

Basic Genetic Terms

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This is to help the fancier who wants to breed pigeons by colour. Please take note that these are basic terms and that we are not speaking of any of the autosomal pattern, structural (crest, porcupine, glandless, etc.), or colour affecting genes (modifiers!). This page is to help the beginner and not the more advanced pigeon geneticist.

COLOUR:

The pigmentation of plumage on pigeons. The basic colours consist of blue, black, brown, and red.

SEX LINKED:

Sex linked means that the colour is carried on the sex chromosome. This includes colour only and not pattern.

DOMINANCE:

Certain colours are dominant to (they over ride) other colours.

PATTERNS:

Patterns are the designs on the pigeon (ex. black head with white flights).

RECESSIVE:

Some colours and patterns can be "hidden" by others. Where two colours or patterns are carried the recessive colour or pattern will not show on the bird. As in cock birds that carry two colours the dominant colour will show and the recessive colour will not. This cock could produce either colour of squabs.

HETEROZYGOUS:

A heterozygous pigeon carries one single gene of colour. It is not pure as in it carries also another gene. Only cock birds can be heterozygous because they carry two colour genes. Hens are always pure because they only carry one colour gene.

HOMOZYGOUS:

This means the pigeon carries only one type of colour gene. Both hens and cocks can be homozygous. Hens are always homozygous (pure) because they only carry one colour. Cocks must have two of the same colour genes in order to be homozygous because they carry two colour chromosomes.

DILUTE:

This term means that a colour has been reduced to 1/3 of its original intense colour. Dilute colours consist of Silver, Dun, Khaki, and Yellow.

MODIFIERS:

There are many modifiers in existence. Modifiers are simply mutations (changes) from the basic colours caused by gene differences of the basic blue pigeon. To list a few there is Grizzle, Spread, Indigo, Smoky, Bronze and a bunch more.

ORDER OF DOMINANCE:

This term refers to the order in which colours and patterns are show. There is a scale with the highest pattern on top, which always shows, and on the bottom is the lowest pattern, which only shows if no pattern higher on the scale has been given to the pigeon through its genes.

COLOURS

BARLESS:

Barless is an autosomal recessive gene. "Autosomal" means it's not on the sex chromosome, and "recessive" means the bird must possess two of these genes (one from each parent) for the characteristic to be visible. A barless blue pigeon looks like an ordinary blue bar or blue check, except it does not possess the black markings (bars or checks) on the wingshields. Barless ash red (homer men call it "barless silver") looks like an ordinary silver red bar, but without the red bars. Such birds are often confused with spread ash, which looks very similar to barless ash. They are completely different genetically, however. If you have what you think is a barless ash red, you can test to see if it is really genetically barless by mating it to a blue of any pattern. If you ever obtain any black youngsters out of such a pairing, you can be sure that your ash is actually the spread factor rather than barless. (Black is the same as "spread blue.") If you obtain only birds that look like the ash parent, you can also be sure it is not barless because barless is recessive and if barless is mated to a bird that is barred or checkered and the latter does not carry the gene for barless, the young cannot be barless.

INDIGO:

Indigo is an autosomal dominant gene. Since it is dominant, any bird that carries it will show it and therefore it is very easy to follow. Indigo, in its heterozygous state, gives a blue pigeon a purplish hue and changes the bars or checks from black to a plum colour. It also washes out the tail bar so instead of being black the tail bar is lighter than the rest of the tail.

Indigo combined with black (blue plus the spread factor) yields the typical "Andalusian Blue" seen in many breeds. In the homozygous state, indigo on a blue base mimics ash red, and such a bird resembles an ash red with a slightly darker ground colour. On a black base, homozygous indigo yields a bird with a near-white ground colour and darker lacing.

Indigo in combination with brown gives a bird that very closely resembles an ash red, but with richer wing markings and some tell-tale lacing on upper tail coverts. Indigo with ash red is virtually indistinguishable from ash red, although when combined with spread often gives a rich mahogany effect.

It has been noted by several fanciers and reported in the literature that indigo noticeably enriches the colour of recessive red.

