This is the second color article from the Bearded Colleague by Carol Gold.

Colours...we have colours (part 2) by Carol Gold

Coat colour inheritance in Beardies is a subject no one has fully explored, although coat colour inheritance in dogs in general is well-researched. We can look at what is definitely known about our breed and make a few educated guesses about the rest. At the end of this article I will be asking you to supply more information so we can find out more about the inheritance of coat colour in Bearded Collies.

Let's take a quick and very basic look at the 'how' of inheritance. Every characteristic of a living creature is determined by a pair of genes. One of the pair came from the father, the other of the pair came from the mother. Genes are arranged along thread-like chromosomes and every species has a different number of chromosome pairs. The chromosomes have 'reserved seats' along them for the genes affecting certain characteristics, so a gene for toenails can't get into the spot for length of eyelashes. These reserved seats are called LOCI (or LOCUS in the singular). Only one gene can occupy any one locus. However, each locus may have a family of genes that could occupy it—all the genes that fit any one locus are called ALLELLES. Each allelle will produce a different variation on the characteristic controlled by that locus.

Each series of allelles has an order of dominance, so that if two different allelles are paired together, the more dominant of the two is what you will see in the individual carrying them, while the more recessive is not exhibited but can be passed on to the next generation. Where there are only two allelles at a locus—as in the case of basic colour, where a dog is either basically black (which is dominant and written B) or basically brown (which is recessive and written b), one gene is usually completely dominant over the other. But sometimes there are a number of allelles, as in the S series, which controls the amount of white marking, and in this case one allelle is dominant over all the others, the next in line is recessive to it, but dominant to the allelles beneath it and so on until the bottom of the line where the most recessive allelle will be masked out if it is paired with any of the others.

Now ther's whole volumes on genetics, which will explain that dominance can be incomplete, and modifiers can change the whole outward picture, but as this is only an article we will be as simplistic as possible. Two recommended books for further reading are listed at the end of this story.

In dogs, there are ten known loci dealing with coat colour. I will deal only with those about which we have specific information on Beardies.

Let's start by going back to black and brown. Black is dominant. So a black Beardie can be BB, if he inherited black from both parents, or Bb, having inherited black from one parent and brown from the other. A black Beardie who is genetically BB can never have any brown or fawn puppies, no matter what colour Beardie he's mated to.

A brown Beardie can only be bb—he must have inherited the brown factor from both parents. Although his parents may have been black, if they produce a brown puppy, you know they both carry the recessive b for brown. Also, you can see that a brown Beardie can only pass on b. Therefore, mated to another brown, he can only produce brown, but mated to black or blue, all colours are possible, although all the resulting puppies will carry one gene for brown.

One of the other factors affecting Beardie colour is the dilution factor. This has nothing to do with fading colours, or paleness. Dilution is what makes the difference between black and blue, and between brown and fawn.

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This has, I repeat, nothing to do with the depth of pigmentation--whether the dog will be well-coloured--but with the density of the colour itself. Denseness is dominant and written D. Dilution is recessive and written d.

A black or brown Beardie can be either DD or Dd. A DD Beardie cannot have blue or fawn puppies. A blue or fawn Beardie must be dd.

So we can see that several genetic combinations will make up each of the four basic Beardie colours, except for fawn, which is a dilution of brown and can only be bbdd.

A black Beardie can be BBDD, BbDD, BBDd, BbDd.
A brown Beardie can be bbDD, bbDd.
A blue Beardie can be BBdd, Bbdd.

Although these different genetic combinations in each colour will not affect the way you see the dog's colour, they will affect the colours of dogs that dog can produce. So while a blue Beardie who genetically is BBdd can never have anything but black or blue puppies, his brother who may be Bdd could produce every one of the four colours (depending, of course on the other parent). You can see how this works with the four types of blacks, too. Ther's one type which can never have anything but black pups, one type that can only have blacks and browns, one type that can only have blacks and blues, and one type that can produce all four colours.

So much for the basic colours. Now let's get on to the trimmings.

