a number of different genotypes. For example, a Brindle & White Bull Terrier may have one of four different genotypes. While this phenotype is easily observable, its genotype is not so clear. If the parents of the dog are known, then it is possible to be able to identify which genotype is resulting in its Brindle & White phenotype. Thus genotype can be inferred by considering the colours of an individual's parents or from the colours of puppies already produced by that individual.













If the genotype of both parents of a litter is known, proportions of different colours for that litter can easily be calculated mathematically. It is important to note, that these ratios apply to large numbers of individuals and will not occur in small litters but they still give an indication of probability. To use a human example: while a mother may expect a 50% chance of a boy or a girl, she may in fact produce four sons in succession and the fact that she already has four sons does not change the probability that she could have another. She could still expect a 50% chance of another boy. As the number of puppies in a litter is tiny in statistical terms, the actual proportions of the different colours cannot be expected. However, these calculations do show which colours are not possible in particular matings.

To use the tables, find the table with a heading corresponding to the colour of the sire. Look across the top row to find the column heading corresponding to the colour of the dam. Follow this column down through the rows of options to find the colours possible in the litter and their probabilities of occurring. The tables above can be used as a reference to the genotype options.



WHITE BULL TERRIER (carrying RED) – GENOTYPE OPTION 1 – $A^Y A^Y k^Y k^Y s^w s^w$















X	White carrying Red WHITE 	Red & White RD&WH 	Red Solid RDSol 	White carrying Black & Tan WHITE 	Tricolour Tri 	Black & Tan Solid B&TSol 	White carrying Brindle WHITE 	Brindle & White BR&WH 	Brindle Solid BRSol 	White carrying Black Brindle WHITE 	Black Brindle & White BBR&H 	Black Brindle Solid BBRSol 
Genotype Option 1	ALL WHITE	½ WHITE ½ RD&WH	ALL RD&WH	ALL WHITE	½ WHITE ½ RD&WH	ALL RD&WH	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH
Genotype Option 2	ALL WHITE	½ WHITE ½ RD&WH	ALL RD&WH				ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	½ BR&WH ½ RD&WH	ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	½ BR&WH ½ RD&WH
Genotype Option 3							ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH			
Genotype Option 4							ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	½ BR&WH ½ RD&WH			

This genotype of WHITE (carrying RED) can only produce all WHITE, RED & WHITE and BRINDLE & WHITE puppies depending on the colour of the mate.



WHITE BULL TERRIER (carrying RED) – GENOTYPE OPTION 2 – $A^y a^t k^y k^y s^w s^w$















X	White carrying Red WHITE 	Red & White RD&WH 	Red Solid RDSol 	White carrying Black & Tan WHITE 	Tricolour Tri 	Black & Tan Solid B&TSol 	White carrying Brindle WHITE 	Brindle & White BR&WH 	Brindle Solid BRSol 	White carrying Black Brindle WHITE 	Black Brindle & White BBR&H 	Black Brindle Solid BBRSol 
Genotype Option 1	ALL WHITE	½ WHITE ½ RD&WH	ALL RD&WH	ALL WHITE	½ WHITE ¼ RD&WH ¼ TRI	½ RD&WH ½ TRI	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ¼ BR&WH ¼ BBR&WH	½ BR&WH ½ BBR&WH
Genotype Option 2	ALL WHITE	½ WHITE ¾ RD&WH ⅙ TRI	¾ RD&WH ¼ TRI				ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	½ BR&WH ½ RD&WH	ALL WHITE	½ WHITE ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI	¼ BR&WH ¼ RD&WH ¼ BBR&WH ¼ TRI
Genotype Option 3							ALL WHITE	½ WHITE ⅜ BR&WH ⅙ BBR&WH	¾ BR&WH ¼ BBR&WH			
Genotype Option 4							ALL WHITE	½ WHITE ⅜ BR&WH ⅜ RD&WH ⅙ BBR&WH ⅙ TRI	¾ BR&WH ¾ RD&WH ⅙ BBR&WH ⅙ TRI			

This genotype of WHITE (carrying RED) can produce TRICOLOUR and BLACK BRINDLE & WHITE puppies as well as all WHITE, RED & WHITE and BRINDLE & WHITE depending on the colour of the mate.

 **WHITE BULL TERRIER (carrying BRINDLE) – GENOTYPE OPTION 1 – $A^y A^y k^{br} k^{br} s^w s^w$**















X	White carrying Red WHITE 	Red & White RD&WH 	Red Solid RDSol 	White carrying Black & Tan WHITE 	Tricolour Tri 	Black & Tan Solid B&TSol 	White carrying Brindle WHITE 	Brindle & White BR&WH 	Brindle Solid BRSol 	White carrying Black Brindle WHITE 	Black Brindle & White BBR&H 	Black Brindle Solid BBRSol 
Genotype Option 1	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH
Genotype Option 2	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH				ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH
Genotype Option 3							ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH			
Genotype Option 4							ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH			

This genotype of WHITE (carrying BRINDLE) can only produce all WHITE and/or BRINDLE & WHITE puppies no matter what colour the mate is.

 **WHITE BULL TERRIER (carrying BRINDLE) – GENOTYPE OPTION 2 – $A^Y A^Y k^{br} k^y s^w s^w$**















X	White carrying Red	Red & White	Red Solid	White carrying Black & Tan	Tricolour	Black & Tan Solid	White carrying Brindle	Brindle & White	Brindle Solid	White carrying Black Brindle	Black Brindle & White	Black Brindle Solid
	WHITE 	RD&WH 	RDSol 	WHITE 	Tri 	B&TSol 	WHITE 	BR&WH 	BRSol 	WHITE 	BBR&H 	BBRSol 
Genotype Option 1	ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	½ BR&WH ½ RD&WH	ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	½ BR&WH ½ RD&WH	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH
Genotype Option 2	ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	½ BR&WH ½ RD&WH				ALL WHITE	½ WHITE ¾ BR&WH ⅛ RD&WH	¾ BR&WH ¼ RD&WH	ALL WHITE	½ WHITE ¾ BR&WH ⅛ RD&WH	¾ BR&WH ¼ RD&WH
Genotype Option 3							ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH			
Genotype Option 4							ALL WHITE	½ WHITE ¾ BR&WH ⅛ RD&WH	¾ BR&WH ¼ RD&WH			

This genotype of WHITE (carrying BRINDLE) can produce all WHITE, BRINDLE & WHITE and/or RED & WHITE puppies depending on the colour of the mate.

 **WHITE BULL TERRIER (carrying BRINDLE) – GENOTYPE OPTION 3 – $A^y a^t k^{br} k^{br} s^w s^w$**















X	White carrying Red	Red & White	Red Solid	White carrying Black & Tan	Tricolour	Black & Tan Solid	White carrying Brindle	Brindle & White	Brindle Solid	White carrying Black Brindle	Black Brindle & White	Black Brindle Solid
	WHITE 	RD&WH 	RDSol 	WHITE 	Tri 	B&TSol 	WHITE 	BR&WH 	BRSol 	WHITE 	BBR&H 	BBRSol 
Genotype Option 1	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ¼ BR&WH ¼ BBR&WH	½ BR&WH ½ BBR&WH	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ¼ BR&WH ¼ BBR&WH	½ BR&WH ½ BBR&WH
Genotype Option 2	ALL WHITE	½ WHITE ¾ BR&WH ⅙ BBR&WH	¾ BR&WH ¼ BBR&WH				ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ¼ BR&WH ¼ BBR&WH	½ BR&WH ½ BBR&WH
Genotype Option 3							ALL WHITE	½ WHITE ¾ BR&WH ⅙ BBR&WH	¾ BR&WH ¼ BBR&WH			
Genotype Option 4							ALL WHITE	½ WHITE ¾ BR&WH ⅙ BBR&WH	¾ BR&WH ¼ BBR&WH			

This genotype of WHITE (carrying BRINDLE) can produce all WHITE, BRINDLE & WHITE and/or BLACK BRINDLE & WHITE puppies depending on the colour of the mate.