DOMINANT OPAL:

Dominant opal is an autosomal dominant gene. It is extremely variable in its expression, ranging from slight washing out of the bar and check pattern all the way to white bars and checks. At the same time the tail bar may be washed out or it may be nearly black. One way to identify dominant opal is by the light-coloured shaft of the tail feathers. The most common expression of dominant opal is a light greyish-brown in place of the normal black bars or checkering. Another common effect is that the normal blue ground colour lightens up to a steely gray. The white bar or white check effect is more likely to occur if the gene is in combination with indigo, although that combination does not always yield the same results.

Dominant opal in combination with ash-red is often indistinguishable from ordinary ash red. When combined with black the results range from a very attractively laced bird with silvery ground colour, to an overall gun-metal gray, all the way to what has sometimes been described as "dark mud" which is a washed out black with some lightening effects near the base of the feathers.

RECESSIVE OPAL:

Recessive opal is another autosomal recessive gene. It causes the bars and checks, as well as the tail bar, on an otherwise blue pigeon to become much lighter. That lightening effect is extremely variable, and the wing markings can range anywhere from a medium grey rather than black, to a greyish-tan, to a "bronzy" black, to a pink or reddish hue. The last often mimics the colour of ash red, including the absence of a tail bar. When this happens, some fanciers are led to believe that they have produced a red check out of a pair of blue checks, which is genetically impossible. In such a case the checkering on the wingshield is often edged in gray. If such a pseudo-red check (or pseudo-silver) is mated to a blue that does not carry the gene for recessive opal, all young will be blues. It is not uncommon for the inexperienced fancier to confuse recessive opal with dominant opal.

SMOKEY:

Smokey is the gene responsible for what most Racing Homer flyers call "slate". It is a simple autosomal recessive that is very common in homers. This gene causes the normal blue pigment to wash out to the point that the bird's ground colour is a duller gray than the normal blue-gray of a blue bar or blue check. It also causes the pattern on the wingshield, as well as the tail bar, to be less well-defined. The gene got its name when someone commented that it looked as if the pigeon was being viewed through a thick layer of smoke. One of the tell-tale signs of smokey is that the albescent (white) strips along the outer edges of the two outer tail feathers are not there. Also, smokey pigeons will usually have a much lighter beak than that of an ordinary blue pigeon. Smokey in the presence of ash red is believed to be responsible for some of the "plum" coloured reds seen in some lofts. The smokey gene is believed to be very common in the Janssen and Trenton strains of Racing Homers. It is also common in Russian Tumblers and several other breeds.

REDUCED:

Reduced is a sex-linked recessive gene. Since it is sex-linked, it need occur just once in hens (hens have only one "active" sex chromosome), but in cocks it must occur twice. Reduced causes blue pigeons to have a light, frosty ground colour - often with a silvery crescent on the crop area - with pinkish-coloured bars and checks. Reduced checkers are the most attractive. Reduced barless are the least attractive, because they have no bars or checks to show off the effects of this gene. Reduced ash red in either bar or check pattern gives the closest thing I have seen to a pink pigeon.

DILUTE:

Dilute is also a sex-linked recessive gene. It changes a blue pigeon to a "true" silver (as opposed to the silver of the racing homer, which is actually ash red bar), or as many racing homer people call it, "dun bar" or "dun check". An ash red dilute is a yellow check or cream bar, and a brown dilute is a khaki, which in the bar and check patterns is often confused with dilute ash red. The former, however, will always show a dark tail bar while the latter will have a lighter tail bar or no tail bar at all.

RECESSIVE RED AND RECESSIVE YELLOW:

Recessive red is an autosomal recessive gene which masks the underlying basic colour (blue-black, ash-red, or brown) and pattern. It causes the pigeon to take on a fairly uniform rust or red-brown colouration. Ideal recessive red colouration is uniform throughout, with the flight feathers and tail the same shade as the rest of the bird. (A good example is the red Carneau or the red schietti Modena.) However, such ideal colouration requires some additional modifying genes, not all of which have been positively identified. It is claimed by many fanciers that indigo quite noticeably improves the colour, and the spread factor does likewise. (The best coloured recessive red Racing Homer I ever owned was also spread and indigo.) Many recessive reds possess a smuttiness that dulls the colour, and the tail is more brown than red. This is particularly true in recessive red Racing Homers, where the emphasis is on performance rather than on colour. Recessive yellow is the combination of the recessive red gene with the gene for dilution, which is also recessive (see above). Recessive yellows are not really yellow, but more of a rich tan similar to the "buff" found in chickens.

