Dachshund Coat Colours and their inheritance

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Background

2 sizes (3 in FCI countries)

3 coat types

3 base colours

3 modifiers

4 patterns

= 216 different combinations!!

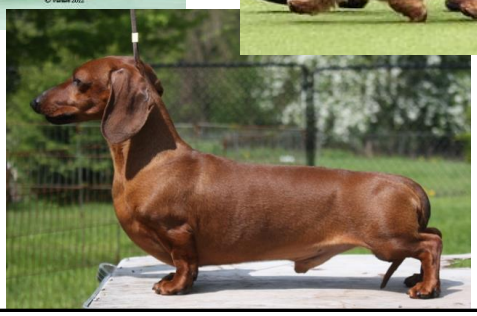
Coat colour

Coat colour in Dachshunds is controlled by at least 7 different genes, each of which can exist in more than one version (allele).

The way they interact gives us the unique colours we see in our dogs.

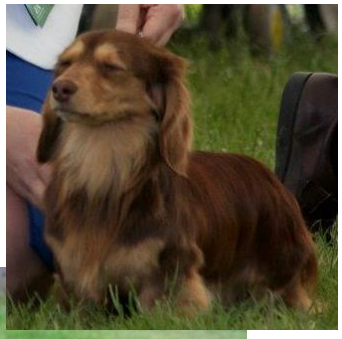
Understanding these genes and how they work together gives us the potential to predict (in most cases) the colour of puppies in any litters we breed and ensure that we don't produce any of the colour linked health problems.

Base colours - red



Base colours – black

Base colours - Chocolate



Modifiers - Cream

Cream is a separate gene (the “intensity” gene), it is a recessive gene so can be passed on even if the parents don’t show it. To be cream or have cream markings (rather than tan markings) then the dog has to have 2 copies of the cream gene, 1 from each parent.

A cream dog (or one with cream markings) will still be one of the base colours, but the cream gene dilutes the pheomelanin areas (areas that have red/tan hairs). So a genetically red dog will become cream and a black and tan dog will become black and cream.

Modifiers – Recessive (ee) red

Occasionally a clear red or cream puppy will occur in a litter where traditionally breeders would have thought it impossible. These dogs have no black hairs at all but can have black noses and nails.

This is caused by the recessive red gene which masks all eumelanin (black hair pigment). The dog may be genetically black or chocolate but the recessive red gene overrides it. It also masks dapple and brindle. Both parents must carry this gene to produce a puppy this colour.

If one parent is a dapple then these puppies should be DNA tested to prove whether they are a hidden dapple or not.

1 parent Black & Tan, the other Chocolate & Tan Dapple
Puppies – 1 Black & Tan, 2 Black & Tan Dapples, 2 ee Reds (these may or may not be dapples, only a DNA test would confirm).

Modifiers – Dilute

Not acceptable colours in the UK

If a Dachshund has 2 copies of the Dilution gene (1 from each parent) then any black or chocolate hairs will be diluted to blue or isabella.

Some dilute dachshunds suffer from CDA and associated problems.

One theory suggest that there are 3 alleles of this gene – D – Non dilution, d – dilution and d^{l} – dilution with CDA, if a dog has even one copy of the d^{l} version then it will suffer from CDA, 2 copies will probably mean it has an extreme version of CDA. Unfortunately the d^{l} version of the gene does occur in Dachshunds. It is not present in all breeds where dilution occurs.

Patterns

Dachshunds can also have 1 or more patterns, these are all caused by different genes and are passed on in different ways.

Dapple (merle) – dominant gene – one parent must be dapple to produce a dapple

Brindle – dominant gene – one parent must be brindle to produce a brindle

Shading – this is a version of the red gene which exists in at least 3 versions in dachshunds, depending on which version determines if it is recessive or dominant.

Piebald – recessive gene – both parents must be piebald or carry piebald to produce a piebald

Patterns - Dapple

The dapple gene can affect any of the base colours or the modified colours.