WHITE BULL TERRIER (carrying BRINDLE) – GENOTYPE OPTION 4 – $A^y a^t k^{br} k^y s^w s^w$















X	White carrying Red	Red & White	Red Solid	White carrying Black & Tan	Tricolour	Black & Tan Solid	White carrying Brindle	Brindle & White	Brindle Solid	White carrying Black Brindle	Black Brindle & White	Black Brindle Solid
	WHITE 	RD&WH 	RDSol 	WHITE 	Tri 	B&TSol 	WHITE 	BR&WH 	BRSol 	WHITE 	BBR&H 	BBRSol 
Genotype Option 1	ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	½ BR&WH ½ RD&WH	ALL WHITE	½ WHITE ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI	¼ BR&WH ¼ RD&WH ¼ BBR&WH ¼ TRI	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ¼ BR&WH ¼ BBR&WH	½ BR&WH ½ BBR&WH
Genotype Option 2	ALL WHITE	½ WHITE ⅜ BR&WH ⅜ RD&WH ⅜ BBR&WH ⅜ TRI	⅜ BR&WH ⅜ RD&WH ⅜ BBR&WH ⅜ TRI				ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	¾ BR&WH ¼ RD&WH	ALL WHITE	½ WHITE ⅜ BR&WH ⅜ BBR&WH ⅜ RD&WH ⅜ TRI	⅜ BR&WH ⅜ BBR&WH ⅜ RD&WH ⅜ TRI
Genotype Option 3							ALL WHITE	½ WHITE ⅜ BR&WH ⅜ BBR&WH	¾ BR&WH ¼ BBR&WH			
Genotype Option 4							ALL WHITE	½ WHITE ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI	⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI			

This genotype of WHITE (carrying BRINDLE) can produce all coloured & white options – BRINDLE & WHITE, BLACK BRINDLE & WHITE, RED & WHITE and/or TRICOLOUR as well as all WHITE puppies depending on the colour of the mate.



WHITE BULL TERRIER (carrying BLACK BRINDLE) – GENOTYPE OPTION 1 – $a^t a^t k^{br} k^{br} s^w s^w$















X	White carrying Red	Red & White	Red Solid	White carrying Black & Tan	Tricolour	Black & Tan Solid	White carrying Brindle	Brindle & White	Brindle Solid	White carrying Black Brindle	Black Brindle & White	Black Brindle Solid
	WHITE 	RD&WH 	RDSol 	WHITE 	Tri 	B&TSol 	WHITE 	BR&WH 	BRSol 	WHITE 	BBR&H 	BBRSol 
Genotype Option 1	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BBR&WH	ALL BBR&WH	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BBR&WH	ALL BBR&WH
Genotype Option 2	ALL WHITE	½ WHITE ¼ BR&WH ¼ BBR&WH	½ BR&WH ½ BBR&WH				ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BBR&WH	ALL BBR&WH
Genotype Option 3							ALL WHITE	½ WHITE ¼ BR&WH ¼ BBR&WH	½ BR&WH ½ BBR&WH			
Genotype Option 4							ALL WHITE	½ WHITE ¼ BR&WH ¼ BBR&WH	½ BR&WH ½ BBR&WH			

This genotype of WHITE (carrying BLACK BRINDLE) can produce all WHITE, BRINDLE & WHITE and/or BLACK BRINDLE & WHITE puppies depending on the colour of the mate.

 **WHITE BULL TERRIER (carrying BLACK BRINDLE) – GENOTYPE OPTION 2 – $a^t a^t k^{br} k^y s^w s^w$**















X	White carrying Red WHITE 	Red & White RD&WH 	Red Solid RDSol 	White carrying Black & Tan WHITE 	Tricolour Tri 	Black & Tan Solid B&TSol 	White carrying Brindle WHITE 	Brindle & White BR&WH 	Brindle Solid BRSol 	White carrying Black Brindle WHITE 	Black Brindle & White BBR&H 	Black Brindle Solid BBRSol 
Genotype Option 1	ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	½ BR&WH ½ RD&WH	ALL WHITE	½ WHITE ¼ BBR&WH ¼ TRI	½ BBR&WH ½ TRI	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BBR&WH	ALL BBR&WH
Genotype Option 2	ALL WHITE	½ WHITE ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI	¼ BR&WH ¼ RD&WH ¼ BBR&WH ¼ TRI				ALL WHITE	½ WHITE ⅓ BR&WH ⅙ RD&WH	¾ BR&WH ¼ RD&WH	ALL WHITE	½ WHITE ⅓ BBR&WH ⅙ TRI	¾ BBR&WH ¼ TRI
Genotype Option 3							ALL WHITE	½ WHITE ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI	¼ BR&WH ¼ RD&WH ¼ BBR&WH ¼ TRI			
Genotype Option 4							ALL WHITE	½ WHITE ⅜ BR&WH ⅜ BBR&WH ⅙ RD&WH ⅙ TRI	⅜ BR&WH ⅜ BBR&WH ⅙ RD&WH ⅙ TRI			

This genotype of WHITE (carrying BLACK BRINDLE) can produce all coloured & white options – BRINDLE & WHITE, BLACK BRINDLE & WHITE, RED & WHITE and/or TRICOLOUR as well as all WHITE puppies depending on the colour of the mate.

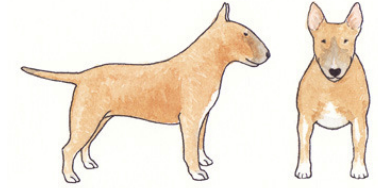
 **WHITE BULL TERRIER (carrying BLACK & TAN) – GENOTYPE OPTION 1 – $a^t a^t k^y k^y s^w s^w$**















X	White carrying Red WHITE 	Red & White RD&WH 	Red Solid RDSol 	White carrying Black & Tan WHITE 	Tricolour Tri 	Black & Tan Solid B&TSol 	White carrying Brindle WHITE 	Brindle & White BR&WH 	Brindle Solid BRSol 	White carrying Black Brindle WHITE 	Black Brindle & White BBR&H 	Black Brindle Solid BBRSol 
Genotype Option 1	ALL WHITE	½ WHITE ½ RD&WH	ALL RD&WH	ALL WHITE	½ WHITE ½ TRI	ALL TRI	ALL WHITE	½ WHITE ½ BR&WH	ALL BR&WH	ALL WHITE	½ WHITE ½ BBR&WH	ALL BBR&WH
Genotype Option 2	ALL WHITE	½ WHITE ¼ RD&WH ¼ TRI	½ RD&WH ½ TRI				ALL WHITE	½ WHITE ¼ BR&WH ¼ RD&WH	½ BR&WH ½ RD&WH	ALL WHITE	½ WHITE ¼ BBR&WH ¼ TRI	½ BBR&WH ½ TRI
Genotype Option 3							ALL WHITE	½ WHITE ¾ BR&WH ⅙ BBR&WH	½ BR&WH ½ BBR&WH			
Genotype Option 4							ALL WHITE	½ WHITE ⅙ BR&WH ⅙ BBR&WH ⅙ RD&WH ⅙ TRI	¼ BR&WH ¼ BBR&WH ¼ RD&WH ¼ TRI			

This genotype of WHITE (carrying BLACK & TAN) can produce all coloured & white options – BRINDLE & WHITE, BLACK BRINDLE & WHITE, RED & WHITE and/or TRICOLOUR as well as all WHITE puppies depending on the colour of the mate.

 **RED SOLID BULL TERRIER – GENOTYPE OPTION 1 – $A^y A^y k^y k^y s^i s^i$**

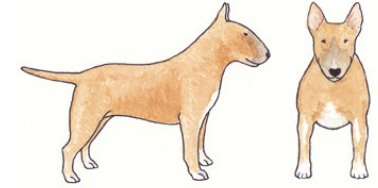


X	White carrying Red WHITE 	Red & White RD&WH 	Red Solid RDSol 	White carrying Black & Tan WHITE 	Tricolour Tri 	Black & Tan Solid B&TSol 	White carrying Brindle WHITE 	Brindle & White BR&WH 	Brindle Solid BRSol 	White carrying Black Brindle WHITE 	Black Brindle & White BBR&H 	Black Brindle Solid BBRSol 
Genotype Option 1	ALL RD&WH	½ RDSol ½ RD&WH	ALL RDSol	ALL RD&WH	½ RDSol ½ RD&WH	ALL RDSol	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol
Genotype Option 2	ALL RD&WH	½ RDSol ½ RD&WH	ALL RDSol				½ BR&WH ½ RD&WH	¼ BRSol ¼ BR&WH ¼ RDSol ¼ RD&WH	½ BRSol ½ RDSol	½ BR&WH ½ RD&WH	¼ BRSol ¼ BR&WH ¼ RDSol ¼ RD&WH	½ BRSol ½ RDSol
Genotype Option 3							ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol			
Genotype Option 4							½ BR&WH ½ RD&WH	¼ BRSol ¼ BR&WH ¼ RDSol ¼ RD&WH	½ BRSol ½ RDSol			

This genotype of RED SOLID can produce only RED SOLID and/or BRINDLE SOLID, RED & WHITE and/or BRINDLE & WHITE puppies depending on the colour of the mate.