WHITE:

White is a complicated subject for the simple reason that a white pigeon may be the result of several genetic factors. For example, homozygous grizzle causes a blue pigeon to be stork-marked (white body with some colouring on the flights and tail feathers), but a homozygous grizzle ash red is almost pure white, with perhaps a few very light red feathers visible upon close inspection. Such whites can usually be distinguished from other genetic combinations because they will have orange eyes rather than the "bull" eyes of many whites.

Other whites are the result of one or more of the genes that cause a bird to be pied, and the particulars of some of these genes have not yet been worked out. Examples would be the saddle, whiteside, baldhead, Lahore, and other patterns.

It has been established, however, that many whites are the result of a specific gene for "recessive white". Such a gene has been identified in the various "homer" breeds: Racing Homers, American Giant Homers, German Beauty Homers, Dragoons, etc. Recessive white is believed by some to be at the same locus as the gene for the gazzi pattern, which has been shown to be a simple recessive, and recessive white is epistatic (see "epistasis" below) to all other colours and patterns, a possible exception being recessive red. (I am unaware of any research concerning the combination of those two genes.) The action of recessive white is identical to that of recessive red in that if a pair of recessive whites are mated together, all young are recessive white. If a recessive white is mated to a self-coloured bird that does not carry the recessive white gene, all young are coloured. If two coloured birds carrying the recessive white gene are mated, the offspring exhibit the classic 1:2:1 Mendelian ratio, which is: 1 white, 2 coloured birds carrying white, and 1 coloured bird that does not carry white. Most, if not all, recessive whites have dark or "bull" eyes

"SEX-LINKED" MATINGS:

A sex-linked mating is a mating of two pigeons whose sex-linked colour characteristics (dilution, reduced, almond, faded, Quinn-mutant, along with the three "basic" colours of blue-black, brown, and ash-red) are such that the gene for the hen's particular sex-linked characteristic is dominant to the cock's corresponding gene for that characteristic. When this happens, all youngsters having the mother's colour will be cocks and all young having the sire's colour will be hens. In other words, in a sex-linked mating the young are just the opposite colour of the parents. The reason for this is that the cock has two active sex chromosomes (one from each parent) and the hen has only one that is active. She receives her sex chromosome from her sire only; hence her colour must be inherited strictly from him. Since the young cock receives one chromosome from each parent, and since in a sex-linked mating the mother's colour is the dominant one, the son must appear the colour of his mother. (He will carry the sire's colour on the other chromosome and is capable of passing it on to later generations.) Examples of sex-linked matings in which the young have just the opposite colours of their parents include, but are not limited to: Blue cock x ash-red hen; Brown cock x ash-red or blue hen; Non-almond cock x almond hen; dilute cock (dun, yellow, "true" silver or silver-dun-bar, cream, etc.) x intense (blue-black, ash-red, brown) hen. Indigo, dominant and recessive opal, toy stencil, etc. are not sex-linked characteristics and therefore these principles don't apply to them.

THE PATTERN SERIES:

The pattern series consists of T-pattern (sometimes called "velvet"), checker, bar, and barless, in descending order of dominance. That is, anything later in this list is recessive to anything listed ahead of it. Pattern is an autosomal characteristic and therefore is controlled by 2 genes, one from each parent. A bird that appears to be a T-pattern can carry any of the four pattern genes (T-pattern, checker, bar or barless) on the second chromosome but it appears T-pattern because T-pattern is dominant to all the rest. A bird that is checker can carry checker, bar or barless on the other chromosome, but it appears checker because checker is dominant to bar and barless. It cannot carry T-pattern because if it did it would appear T-pattern rather than checker. Likewise a bar can carry bar or barless on the other chromosome, but it cannot carry T-pattern or checker because if it did it would not be a bar; it would be T-pattern or checker, due to the dominance of the latter. A barless must be barless on both chromosomes because the gene for barless is recessive to all the other pattern genes.

If a bird has the same pattern gene on both chromosomes we say the bird is "homozygous" for that pattern. If a bird is homozygous for a given pattern and is mated to a bird of another pattern that is recessive to it, all the young will

have the same pattern as the dominant parent, but will carry the gene for the pattern of the recessive parent. Such youngsters are said to be "heterozygous" for each pattern. If two heterozygotes are mated together we get the classical 1:2:1 Mendelian pattern, which means 25% of those young will be homozygous for the dominant gene, 50% heterozygous, and 25% homozygous for the recessive gene. In appearance they will be 3:1, since only the one that is homozygous for the recessive gene will show it.

