It's all in the Genes

By Joanne Fernall

Devonsleigh Perm Register Labrador Retrievers and Pugs

Did you know that the size of the litter is determined by the mother? Did you know that the sex of the puppies is determined by the father? Yes, that's correct and it's all based on the genes that are passed down from each parent. Genes are complex, they can be a good thing or a bad thing, but one thing is for certain – they are definitely interesting!

One of the most common questions that I get asked is what colour combinations are possible in a litter of Labrador Retriever puppies. Can a black mother produce a yellow puppy or a chocolate puppy? The answer is both yes and no. It all depends on what genes the mother carries. Interestingly enough if a black mother carries both the yellow gene and the chocolate gene and she is bred to a male that also carries both genes, she could produce a litter with all three colours in it. That's right – one litter with chocolate, yellow and black puppies! Here is a basic explanation of the colour genes and how a tri coloured litter could be possible.

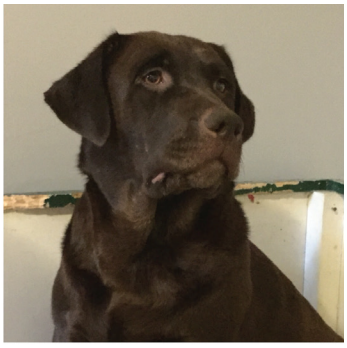
Let's start with the basics.

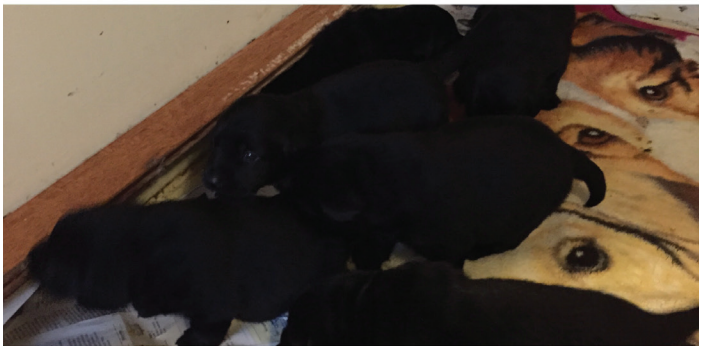
Chocolate is a recessive colour. Because it is recessive, the only way to guarantee a complete litter of chocolate puppies would be to breed a chocolate to a chocolate.

Yellow is also a recessive colour. Because it is recessive, the only way to guarantee a complete litter of yellow puppies would be to breed a yellow to a yellow.

Now let's start adding in the black. I'll start with dominant black. If you breed a dominant black to a dominant black the puppies will all be black.

Let's talk more about the black gene. The black colour gene is dominant. A dominant gene will express itself over a recessive gene. So a dog may be black (the colour black is expressed) but it may also carry a chocolate gene or a yellow gene (those colours are carried but not expressed). This is where it gets interesting and I'll offer you a very simplistic explanation.





Let's say a dominant black female is bred to a yellow male. The resulting puppies will get one copy of the black gene from the mother. They will also get one copy of the yellow gene from the father. The resulting offspring will be black because the black gene is dominant and a dominant gene always gets to express itself. However, these puppies will now carry the yellow gene. It's there and it's hiding – just waiting for the chance to express itself.

So now let's take this scenario one step further. Let's say the mother is black and she carries the yellow gene. Now let's mate her to male who is also black that carries the yellow gene. This mating would produce black and yellow puppies because both the mother and the father could pass down either a black gene or a yellow gene and depending on what combination each pup got it would either be yellow or black.

This dominant and recessive combination is also available with the chocolate gene. A black female may carry the chocolate gene. If she is bred to a black male that also carries the chocolate gene the resulting offspring will be either black or chocolate.

Now let's finish this off and see how we can produce a tri-coloured litter.

If you breed a chocolate to a yellow the resulting puppies will all be black. The reason for this is because both of these colours are recessive, the chocolate cannot produce yellow. Additionally, the yellow cannot produce chocolate. To summarize, the mother can give a chocolate gene and the father can give a yellow gene, but neither can be expressed because they are both recessive colours, so the resulting puppies have to be black.

Here's the best part – each pup will be black but it will also carry both the chocolate gene and the yellow gene. Depending on what you bred that resulting offspring to you could produce any of the following colour combinations:

- If you mated it with a yellow – you would produce black or yellow puppies.
- If you mated it with a chocolate – you would produce black or chocolate puppies.
- If you mated it to a black that was dominant black – you would produce black puppies.
- If you mated it to a black that carried yellow – you would produce black and yellow puppies
- If you mated it to a black that carried chocolate – you would produce black and chocolate puppies

And now for the pièce de résistance – if you mated it to a black that carried chocolate and yellow – you would produce a litter of puppies with all three colours in it.

For a further description of recessive and dominant genes, stay tuned for my next article where we'll explore Mendel's principals of inheritance and we'll look at those very important health genes that reputable breeders are now testing for.