RED SOLID BULL TERRIER – GENOTYPE OPTION 2 – $A^y a^t k^y k^y s^i s^i$















X	White carrying Red WHITE	Red & White RD&WH	Red Solid RDSol	White carrying Black & Tan WHITE	Tricolour Tri	Black & Tan Solid B&TSol	White carrying Brindle WHITE	Brindle & White BR&WH	Brindle Solid BRSol	White carrying Black Brindle WHITE	Black Brindle & White BBR&H	Black Brindle Solid BBRSol
Genotype Option 1	ALL RD&WH	½ RDSol ½ RD&WH	ALL RDSol	½ RD&WH ½ TRI	¼ RDSol ¼ RD&WH ¼ B&TSol ¼ TRI	½ RDSol ½ B&TSol	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	½ BR&WH ½ BBR&WH	¼ BRSol ¼ BBRSol ¼ BR&WH ¼ BBR&WH	½ BRSol ½ BBRSol
Genotype Option 2	¾ RD&WH ¼ TRI	¾ RDSol ¾ RD&WH ¼ B&TSol ¼ TRI	¾ RDSol ¼ B&TSol				½ BR&WH ½ RD&WH	¼ BRSol ¼ BR&WH ¼ RDSol ¼ RD&WH	½ BRSol ½ RDSol	¼ BR&WH ¼ BBR&WH ¼ RD&WH ¼ TRI	⅙ BRSol ⅙ BBRSol ⅙ RDSol ⅙ B&TSol ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI	¼ BRSol ¼ BBRSol ¼ RDSol ¼ B&TSol
Genotype Option 3							¾ BR&WH ¼ BBR&WH	¾ BRSol ¾ BR&WH ⅙ BBRSol ⅙ BBR&WH	¾ BRSol ¼ BBRSol			
Genotype Option 4							¾ BR&WH ¾ RD&WH ⅙ BBR&WH ⅙ TRI	¾ BRSol ¾ BR&WH ¾ RDSol ¾ RD&WH ⅙ BBRSol ⅙ BBR&WH ⅙ B&TSol ⅙ TRI	¾ BRSol ¾ RDSol ⅙ BBRSol ⅙ B&TSol			

This genotype of RED SOLID can produce all solid coloured and coloured & white options – BRINDLE SOLID, BRINDLE & WHITE, RED SOLID, RED & WHITE, BLACK BRINDLE SOLID, BLACK BRINDLE & WHITE, BLACK & TAN SOLID and TRICOLOUR puppies depending on the colour of the mate.



RED & WHITE BULL TERRIER – GENOTYPE OPTION 1 – $A^y A^y k^y k^y s^i s^w$















X	White carrying Red WHITE 	Red & White RD&WH 	Red Solid RDSol 	White carrying Black & Tan WHITE 	Tricolour Tri 	Black & Tan Solid B&TSol 	White carrying Brindle WHITE 	Brindle & White BR&WH 	Brindle Solid BRSol 	White carrying Black Brindle WHITE 	Black Brindle & White BBR&H 	Black Brindle Solid BBRSol 
Genotype Option 1	½ WHITE ½ RD&WH	¼ WHITE ¼ RDSol ½ RD&WH	½ RDSol ½ RD&WH	½ WHITE ½ RD&WH	¼ WHITE ¼ RDSol ½ RD&WH	½ RDSol ½ RD&WH	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH
Genotype Option 2	½ WHITE ½ RD&WH	¼ WHITE ¼ RDSol ½ RD&WH	½ RDSol ½ RD&WH				½ WHITE ¼ BR&WH ¼ RD&WH	¼ WHITE ⅛ BRSol ⅛ RDSol ¼ BR&WH ¼ RD&WH	¼ BRSol ¼ RDSol ¼ BR&WH ¼ RD&WH	½ WHITE ¼ BR&WH ¼ RD&WH	¼ WHITE ⅛ BRSol ⅛ RDSol ¼ BR&WH ¼ RD&WH	¼ BRSol ¼ RDSol ¼ BR&WH ¼ RD&WH
Genotype Option 3							½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH			
Genotype Option 4							½ WHITE ¼ BR&WH ¼ RD&WH	¼ WHITE ⅛ BRSol ⅛ RDSol ¼ BR&WH ¼ RD&WH	¼ BRSol ¼ RDSol ¼ BR&WH ¼ RD&WH			

This genotype of RED & WHITE can produce RED SOLID and/or BRINDLE SOLID, RED & WHITE and/or BRINDLE & WHITE and/or all WHITE puppies depending on the colour of the mate.



RED & WHITE BULL TERRIER – GENOTYPE OPTION 2 – $A^y a^t k^y k^y s^i s^w$



X	White carrying Red WHITE 	Red & White RD&WH 	Red Solid RDSol 	White carrying Black & Tan WHITE 	Tricolour Tri 	Black & Tan Solid B&TSol 	White carrying Brindle WHITE 	Brindle & White BR&WH 	Brindle Solid BRSol 	White carrying Black Brindle WHITE 	Black Brindle & White BBR&H 	Black Brindle Solid BBRSol 	
Genotype Option 1	½ WHITE ½ RD&WH	¼ WHITE ¼ RDSol ½ RD&WH	½ RDSol ½ RD&WH	½ WHITE ¼ RD&W ¼ TRI	¼ WHITE ¼ RDSol ¼ B&TSol ¼ RD&WH ¼ TRI	¼ RDSol ¼ B&TSol ¼ RD&WH ¼ TRI	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ¼ BR&WH ¼ BBR&WH	¼ WHITE ¼ BRSol ¼ BBR&WH ¼ BR&WH ¼ BBR&WH	¼ BRSol ¼ BBR&WH ¼ BR&WH ¼ BBR&WH	
Genotype Option 2	½ WHITE ⅓ RD&WH ⅙ TRI	¼ WHITE ⅓ ₁₆ RDSol ⅓ ₁₆ B&TSol ⅓ RD&WH ⅙ TRI	⅓ RDSol ⅙ B&TSol ⅓ RD&WH ⅙ TRI					½ WHITE ¼ BR&WH ¼ RD&WH	¼ WHITE ¼ BRSol ¼ RDSol ¼ BR&WH ¼ RD&WH	¼ BRSol ¼ RDSol ¼ BR&WH ¼ RD&WH	½ WHITE ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI	¼ WHITE ⅓ ₁₆ BRSol ⅓ ₁₆ BBR&WH ⅓ ₁₆ RDSol ⅓ ₁₆ B&TSol ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI	⅙ BRSol ⅙ BBR&WH ⅙ RDSol ⅙ B&TSol ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI
Genotype Option 3							½ WHITE ⅓ BR&WH ⅙ BBR&WH	¼ WHITE ⅓ ₁₆ BRSol ⅓ ₁₆ BBR&WH ⅓ BR&WH ⅙ BBR&WH	⅓ BRSol ⅙ BBR&WH ⅓ BR&WH ⅙ BBR&WH				
Genotype Option 4							½ WHITE ⅓ ₁₆ BR&WH ⅓ ₁₆ RD&WH ⅓ ₁₆ BBR&WH ⅓ ₁₆ TRI	¼ WHITE ⅓ ₃₂ BRSol ⅓ ₃₂ RDSol ⅓ ₃₂ BBR&WH ⅓ ₃₂ B&TSol ⅓ ₁₆ BR&WH ⅓ ₁₆ RD&WH ⅓ ₁₆ BBR&WH ⅓ ₁₆ TRI	⅓ ₁₆ BRSol ⅓ ₁₆ RDSol ⅓ ₁₆ BBR&WH ⅓ ₁₆ B&TSol ⅓ ₁₆ BR&WH ⅓ ₁₆ RD&WH ⅓ ₁₆ BBR&WH ⅓ ₁₆ TRI				

This genotype of RED & WHITE can produce all colour options – BRINDLE SOLID, BRINDLE & WHITE, RED SOLID, RED & WHITE, BLACK BRINDLE SOLID, BLACK BRINDLE & WHITE, BLACK & TAN SOLID, TRICOLOUR and all WHITE puppies depending on the colour of the mate.



BRINDLE SOLID BULL TERRIER – GENOTYPE OPTION 1 – $A^y A^y k^{br} k^{br} s^i s^i$



X	White carrying Red WHITE	Red & White RD&WH	Red Solid RDSol	White carrying Black & Tan WHITE	Tricolour Tri	Black & Tan Solid B&TSol	White carrying Brindle WHITE	Brindle & White BR&WH	Brindle Solid BRSol	White carrying Black Brindle WHITE	Black Brindle & White BBR&H	Black Brindle Solid BBRSol
Genotype Option 1	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol
Genotype Option 2	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol				ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol
Genotype Option 3							ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol			
Genotype Option 4							ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol			

This genotype of BRINDLE SOLID can only produce BRINDLE SOLID and/or BRINDLE & WHITE puppies no matter what the colour of the mate is.