Caution! The gene for spread, which makes a blue pigeon black, is NOT part of the pattern series.

EPISTASIS: Sometimes you hear a statement such as "Recessive red is epistatic to all other colours and to the pattern series." This simply means that recessive red covers or hides all other colours or patterns. For example, a recessive red may be genetically a bar or a checker, but one cannot tell by looking at the bird because the pattern is hidden by the recessive red gene. Recessive red also hides ("is epistatic to") the underlying sex-linked colour of blue-black, ash-red, or brown. The spread factor is epistatic to the pattern on an otherwise blue pigeon, making it appear solid black. The combination of both recessive red and spread often makes for a much richer and more even shade of red.

"SILVER":

I have placed the word "Silver" in quotes because within the pigeon fancy it has two separate meanings.

To a geneticist and to breeders of most fancy breeds, it means the same as dilute blue bar. This is an ordinary "wild type" blue bar pigeon with the single recessive sex-linked gene for dilute (homozygous, or two copies of the gene, in cocks; one copy of the gene in hens). Such a bird has a light silvery ground colour with bars that are almost black. Racing Homer breeders often refer to this as a "dun bar" or "silver dun bar". (See notes on "dilute", above.) Sometimes a brown bar is called silver, but the bars of a brown are more chocolate coloured. Also, a brown will fade considerably with continued exposure to sunlight, and usually will have "false pearl" or pinkish tinted eyes. A true silver (dilute blue) will fade with heavy exposure to sunlight, but not nearly as much as a brown. The term "silver", when used by Racing Homer breeders in the United States, or breeders of many of the show strains of the Racing Homer or the American Show Racer, means the same as "silver red bar", which is simply an ash red bar pigeon with clear ash wingshields and often with a "frosty" or silvery sheen to the feathers on the neck. Note that in this case we are dealing with a sex-linked dominant. If such a bird shows any smuttiness or dirtiness in the wingshield area, it is usually referred to as a "mealy".

CREST:

Crest is another autosomal recessive gene that causes the feathers on the back of the head to be reversed. One gene appears to be responsible for the reversal of feathers, while additional "modifier" genes determine whether the reversal appears as a "peak" crest as in Oriental Frills and Archangels, or a "shell" crest as seen in Helmets, Nuns and English Trumpeters.

WILD TYPE:

The phrase "wild type", when used in genetics, simply means the total gene package of an individual which has no mutations. It is a reference point from which geneticists work. In the case of the pigeon, it represents a blue bar bird of normal size, with clean legs, no crest or frill, orange eyes, etc. In other words, it represents a bird resembling the "wild type" rock dove, *Columba livia*. "Wild type" in reference to the pattern series means barred; "wild type" in reference to foot feathering means clean legged; "wild type" in reference to basic colour means blue; etc. In discussing "wild type", many pigeon geneticists envision a blue bar racing homer, although the racing homer is admittedly not "wild type" when the homing instinct is considered.

BROWN:

Brown is a sex-linked recessive, which causes the black areas on a "wild type" pigeon to become a chocolate brown. It is often confused with the dilute of blue, or what many refer to as "silver dun bar" or "true silver". However, brown is intense, and brown youngsters will have normal down when in the nest, unlike the short down of a true silver. The dilute of brown is Khaki. Khaki is often confused with cream, or ash yellow, which is the dilute of ash red. Cream, however, does not show a tail bar, and khaki always does. Both brown and khaki are extremely susceptible to bleaching by sunlight, whereas true silver and cream may show some bleaching but nothing near the effect on brown. (See notes above, under "dilute" and "silver".)

NOTE:

For those of you with absolutely no knowledge of pigeon genetics, the following will NEVER work when you wish to introduce a new colour into your flock.

1. You cannot get almond by crossing a yellow to a black splash.
2. You cannot get recessive red by crossing a recessive yellow to a black, unless the black carries the gene for recessive red.
3. You cannot get tiger grizzle by crossing white to black, unless the white carries the gene for tiger grizzle.
4. You cannot get "pink" (meaning all the various modifiers that lighten an otherwise red pigeon) by crossing a white to a red.