We all know how Beardies fade from their birth colour and then darken again and go on to lighten and darken and change shade at intervals throughout their lives. When a geneticist was first asked to look at Beardie colour several years ago in England, he declared that the gene controlling this was the greying gene (G) seen in several other breeds, like Kerry Blue Terriers, Old English Sheepdogs and silver Poodles. In all of these breeds, the dogs are born black and fade out to a blue-grey by the time they are a year and a half to two years old. The greying gene, G, which is dominant over non-greying, g, is what causes this. However, in none of the other greying breeds, do they darken again the way Beardies do; nor do they continue to change shade the way Beardies do. This leads me to believe there may be another factor present in Beardies that hasn't yet been identified. The only way to find out is to collect records of the coat colour changes of the litters we breed and their parents and progeny--did they fade? how pale did they get? when did they start to fade and when did they start to darken again? how dark was the colour they came back to?

Then theres tan pointings (or tricolour markings) which again don't follow the same pattern in Beardies as they do in most other breeds. In Dobermans, for instance, tan points are present in all colours at all times. In Collies and Shelties, they occur in a tricolour pattern with black and blue merle only and in many breeds appear with black to form a bicolour pattern. In Beardies, tan points can appear with all of the four basic colours, but don't appear regularly with any of them. Tan points are created by the most recessive of the multiple allelles at the A locus, which influences the relative amounts and location of dark (black or brown) and of light (tan or yellow) pigment both in the individual hair and in the coat as a whole. That the gene controlling them is extremely recessive in Beardies is indicated by the fact that tan points pop up in litters where neither parent has them and they are not visible in the recent ancestry either. If this is the case, then two tan pointed Beardies mated together would produce only tan-pointed Beardies. Anybody planning such a mating? Let us know what results.

Another interesting feature of tan points is that they fade rather spectacularly, so that by the time the dog is show age, all that's left is a

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cream or off-white where the tan used to be. This fading occurs even where the main body colour of the dog doesn't fade. Or does anyone know a Beardie whose tan points stayed a nice, rich colour?

(Another note on tan points--they are often difficult to spot on brown puppies. Check the eyebrows and cheeks. If the white goes far enough up the hind legs, the tan that would run down the inside of the stifle will be obliterated. The most conclusive tan evidence is under the tail.)

So here's another area where we need more information. Have you bred any tan-pointed Beardies? what basic colour were they? what colour were both their parents and did they have any tan points (don't rely on your eyes if you didn't see the parents as young pups)? did the tanOpointed pups produce any tan points when they were bred and if they did, what was the colour and history of the dog they were bred to? how soon did the tan fade? did it ever darken again?

And now white. The Standard calls for a coloured dog, with or without white Collie markings and this is intended to mean that a predominantly white Beardie is wrong. White Beardies appear more often than novices expect, but most breeders put them down at birth or give them away as pets without papers and never mention that they produced any white Beardies at all. It would be much easier to formulate a breeding program to avoid white puppies ("white" Beardies, to clarify, usually have dark eyes, noses, lips, and dark splotches on the coat--sometimes even correctly marked heads) if we knew the inheritance pattern of the whites and for this we need a great deal more information. It would be a whole different ballgame, for instance if we found that whites are caused by a modification of the s^i gene that produces the regular Collie pattern than if they are caused by the s^p gene that produces piebald dogs, since one of these genes is recessive to the other. Secrecy about whites is no answer.

So we need lots of data. Have you bred any white Beardies? what colour were the parents and what pattern of markings did they have? has either parent produced white to another dog? were any of the littermates of the white bred and did they produce any whites, or any excessively white-marked puppies? what were the markings of the whites you produced?

This article has asked a lot of questions---now it's up to you to supply some answers. The Bearded Collea ue would like to receive as much complete colour data from breeders as possible. (By complete, we mean don't just tell us about some puppies in a litter or some litters from a bitch or dog, but all of them!) We need to know as much about their colour changes as you can find out. All the data will be compiled and presented to a genetic expert for conclusions when sufficient information is received.

It would be helpful if the dogs in your data were named, so they could be compared with data from other breeders. No names will be revealed without permission. We will accept information without dogs' names, but should that information conflict with data submitted with names, the anonymous data will be discounted.

If you want to do some further reading, these two books will get you started:

GENETICS OF THE DOG by Burns & Fraser
THE INHERITANCE OF COAT COLOUR IN THE DOG by Clarence C. Little

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