BRINDLE SOLID BULL TERRIER – GENOTYPE OPTION 2 – $A^y A^y k^{br} k^y s^i s^i$



X	White carrying Red WHITE	Red & White RD&WH	Red Solid RDSol	White carrying Black & Tan WHITE	Tricolour Tri	Black & Tan Solid B&TSol	White carrying Brindle WHITE	Brindle & White BR&WH	Brindle Solid BRSol	White carrying Black Brindle WHITE	Black Brindle & White BBR&H	Black Brindle Solid BBRSol
Genotype Option 1	1/2 BR&WH 1/2 RD&WH	1/4 BRSol 1/4 RDSol 1/4 BR&WH 1/4 RD&WH	1/2 BRSol 1/2 RDSol	1/2 BR&WH 1/2 RD&WH	1/4 BRSol 1/4 RDSol 1/4 BR&WH 1/4 RD&WH	1/2 BRSol 1/2 RDSol	ALL BR&WH	1/2 BRSol 1/2 BR&WH	ALL BRSol	ALL BR&WH	1/2 BRSol 1/2 BR&WH	ALL BRSol
Genotype Option 2	1/2 BR&WH 1/2 RD&WH	1/4 BRSol 1/4 RDSol 1/4 BR&WH 1/4 RD&WH	1/2 BRSol 1/2 RDSol				3/4 BR&WH 1/4 RD&WH	3/8 BRSol 1/8 RDSol 3/8 BR&WH 1/8 RD&WH	3/4 BRSol 1/4 RDSol	3/4 BR&WH 1/4 RD&WH	3/8 BRSol 1/8 RDSol 3/8 BR&WH 1/8 RD&WH	3/4 BRSol 1/4 RDSol
Genotype Option 3							ALL BR&WH	1/2 BRSol 1/2 BR&WH	ALL BRSol			
Genotype Option 4							3/4 BR&WH 1/4 RD&WH	3/8 BRSol 1/8 RDSol 3/8 BR&WH 1/8 RD&WH	3/4 BRSol 1/4 RDSol			

This genotype of BRINDLE SOLID can only produce BRINDLE SOLID and/or RED SOLID, BRINDLE & WHITE and/or RED & WHITE puppies depending on the colour of the mate.



BRINDLE SOLID BULL TERRIER – GENOTYPE OPTION 3 – $A^y a^t k^{br} k^{br} s^i s^i$



X	White carrying Red	Red & White	Red Solid	White carrying Black & Tan	Tricolour	Black & Tan Solid	White carrying Brindle	Brindle & White	Brindle Solid	White carrying Black Brindle	Black Brindle & White	Black Brindle Solid
	WHITE	RD&WH	RDSol	WHITE	Tri	B&TSol	WHITE	BR&WH	BRSol	WHITE	BBR&H	BBRSol
Genotype Option 1	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	½ BR&WH ½ BBR&WH	¼ BRSol ¼ BBRSol	½ BRSol ½ BBRSol	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	½ BR&WH ½ BBR&WH	¼ BRSol ¼ BBRSol	½ BRSol ½ BBRSol
Genotype Option 2	¾ BR&WH ¼ BBR&WH	¾ BRSol ¼ BBRSol	¾ BRSol ¼ BBRSol				ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	½ BR&WH ½ BBR&WH	¼ BRSol ¼ BBRSol	½ BRSol ½ BBRSol
Genotype Option 3							¾ BR&WH ¼ BBR&WH	¾ BRSol ¼ BBRSol	¾ BRSol ¼ BBRSol			
Genotype Option 4							¾ BR&WH ¼ BBR&WH	¾ BRSol ¼ BBRSol	¾ BRSol ¼ BBRSol			

This genotype of BRINDLE SOLID can only produce BRINDLE SOLID and/or BLACK BRINDLE SOLID, BRINDLE & WHITE and/or BLACK BRINDLE & WHITE puppies depending on the colour of the mate.



BRINDLE SOLID BULL TERRIER – GENOTYPE OPTION 4 – $A^y a^t k^{br} k^y s^i s^i$



X	White carrying Red	Red & White	Red Solid	White carrying Black & Tan	Tricolour	Black & Tan Solid	White carrying Brindle	Brindle & White	Brindle Solid	White carrying Black Brindle	Black Brindle & White	Black Brindle Solid
	WHITE	RD&WH	RDSol	WHITE	Tri	B&TSol	WHITE	BR&WH	BRSol	WHITE	BBR&H	BBRSol
Genotype Option 1	1/2 BR&WH 1/2 RD&WH	1/4 BRSol 1/4 RDSol 1/4 BR&WH 1/4 RD&WH	1/2 BRSol 1/2 RDSol	1/4 BR&WH 1/4 BBR&WH 1/4 RD&WH 1/4 TRI	1/8 BRSol 1/8 RDSol 1/8 BBRSol 1/8 B&TSol 1/8 BR&WH 1/8 BBR&WH 1/8 RD&WH 1/8 TRI	1/4 BRSol 1/4 RDSol 1/4 BBRSol 1/4 B&TSol	ALL BR&WH	1/2 BRSol 1/2 BR&WH	ALL BRSol	1/2 BR&WH 1/2 BBR&WH	1/4 BRSol 1/4 BBRSol 1/4 BR&WH 1/4 BBR&WH	1/2 BRSol 1/2 BBRSol
Genotype Option 2	3/8 BR&WH 3/8 RD&WH 1/8 BBR&WH 1/8 TRI	3/16 BRSol 3/16 RDSol 1/16 BBRSol 1/16 B&TSol 3/16 BR&WH 3/16 RD&WH 1/16 BBR&WH 1/16 TRI	3/8 BRSol 3/8 RDSol 1/8 BBRSol 1/8 B&TSol				3/4 BR&WH 1/4 RD&WH	3/8 BRSol 1/8 RDSol 3/8 BR&WH 1/8 RD&WH	3/4 BRSol 1/4 RDSol	3/8 BR&WH 3/8 BBR&WH 1/8 RD&WH 1/8 TRI	3/16 BRSol 3/16 BBRSol 1/16 RDSol 1/16 B&TSol 3/16 BR&WH 3/16 BBR&WH 1/16 RD&WH 1/16 TRI	3/8 BRSol 3/8 BBRSol 1/8 RDSol 1/8 B&TSol
Genotype Option 3							3/4 BR&WH 1/4 BBR&WH	3/8 BRSol 1/8 BBRSol 3/8 BR&WH 1/8 BBR&WH	3/4 BRSol 1/4 BBRSol			
Genotype Option 4							9/16 BR&WH 3/16 RD&WH 3/16 BBR&WH 1/16 TRI	9/32 BRSol 3/32 RDSol 3/32 BBRSol 1/32 B&TSol 9/32 BR&WH 3/32 RD&WH 3/32 BBR&WH 1/32 TRI	9/16 BRSol 3/16 RDSol 3/16 BBRSol 1/16 B&TSol			

This genotype of BRINDLE SOLID can produce all colour options except all WHITE – i.e. BRINDLE SOLID, BRINDLE & WHITE, RED SOLID, RED & WHITE, BLACK BRINDLE SOLID, BLACK BRINDLE & WHITE, BLACK & TAN SOLID and/or TRICOLOUR puppies depending on the colour of the mate.



BRINDLE & WHITE BULL TERRIER – GENOTYPE OPTION 1 – $A^Y A^Y k^{br} k^{br} s^i s^w$



X	White carrying Red WHITE	Red & White RD&WH	Red Solid RDSol	White carrying Black & Tan WHITE	Tricolour Tri	Black & Tan Solid B&TSol	White carrying Brindle WHITE	Brindle & White BR&WH	Brindle Solid BRSol	White carrying Black Brindle WHITE	Black Brindle & White BBR&H	Black Brindle Solid BBRSol
Genotype Option 1	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH
Genotype Option 2	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH				½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH
Genotype Option 3							½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH			
Genotype Option 4							½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH			

This genotype of BRINDLE & WHITE can produce BRINDLE SOLID, BRINDLE & WHITE and/or all WHITE puppies depending on the colour of the mate.