The dapple gene dilutes random sections of the coat to a lighter colour, leaving patches of the original colour remaining. The patches can be any size and can be located anywhere on the dog. The edges of the patches may appear jagged and torn.

Dapple affects only eumelanin. That means that any black, liver, blue or isabella in the coat, eyes or nose can be dapple. Pheomelanin (red pigment) is not affected at all and will appear as normal.

Patterns - Brindle

The brindle gene causes black or chocolate stripes to appear on any red, tan or cream pigmented areas. It is a dominant gene, so one parent must be brindle to get a brindle puppy. The amount of brindle stripes is random.

Patterns - Shading

Not strictly a pattern in its own right as it is a version of the gene that causes red.

If a Dachshund has just one copy of the A^y gene it will be a red base colour, regardless of any other genes it has.

The A gene is called the sable gene in genetics terminology, A^y is clear sable (clear red), a version of this gene exists which produces some black or chocolate shading and another version which produces extensive shading.

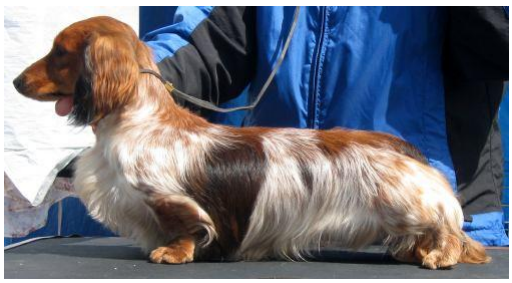
Patterns - Piebald

Not an acceptable colour in the UK as the breed standard says white is not permissible except a small patch on the chest.

Caused by a recessive gene so both parents must be piebald or carry piebald to produce it. Having 1 copy of the piebald gene may cause white tips to the toes and tail in some dogs.

Any base colour can also have the piebald pattern and all the patterns can exist on the same dog.

Piebald can have clear white patches or patches with ticking on.



Patterns and Health

Double Dapple – where both parents are dapple each puppy has a 25% chance of being a double dapple. Double Dapples can have severe sight and hearing problems, missing/small eyes and internal deformities. The UK Kennel Club will not accept the registration of any litter where both parents are registered as dapple.

Hidden Dapples – not a health issue in themselves, however, they can inadvertently be mated to another dapple and produce double dapples – if in any doubt whether a puppy is dapple or not then you must DNA test.

This is Noddy, a double dapple dachshund, who was born completely white apart from some black pigment on his nose.
He is completely blind and his eyes are small and deformed.
He is completely deaf.

Hidden Dapples

Reds and creams often don't show their dapple patterning and if a red or cream has a dapple parent then it should be DNA tested for the Merle gene before being bred from to ensure no double dapple puppies are produced

Predicting the colour of puppies

1. You need to know what genes both parents have (DNA test/trial & error/pedigree analysis)
2. You need to know which colour/pattern is dominant to other colours/patterns
3. Once you have worked out the possibilities you need to know the chance of each puppy being that colour

Parents both Black & Tan

Puppies

2 x Black & Tan

1 x Black & Cream

1 x Chocolate & Cream

Black & Tan that produces chocolate and cream

Bb atat Ii DD EE mm kk

Bb = Black carrying chocolate

atat = tan markings (black & tan/chocolate and tan)

Ii – 1 copy of the intensity gene which causes cream, dog isn't cream/cream markings but could pass it on

DD – No dilution

EE – No recessive red

mm – No merle/dapple

kk – No brindle or dominant black

2 parents of this combination

Each puppy has:

75% chance of being black, 25% chance of being chocolate

100% chance of having tan points (won't be red)

75% chance of having tan points, 25% chance of having cream points

0% chance of being a dilute (blue/isabella)

0% chance of being an ee red/cream

0% chance of being Dapple

0% chance of being brindle or dominant black