BRINDLE & WHITE BULL TERRIER – GENOTYPE OPTION 2 – $A^Y A^Y k^{br} k^y s^j s^w$















X	White carrying Red WHITE	Red & White RD&WH	Red Solid RDSol	White carrying Black & Tan WHITE	Tricolour Tri	Black & Tan Solid B&TSol	White carrying Brindle WHITE	Brindle & White BR&WH	Brindle Solid BRSol	White carrying Black Brindle WHITE	Black Brindle & White BBR&H	Black Brindle Solid BBRSol
Genotype Option 1	1/2 WHITE 1/4 BR&WH 1/4 RD&WH	1/4 WHITE 1/8 BRSol 1/8 RDSol 1/4 BR&WH 1/4 RD&WH	1/4 BRSol 1/4 RDSol 1/4 BR&WH 1/4 RD&WH	1/2 WHITE 1/4 BR&WH 1/4 RD&WH	1/4 WHITE 1/8 BRSol 1/8 RDSol 1/4 BR&WH 1/4 RD&WH	1/4 BRSol 1/4 RDSol 1/4 BR&WH 1/4 RD&WH	1/2 WHITE 1/2 BR&WH	1/4 WHITE 1/4 BRSol 1/2 BR&WH	1/2 BRSol 1/2 BR&WH	1/2 WHITE 1/2 BR&WH	1/4 WHITE 1/4 BRSol 1/2 BR&WH	1/2 BRSol 1/2 BR&WH
Genotype Option 2	1/2 WHITE 1/4 BR&WH 1/4 RD&WH	1/4 WHITE 1/8 BRSol 1/8 RDSol 1/4 BR&WH 1/4 RD&WH	1/4 BRSol 1/4 RDSol 1/4 BR&WH 1/4 RD&WH				1/2 WHITE 3/8 BR&WH 1/8 RD&WH	1/4 WHITE 3/16 BRSol 1/16 RDSol 3/8 BR&WH 1/8 RD&WH	3/8 BRSol 1/8 RDSol 3/8 BR&WH 1/8 RD&WH	1/2 WHITE 3/8 BR&WH 1/8 RD&WH	1/4 WHITE 1/8 BRSol 1/8 RDSol 1/4 BR&WH 1/4 RD&WH	1/4 BRSol 1/4 RDSol 1/4 BR&WH 1/4 RD&WH
Genotype Option 3							1/2 WHITE 1/2 BR&WH	1/4 WHITE 1/4 BRSol 1/2 BR&WH	1/2 BRSol 1/2 BR&WH			
Genotype Option 4							1/2 WHITE 3/8 BR&WH 1/8 RD&WH	1/4 WHITE 3/16 BRSol 1/16 RDSol 3/8 BR&WH 1/8 RD&WH	3/8 BRSol 1/8 RDSol 3/8 BR&WH 1/8 RD&WH			

This genotype of BRINDLE & WHITE can produce BRINDLE SOLID, RED SOLID, BRINDLE & WHITE, RED & WHITE or all WHITE puppies depending on the colour of the mate.

 **BRINDLE & WHITE BULL TERRIER – GENOTYPE OPTION 3 – $A^y a^t k^{br} k^{br} s^j s^w$**



X	White carrying Red	Red & White	Red Solid	White carrying Black & Tan	Tricolour	Black & Tan Solid	White carrying Brindle	Brindle & White	Brindle Solid	White carrying Black Brindle	Black Brindle & White	Black Brindle Solid
	WHITE 	RD&WH 	RDSol 	WHITE 	Tri 	B&TSol 	WHITE 	BR&WH 	BRSol 	WHITE 	BBR&H 	BBRSol 
Genotype Option 1	$\frac{1}{2}$ WHITE $\frac{1}{2}$ BR&WH	$\frac{1}{4}$ WHITE $\frac{1}{4}$ BRSol $\frac{1}{2}$ RD&WH	$\frac{1}{2}$ BRSol $\frac{1}{2}$ BR&WH	$\frac{1}{2}$ WHITE $\frac{1}{4}$ BR&WH $\frac{1}{4}$ BBR&WH	$\frac{1}{4}$ WHITE $\frac{1}{8}$ BRSol $\frac{1}{8}$ BBRSol $\frac{1}{4}$ BR&WH $\frac{1}{4}$ BBR&WH	$\frac{1}{4}$ BRSol $\frac{1}{4}$ BBRSol $\frac{1}{4}$ BR&WH $\frac{1}{4}$ BBR&WH	$\frac{1}{2}$ WHITE $\frac{1}{2}$ BR&WH	$\frac{1}{4}$ WHITE $\frac{1}{4}$ BRSol $\frac{1}{2}$ BR&WH	$\frac{1}{2}$ BRSol $\frac{1}{2}$ BR&WH	$\frac{1}{2}$ WHITE $\frac{1}{4}$ BR&WH $\frac{1}{4}$ BBR&WH	$\frac{1}{4}$ WHITE $\frac{1}{8}$ BRSol $\frac{1}{8}$ BBRSol $\frac{1}{4}$ BR&WH $\frac{1}{4}$ BBR&WH	$\frac{1}{4}$ BRSol $\frac{1}{4}$ BBRSol $\frac{1}{4}$ BR&WH $\frac{1}{4}$ BBR&WH
Genotype Option 2	$\frac{1}{2}$ WHITE $\frac{3}{8}$ BR&WH $\frac{1}{8}$ BBR&WH	$\frac{1}{4}$ WHITE $\frac{3}{16}$ BRSol $\frac{1}{16}$ BBRSol $\frac{3}{8}$ BR&WH $\frac{1}{8}$ BBR&WH	$\frac{3}{8}$ BRSol $\frac{1}{8}$ BBRSol $\frac{3}{8}$ BR&WH $\frac{1}{8}$ BBR&WH				$\frac{1}{2}$ WHITE $\frac{1}{2}$ BR&WH	$\frac{1}{4}$ WHITE $\frac{1}{4}$ BRSol $\frac{1}{2}$ BR&WH	$\frac{1}{2}$ BRSol $\frac{1}{2}$ BR&WH	$\frac{1}{2}$ WHITE $\frac{1}{4}$ BR&WH $\frac{1}{4}$ BBR&WH	$\frac{1}{4}$ WHITE $\frac{1}{8}$ BRSol $\frac{1}{8}$ BBRSol $\frac{1}{4}$ BR&WH $\frac{1}{4}$ BBR&WH	$\frac{1}{4}$ BRSol $\frac{1}{4}$ BBRSol $\frac{1}{4}$ BR&WH $\frac{1}{4}$ BBR&WH
Genotype Option 3							$\frac{1}{2}$ WHITE $\frac{3}{8}$ BR&WH $\frac{1}{8}$ BBR&WH	$\frac{1}{4}$ WHITE $\frac{3}{16}$ BRSol $\frac{1}{16}$ BBRSol $\frac{3}{8}$ BR&WH $\frac{1}{8}$ BBR&WH	$\frac{3}{8}$ BRSol $\frac{1}{8}$ BBRSol $\frac{3}{8}$ BR&WH $\frac{1}{8}$ BBR&WH			
Genotype Option 4							$\frac{1}{2}$ WHITE $\frac{3}{8}$ BR&WH $\frac{1}{8}$ BBR&WH	$\frac{1}{4}$ WHITE $\frac{3}{16}$ BRSol $\frac{1}{16}$ BBRSol $\frac{3}{8}$ BR&WH $\frac{1}{8}$ BBR&WH	$\frac{3}{8}$ BRSol $\frac{1}{8}$ BBRSol $\frac{3}{8}$ BR&WH $\frac{1}{8}$ BBR&WH			

This genotype of BRINDLE & WHITE can produce BRINDLE SOLID, BLACK BRINDLE SOLID, BRINDLE & WHITE, BLACK BRINDLE & WHITE and all WHITE puppies depending on the colour of the mate.



BRINDLE & WHITE BULL TERRIER – GENOTYPE OPTION 4 – $A^Y a^t k^{br} k^y s^i s^w$















X	White carrying Red	Red & White	Red Solid	White carrying Black & Tan	Tricolour	Black & Tan Solid	White carrying Brindle	Brindle & White	Brindle Solid	White carrying Black Brindle	Black Brindle & White	Black Brindle Solid
	WHITE	RD&WH	RDSol	WHITE	Tri	B&TSol	WHITE	BR&WH	BRSol	WHITE	BBR&H	BBRSol
Genotype Option 1	1/2 WHITE 1/4 BR&WH 1/4 RD&WH	1/4 WHITE 1/8 BRSol 1/8 RDSol 1/4 BR&WH 1/4 RD&WH	1/4 BRSol 1/4 RDSol 1/4 BR&WH 1/4 RD&WH	1/2 WHITE 1/8 BR&WH 1/8 BBR&W 1/8 RD&WH 1/8 TRI	1/4 WHITE 1/16 BRSol 1/16 BBRSol 1/16 RDSol 1/16 B&TSol 1/8 BR&WH 1/8 BBR&W 1/8 RD&WH 1/8 TRI	1/8 BRSol 1/8 BBRSol 1/8 RDSol 1/8 B&TSol 1/8 BR&WH 1/8 BBR&W 1/8 RD&WH 1/8 TRI	1/2 WHITE 1/2 BR&WH	1/4 WHITE 1/4 BRSol 1/2 BR&WH	1/2 BRSol 1/2 BR&WH	1/2 WHITE 1/4 BR&WH 1/4 BBR&WH	1/4 WHITE 1/8 BRSol 1/8 BBRSol 1/4 BR&WH 1/4 BBR&WH	1/4 BRSol 1/4 BBRSol 1/4 BR&WH 1/4 BBR&WH
Genotype Option 2	1/2 WHITE 3/16 BR&WH 3/16 RD&WH 1/16 BBR&WH 1/16 TRI	1/4 WHITE 3/32 BRSol 3/32 RDSol 1/32 BBRSol 1/32 B&TSol 3/16 BR&W 3/16 BR&WH 3/16 RD&WH 1/16 BBR&WH 1/16 TRI	3/16 BRSol 3/16 RDSol 1/16 BBRSol 1/16 B&TSol 3/16 BR&W 3/16 BR&WH 3/16 RD&WH 1/16 BBR&WH 1/16 TRI				1/2 WHITE 3/8 BR&WH 1/8 RD&WH	1/4 WHITE 3/16 BRSol 1/16 RDSol 3/8 BR&WH 1/8 RD&WH	3/8 BRSol 1/8 RDSol 3/8 BR&WH 1/8 RD&WH	1/2 WHITE 3/16 BR&WH 3/16 BBR&WH 1/16 RD&WH 1/16 TRI	1/4 WHITE 1/16 BRSol 1/16 BBRSol 1/16 RDSol 1/16 B&TSol 1/8 BR&WH 1/8 BBR&W 1/8 RD&WH 1/8 TRI	1/8 BRSol 1/8 BBRSol 1/8 RDSol 1/8 B&TSol 1/8 BR&WH 1/8 BBR&W 1/8 RD&WH 1/8 TRI
Genotype Option 3							1/2 WHITE 3/8 BR&WH 1/8 BBR&WH	1/4 WHITE 3/16 BRSol 1/16 BBRSol 3/8 BR&WH 1/8 BBR&WH	3/8 BRSol 1/8 BBRSol 3/8 BR&WH 1/8 BBR&WH			
Genotype Option 4							1/2 WHITE 9/32 BR&WH 3/32 RD&WH 3/32 BBR&WH 1/32 TRI	1/4 WHITE 9/64 BRSol 3/64 RDSol 3/64 BBRSol 1/64 B&TSol 9/32 BR&WH 3/32 RD&WH 3/32 BBR&WH 1/32 TRI	9/32 BRSol 3/32 RDSol 3/32 BBRSol 1/32 B&TSol 9/32 BR&WH 3/32 RD&WH 3/32 BBR&WH 1/32 TRI			

This genotype of BRINDLE & WHITE can produce all colour options – BRINDLE SOLID, BRINDLE & WHITE, RED SOLID, RED & WHITE, BLACK BRINDLE SOLID, BLACK BRINDLE & WHITE, BLACK & TAN SOLID, TRICOLOUR and all WHITE puppies depending on the colour of the mate.



BLACK & TAN SOLID BULL TERRIER – GENOTYPE OPTION 1 – $a^t a^t k^y k^y s^i s^i$



X	White carrying Red WHITE 	Red & White RD&WH 	Red Solid RDSol 	White carrying Black & Tan WHITE 	Tricolour Tri 	Black & Tan Solid B&TSol 	White carrying Brindle WHITE 	Brindle & White BR&WH 	Brindle Solid BRSol 	White carrying Black Brindle WHITE 	Black Brindle & White BBR&H 	Black Brindle Solid BBRSol 
Genotype Option 1	ALL RD&WH	½ RDSol ½ RD&WH	ALL RDSol	ALL TRI	½ B&TSol ½ TRI	ALL B&TSol	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	ALL BBR&WH	½ BBR&WH ½ BBR&WH	ALL BBR&WH
Genotype Option 2	½ RD&WH ½ TRI	¼ RDSol ¼ B&TSol ¼ RD&WH ¼ TRI	½ RDSol ½ B&TSol				½ BR&WH ½ RD&WH	¼ BRSol ¼ RDSol ¼ BR&WH ¼ RD&WH	½ BRSol ½ RDSol	½ BBR&WH ½ TRI	¼ BBR&WH ¼ B&TSol ½ BBR&WH ½ TRI	½ BBR&WH ½ B&TSol
Genotype Option 3							½ BR&WH ½ BBR&WH	¼ BRSol ¼ BBR&WH ¼ BR&WH ¼ BBR&WH	½ BRSol ½ BBR&WH			
Genotype Option 4							¼ BR&WH ¼ BBR&WH ¼ RD&WH ¼ TRI	⅛ BRSol ⅛ RDSol ⅛ BBR&WH ⅛ B&TSol ⅛ BR&WH ⅛ BBR&WH ⅛ RD&WH ⅛ TRI	¼ BRSol ¼ RDSol ¼ BBR&WH ¼ B&TSol			

This genotype of BLACK & TAN SOLID can produce all colour options except all WHITE – i.e. BRINDLE SOLID, BRINDLE & WHITE, RED SOLID, RED & WHITE, BLACK BRINDLE SOLID, BLACK BRINDLE & WHITE, BLACK & TAN SOLID and TRICOLOUR puppies depending on the colour of the mate.



TRICOLOUR BULL TERRIER – GENOTYPE OPTION 1 – $a^t a^t k^y k^y s^i s^w$



X	White carrying Red WHITE	Red & White RD&WH	Red Solid RDSol	White carrying Black & Tan WHITE	Tricolour Tri	Black & Tan Solid B&TSol	White carrying Brindle WHITE	Brindle & White BR&WH	Brindle Solid BRSol	White carrying Black Brindle WHITE	Black Brindle & White BBR&H	Black Brindle Solid BBRSol
Genotype Option 1	½ WHITE ½ RD&WH	¼ WHITE ¼ RDSol ½ RD&WH	½ RDSol ½ RD&WH	½ WHITE ½ TRI	¼ WHITE ¼ B&TSol ½ TRI	½ B&TSol ½ TRI	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ½ BBR&WH	¼ WHITE ¼ BBRSol ½ BBR&WH	½ BBRSol ½ BBR&WH
Genotype Option 2	½ WHITE ¼ RD&WH ¼ TRI	¼ WHITE ¼ RDSol ¼ B&TSol ¼ RD&WH ¼ TRI	¼ RDSol ¼ B&TSol ¼ RD&WH ¼ TRI				½ WHITE ¼ BR&WH ¼ RD&WH	¼ WHITE ¼ BRSol ¼ RDSol ¼ BR&WH ¼ RD&WH	¼ BRSol ¼ RDSol ¼ BR&WH ¼ RD&WH	½ WHITE ¼ BBR&WH ¼ TRI	¼ WHITE ¼ BBRSol ¼ B&TSol ¼ BBR&WH ¼ TRI	¼ BBRSol ¼ B&TSol ¼ BBR&WH ¼ TRI
Genotype Option 3							½ WHITE ¼ BR&WH ¼ BBR&WH	¼ WHITE ¼ BRSol ¼ BBRSol ¼ BR&WH ¼ BBR&WH	¼ BRSol ¼ BBRSol ¼ BR&WH ¼ BBR&WH			
Genotype Option 4							½ WHITE ¼ BR&WH ¼ RD&WH ¼ BBR&WH ¼ TRI	¼ WHITE ¼ BRSol ¼ RDSol ¼ BBRSol ¼ B&TSol ¼ BR&WH ¼ BBR&WH ¼ RD&WH ¼ TRI	¼ BRSol ¼ RDSol ¼ BBRSol ¼ B&TSol ¼ BR&WH ¼ BBR&WH ¼ RD&WH ¼ TRI			

This genotype of TRICOLOUR can produce all colour options – BRINDLE SOLID, BRINDLE & WHITE, RED SOLID, RED & WHITE, BLACK BRINDLE SOLID, BLACK BRINDLE & WHITE, BLACK & TAN SOLID, TRICOLOUR and all WHITE puppies depending on the colour of the mate.



BLACK BRINDLE SOLID BULL TERRIER – GENOTYPE OPTION 1 – $a^t a^t k^{br} k^{br} s^i s^i$



X	White carrying Red WHITE	Red & White RD&WH	Red Solid RDSol	White carrying Black & Tan WHITE	Tricolour Tri	Black & Tan Solid B&TSol	White carrying Brindle WHITE	Brindle & White BR&WH	Brindle Solid BRSol	White carrying Black Brindle WHITE	Black Brindle & White BBR&H	Black Brindle Solid BBRSol
Genotype Option 1	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	ALL BBR&WH	½ BBRSol ½ BBR&WH	ALL BBRSol	ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	ALL BBR&WH	½ BBRSol ½ BBR&WH	ALL BBRSol
Genotype Option 2	½ BR&WH ½ BBR&WH	¼ BRSol ¼ BBRSol ¼ BR&WH ¼ BBR&WH	½ BRSol ½ BBRSol				ALL BR&WH	½ BRSol ½ BR&WH	ALL BRSol	ALL BBR&WH	½ BBRSol ½ BBR&WH	ALL BBRSol
Genotype Option 3							½ BR&WH ½ BBR&WH	¼ BRSol ¼ BBRSol ¼ BR&WH ¼ BBR&WH	½ BRSol ½ BBRSol			
Genotype Option 4							½ BR&WH ½ BBR&WH	¼ BRSol ¼ BBRSol ¼ BR&WH ¼ BBR&WH	½ BRSol ½ BBRSol			

This genotype of BLACK BRINDLE SOLID can produce BRINDLE SOLID and/or BLACK BRINDLE SOLID, BRINDLE & WHITE and/or BLACK BRINDLE & WHITE puppies depending on the colour of the mate.



BLACK BRINDLE SOLID BULL TERRIER – GENOTYPE OPTION 2 – $a^t a^t k^{br} k^y s^i s^i$















X	White carrying Red WHITE	Red & White RD&WH	Red Solid RDSol	White carrying Black & Tan WHITE	Tricolour Tri	Black & Tan Solid B&TSol	White carrying Brindle WHITE	Brindle & White BR&WH	Brindle Solid BRSol	White carrying Black Brindle WHITE	Black Brindle & White BBR&H	Black Brindle Solid BBRSol	
Genotype Option 1	$\frac{1}{2}$ BR&WH $\frac{1}{2}$ RD&WH	$\frac{1}{4}$ BRSol $\frac{1}{4}$ RDSol $\frac{1}{4}$ BR&WH $\frac{1}{4}$ RD&WH	$\frac{1}{2}$ BRSol $\frac{1}{2}$ RDSol	$\frac{1}{2}$ BBR&WH $\frac{1}{2}$ TRI	$\frac{1}{4}$ BBRSol $\frac{1}{4}$ B&TSol $\frac{1}{4}$ BBR&WH $\frac{1}{4}$ TRI	$\frac{1}{2}$ BBRSol $\frac{1}{2}$ B&TSol	ALL BR&WH	$\frac{1}{2}$ BR&WH	ALL BRSol	ALL BBR&WH	$\frac{1}{2}$ BBRSol $\frac{1}{2}$ BBR&WH	ALL BBRSol	
Genotype Option 2	$\frac{1}{4}$ BR&WH $\frac{1}{4}$ RD&WH $\frac{1}{4}$ BBR&WH $\frac{1}{4}$ TRI	$\frac{1}{8}$ BRSol $\frac{1}{8}$ RDSol $\frac{1}{8}$ BBRSol $\frac{1}{8}$ B&TSol $\frac{1}{8}$ BR&WH $\frac{1}{8}$ RD&WH $\frac{1}{8}$ BBR&WH $\frac{1}{8}$ TRI	$\frac{1}{4}$ BRSol $\frac{1}{4}$ RDSol $\frac{1}{4}$ BBRSol $\frac{1}{4}$ B&TSol				$\frac{3}{4}$ BR&WH $\frac{1}{4}$ RD&WH	$\frac{3}{8}$ BR&WH $\frac{1}{8}$ RD&WH	$\frac{3}{4}$ BRSol $\frac{1}{4}$ RDSol		$\frac{3}{8}$ BBR&WH $\frac{1}{8}$ TRI	$\frac{3}{8}$ BBRSol $\frac{1}{8}$ B&TSol $\frac{3}{8}$ BBR&WH $\frac{1}{8}$ TRI	$\frac{3}{4}$ BBRSol $\frac{1}{4}$ B&TSol
Genotype Option 3							$\frac{1}{2}$ BR&WH $\frac{1}{2}$ BBR&WH	$\frac{1}{4}$ BRSol $\frac{1}{4}$ BBRSol $\frac{1}{4}$ BR&WH $\frac{1}{4}$ BBR&WH	$\frac{1}{2}$ BRSol $\frac{1}{2}$ BBRSol				
Genotype Option 4							$\frac{3}{8}$ BR&WH $\frac{1}{8}$ RD&WH $\frac{3}{8}$ BBR&WH $\frac{1}{8}$ TRI	$\frac{3}{16}$ BRSol $\frac{3}{16}$ BBRSol $\frac{1}{16}$ RDSol $\frac{1}{16}$ B&TSol $\frac{3}{16}$ BR&WH $\frac{3}{16}$ BBR&WH $\frac{1}{16}$ RD&WH $\frac{1}{16}$ TRI	$\frac{3}{8}$ BRSol $\frac{1}{8}$ RDSol $\frac{3}{8}$ BBRSol $\frac{1}{8}$ B&TSol				

This genotype of BLACK BRINDLE SOLID can produce all colour options except all WHITE – i.e. BRINDLE SOLID, BRINDLE & WHITE, RED SOLID, RED & WHITE, BLACK BRINDLE SOLID, BLACK BRINDLE & WHITE, BLACK & TAN SOLID and TRICOLOUR puppies depending on the colour of the mate.

 **BLACK BRINDLE & WHITE BULL TERRIER – GENOTYPE OPTION 1 – $a^t a^t k^{br} k^{br} s^j s^w$**



X	White carrying Red 	Red & White 	Red Solid 	White carrying Black & Tan 	Tricolour 	Black & Tan Solid 	White carrying Brindle 	Brindle & White 	Brindle Solid 	White carrying Black Brindle 	Black Brindle & White 	Black Brindle Solid 
Genotype Option 1	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ½ BBR&WH	¼ WHITE ¼ BBR&WH	½ BBR&WH	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ½ BBR&WH	¼ WHITE ¼ BBR&WH	½ BBR&WH
Genotype Option 2	½ WHITE ¼ BR&WH ¼ BBR&WH	¼ WHITE ⅛ BRSol ⅛ BBR&WH ¼ BR&WH ¼ BBR&WH	¼ BRSol ¼ BBR&WH ¼ BR&WH ¼ BBR&WH				½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ½ BBR&WH	¼ WHITE ¼ BBR&WH	½ BBR&WH
Genotype Option 3							½ WHITE ¼ BR&WH ¼ BBR&WH	¼ WHITE ⅛ BRSol ⅛ BBR&WH ¼ BR&WH ¼ BBR&WH	¼ BRSol ¼ BBR&WH ¼ BR&WH ¼ BBR&WH			
Genotype Option 4							½ WHITE ¼ BR&WH ¼ BBR&WH	¼ WHITE ⅛ BRSol ⅛ BBR&WH ¼ BR&WH ¼ BBR&WH	¼ BRSol ¼ BBR&WH ¼ BR&WH ¼ BBR&WH			

This genotype of BLACK BRINDLE & WHITE can produce BRINDLE SOLID and/or BLACK BRINDLE SOLID, BRINDLE & WHITE and/or BLACK BRINDLE & WHITE and/or all WHITE puppies depending on the colour of the mate.















BLACK BRINDLE & WHITE BULL TERRIER – GENOTYPE OPTION 2 – $a^t a^t k^{br} k^y s^j s^w$



X	White carrying Red WHITE	Red & White RD&WH	Red Solid RDSol	White carrying Black & Tan WHITE	Tricolour Tri	Black & Tan Solid B&TSol	White carrying Brindle WHITE	Brindle & White BR&WH	Brindle Solid BRSol	White carrying Black Brindle WHITE	Black Brindle & White BBR&H	Black Brindle Solid BBRSol
Genotype Option 1	½ WHITE ¼ BR&WH ¼ RD&WH	¼ WHITE ⅙ BRSol ⅙ RDSol ¼ BR&WH ¼ RD&WH	¼ BRSol ¼ RDSol ¼ BR&WH ¼ RD&WH	½ WHITE ¼ BBR&WH ¼ TRI	¼ WHITE ⅙ BBRSol ⅙ B&TSol ¼ BBR&WH ¼ TRI	¼ BBRSol ¼ B&TSol ¼ BBR&WH ¼ TRI	½ WHITE ½ BR&WH	¼ WHITE ¼ BRSol ½ BR&WH	½ BRSol ½ BR&WH	½ WHITE ½ BBR&WH	¼ WHITE ¼ BBRSol ½ BBR&WH	½ BBRSol ½ BBR&WH
Genotype Option 2	½ WHITE ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI	¼ WHITE ⅙ BRSol ⅙ RDSol ⅙ BBRSol ⅙ B&TSol ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI	⅙ BRSol ⅙ RDSol ⅙ BBRSol ⅙ B&TSol ⅙ BR&WH ⅙ RD&WH ⅙ BBR&WH ⅙ TRI				½ WHITE ⅙ BR&WH ⅙ RD&WH	¼ WHITE ⅙ BRSol ⅙ RDSol ⅙ BR&WH ⅙ RD&WH	⅙ BRSol ⅙ RDSol ⅙ BR&WH ⅙ RD&WH	½ WHITE ⅙ BBR&WH ⅙ TRI	¼ WHITE ⅙ BBRSol ⅙ B&TSol ⅙ BBR&WH ⅙ TRI	⅙ BBRSol ⅙ B&TSol ⅙ BBR&WH ⅙ TRI
Genotype Option 3							½ WHITE ¼ BR&WH ¼ BBR&WH	¼ WHITE ⅙ BRSol ⅙ BBRSol ¼ BR&WH ¼ BBR&WH	¼ BRSol ¼ BBRSol ¼ BR&WH ¼ BBR&WH			
Genotype Option 4							½ WHITE ⅙ BR&WH ⅙ BBR&WH ⅙ RD&WH ⅙ TRI	¼ WHITE ⅙ BRSol ⅙ BBRSol ⅙ RDSol ⅙ B&TSol ⅙ BR&WH ⅙ BBR&WH ⅙ RD&WH ⅙ TRI	⅙ BRSol ⅙ BBRSol ⅙ RDSol ⅙ B&TSol ⅙ BR&WH ⅙ BBR&WH ⅙ RD&WH ⅙ TRI			

This genotype of BLACK BRINDLE & WHITE can produce all colour options – BRINDLE SOLID, BRINDLE & WHITE, RED SOLID, RED & WHITE, BLACK BRINDLE SOLID, BLACK BRINDLE & WHITE, BLACK & TAN SOLID, TRICOLOUR and all WHITE puppies depending on the colour of the mate.

SUMMARY – Total Possible Colours from each Genotype for any mate

X	White carrying Red  WHITE	Red & White  RD&WH	Red Solid  RDSol	White carrying Black & Tan  WHITE	Tricolour  Tri	Black & Tan Solid  B&TSol	White carrying Brindle  WHITE	Brindle & White  BR&WH	Brindle Solid  BRSol	White carrying Black Brindle  WHITE	Black Brindle & White  BBR&H	Black Brindle Solid  BBRSol
Genotype Option 1	White Red & White Brindle & White	White Red & White Brindle & White Red Solid Brindle Solid	Red & White Brindle & White Red Solid Brindle Solid	White Red & White Brindle & White Tricolour Black Brindle & White	White Red & White Brindle & White Tricolour Black Brindle & White Red Solid Brindle Solid Black & Tan Solid Black Brindle Solid	Red & White Brindle & White Tricolour Black Brindle & White Red Solid Brindle Solid Black & Tan Solid Black Brindle Solid	White Brindle & White	White Brindle & White Brindle Solid	Brindle & White Brindle Solid	White Brindle & White Black Brindle & White	White Brindle & White Black Brindle & White Brindle Solid Black Brindle Solid	Brindle & White Black Brindle & White Brindle Solid Black Brindle Solid
Genotype Option 2	White Red & White Brindle & White Tricolour Black Brindle & White	White Red & White Brindle & White Tricolour Black Brindle & White Red Solid Brindle Solid Black & Tan Solid Black Brindle Solid	Red & White Brindle & White Tricolour Black Brindle & White Red Solid Brindle Solid Black & Tan Solid Black Brindle Solid					White Brindle & White Red & White	White Brindle & White Red & White Brindle Solid Red Solid	Brindle & White Red & White Brindle Solid Red Solid	White Brindle & White Black Brindle & White Red & White Tricolour Brindle Solid Black Brindle Solid Red Solid Black & Tan Solid	Brindle & White Black Brindle & White Red & White Tricolour Brindle Solid Black Brindle Solid Red Solid Black & Tan Solid
Genotype Option 3							White Brindle & White Brindle & White Black	White Brindle & White Black Brindle & White Brindle Solid Black Brindle Solid	Brindle & White Black Brindle & White Brindle Solid Black Brindle Solid			
Genotype Option 4							White Brindle & White Black Brindle & White Red & White Tricolour	White Brindle & White Black Brindle & White Red & White Tricolour Brindle Solid Black Brindle Solid Red Solid Black & Tan Solid	Brindle & White Black Brindle & White Red & White Tricolour Brindle Solid Black Brindle Solid Red Solid Black & Tan Solid			

GENERAL RULES OF COLOUR INHERITANCE IN BULL TERRIERS:

- Two White parents always produce all White puppies. These White puppies may have coloured marks on their heads but they will always be almost all White in colour. Two White parents cannot produce a predominantly Coloured puppy.
- A White parent can never produce a Solid Coloured puppy – it can only produce a Coloured & White or an all White puppy.
- A Solid Coloured parent will never produce an all White puppy. Even with a White mate, a Solid Coloured parent will produce Coloured & White puppies but never all White.
- Two Solid Coloured parents will produce all Solid Coloured puppies.
- A Solid Coloured parent and a White mate will produce all Coloured & White puppies.
- A Solid Coloured parent and a Coloured & White mate will produce half Solid Coloured and half Coloured & White puppies.
- A Coloured & White and an all White parent will produce half all White puppies and half Coloured & White puppies.
- In fact any Coloured & White parent will produce half Coloured & White puppies no matter what colour the mate is.
- Two Coloured & White parents will produce a quarter Solid Coloured and a quarter all White puppies with half Coloured & White.
- Brindle puppies will only result when either one of the parents is Brindle or White carrying Brindle. If a dog has a Brindle gene, they will show Brindle (either Brindle, Brindle & White, Black Brindle or Black Brindle & White) and only then can they pass Brindle on to their offspring. The only exception to this is if it is a White dog carrying that Brindle without any coloured marks to show it.
- Two non-Brindle parents can never produce a Brindle puppy.
- If Black & Tan, Tricolour, Black Brindle or Black Brindle & White dogs are bred with each other, the offspring will only be one of these four options.

It must be highlighted again that the actual proportions of the different colours presented in the tables will only be evident with very large numbers of puppies as a single litter of puppies is too small statistically to reflect this. The tables can show the possible colours that can result from a mating. In conclusion, coat colours in Bull Terriers are comparatively simple to understand as only four genes determine colour variation in our breed. Breeders can use the phenotype of an individual and the colours of the parents and grandparents to determine its genotype. Litters produced can confirm this genotype. Once the genotype is known, future possible litter colours can be predicted from probability tables.

Written by Tracey Butchart

With special thanks to Duncan Butchart for his illustrations.

June 2009

REFERENCES

- Barsh, G. 2007. How The Dog Got Its Spots. *Nature Genetics*: 39(11):1304-1306.
- Bowling, S. A. Color Genetics in Animals. <http://bowlingsite.mcf.com/Genetics/Genetics.html>
- Briggs, L. C. and Kaliss, N. 1942. Coat Color Inheritance in Bull Terriers. *Journal of Heredity*: 33: 223–228.
- Burford, A. G. The Genetics of Breed Color in the American Pit Bull Terrier. *American Dog Breeders Assoc. Publication*.
- Candille, S.I., Kaelin, C.B., Cattanach, B.M., Yu, Bin, Thompson, D.A., Nix, M.A., Kerns, J.A., Schmutz, S.M., Millhauser, G.L., and Barsh, G.S. 2007. A^β-Defensin Mutation Causes Black Coat Color in Domestic Dogs. *Science*: 318(5855): 1418–1423.
- Coppinger, R. and Coppinger, L. 2001. *Dogs – A New Understanding of Canine Origin, Behaviour and Evolution*. Scribner, N.Y.
- Eberhard, E. 1971. *The New Complete Bull Terrier*. Howell Book House, New York.
- Glyn, R. H. 1950. *Bull Terriers and How to Breed Them*. Hall Publisher, Oxford.
- Harris, D. O. 1990. *Full Circle – A History of the Colored Bull Terrier*. D. O. Harris, USA.
- Hogarth, T.W. 1932. *The Coloured and Colour Breeding*. Walker, Galashiels.
- Hogarth, T.W. 1936. *The Bull Terrier Notebook*. Walker, Galashiels.
- Kerns, J.A., Cargill, E. J., Clark, L. A., Candille, S. I., Berryere, T. G., Olivier, M., Lust, G., Todhunter, R. J., Schmutz, S. M., Murphy, K. E. and Barsh, G. S. 2007. Linkage and Segregation Analysis of Black and Brindle Coat Color in Domestic Dogs. *Journal of Genetics*: 176: 1679-1689.
- Little, C.C. 1957. *The Inheritance of Coat Color in Dogs*. Comstock, Ithaca, N.Y.
- Mackay-Smith, W. E. 1980. *From James to Jim: The Next Ten Years, 1969-1978*. KNA Press.
- Ostrander, E. A. and Wayne, R.K. 2005. The Canine Genome. *Genome Research*: 15: 1706-1716.
- Schmutz, S. M. and Berryere, T.G. 2007. Genes affecting coat colour and pattern in domestic dogs: a review. *Animal Genetics*: 38(6): 539-549.
- Schmutz, S.M., Berryere, T. G., Ellinwood, N. M., Kerns, J. A. and Barsh, G. S. 2003. MC1R Studies in Dogs with Melanistic Mask or Brindle Patterns. *Journal of Heredity*: 94(1): 69–73.