Chapter XXI

SHORT-HAIRED BIRD DOG

Taken from Inheritance in Dogs with Special Reference to the Hunting Breeds, by Ojvind Winge, published by Comstock Publishing, Ithaca, N.Y. 1950

(NOTE: This study was conducted using Volumes 55 to 67 of the Danish Studbook; therefore, some of the terms are not what we are accustomed to. For example, "self-colored" is a term now called "solid"; "speckled" is now called "ticked" in most countries, while "mottled" is a term that is now known as "patched". You may also wish to refer to chart at the conclusion which gives explanations for the various gene designations.)

That character which has given this breed its name is the short hair lying close to the body which is due to the dominant factor *K*. The whole breed has thus *KK*. Furthermore the dogs always possess *EE* and are therefore never red or yellow. On the other hand, *B* may or may not be present. *B* + *E* gives black animals; *E* alone, brown.

The breed includes self-colored (*TT* or *Tt*) and mottled (*tt*) individuals. In addition, the white parts produced by the *tt*-forumula may be pure white, *rr* or dappled speckled (*RR* or *Rr*). The *S* gene is sometimes apparent; if it is present alone in *tt* dogs, it produces in them small, distinct black spots in the white areas; if it occurs together with *R*, the dogs become dappled-spotted with small darker spots. The presence of *S* is difficult to establish in the dark-dappled *R* animals. Finally, in brown dogs, both a darker brown and a lighter brown, presumably a recessive shade, are found. The gene *Z*, so named by Steiger (1936), is found in nearly all Shorthairs. If it is lacking and *zz* occurs, the brown coat is modified to a cinnamon color. Thus, in the offspring of 90368 Freja of Helhoejgaard (brown) and 64829 Flok (brown-speckled with brown markings) nine brown and two cinnamon-colored puppies occurred.

"Bicolor" markings occur only rarely in the Short-haired Bird Dog, as mentioned by Buchwald (1945), who designated the markings as being "a la Dachshund." The father of the famous 35447 Bob (Koege) thus had what the Studbook calls "hound markings." 31845 Hestehavens Rap was described in the Studbook as "brown-speckled with brown spots. Tricolored head. Hound markings." A brother to Rap had also, "Tri-colored head. Hound markings on cheeks and ear," while five others from the same litter were brown-speckled with brown spots. Of the parents of this litter, the Studbook merely states that the father was "brown-speckled with spots"; no color is given for the mother. From the standpoint of inheritance it is not surprising that the bicolour markings, which are of a recessive character, and which can therefore be concealed, may turn up in some dogs.

All the short-haired dogs in Volumes 55 to 67 of the Danish studbook formed the basis for his investigation.

As is known, there are fewer black Shorthairs than brown, and fewer self-colored than speckled. (Some animals in the studbooks are called dappled, but there are many more designated as speckled; in the following, we will use the most frequently employed designation – speckled.) Hence it follows that self-colored black are rare, even when one correctly considers as self-colored those animals that have a white or speckled chest spot or a little white or speckling on the paws. As previously mentioned, *T* animals (especially *Tt*) often have these localized markings, which are quite apart from the concept of "white mottling." Actually, many self-colored Shorthairs have these chest and paw markings.

In the thirteen volumes of the Studbook there occurs only a single completely black breeding animal, the bitch 51966 Toboels Svarta and only three black offspring individuals – 55948 Palle of Horndrup and 60336 Toboels Rubbi, both of which, however, had a speckled chest spot (the spot shows the presence of the *R* gene), and 64433 Mona of Tungepil, which had a small white swirl on the chest. Only a very few black-and-white-moddled are found, but many black-speckled – that is, black-and-white-mottled with the gene *R* – are listed. By far the greatest number of Shorthairs are brown, and, of these, most are speckled, so that the most common formulas are *bbEETtRRKK* and *bbEEttRRKK*. Since the brown-speckled dogs are often rather dark, even in the speckled areas, it is not often very apparent that they are all actually mottled of brown and speckled parts. The self-colored brown parts are often confined to a spot above the base of the tail, the ears, and a single spot on the body.

One finds also that speckled dogs are sometimes designated "speckled" and sometimes "speckled with brown markings." This is due to inadequate description. All speckled Shorthairs have self-colored areas; none are speckled over the whole body.

In itself, inheritance in the Short-haired Bird Dog is of a very simple type, and for this reason we selected this breed as an example of one, two, and three gene inheritance in Part One.

Black X black is naturally able to give black or brown offspring, for *BbEE* can segregate *bbEE*, but brown X brown can never produce black offspring. However, in the volumes of the Studbooks examined, not a single case is found in which two black have been mated together. Had it occurred, a segregation of 3 black : 1 brown would presumably have occurred, for all black (or black and speckled) Shorthairs are certainly heterozygotes, *BbEE*, and not homozygotes, *BBEE*.

If black is crossed with brown, and if the black is *BbEE* and the brown *bbEE*, 50 per cent of each color should occur in the offspring. The sparse material from this crossing shows 8 black : 7 brown.

The gene for mottling (white-mottling) is recessive, *tt*, which means that self-colored can segregate out mottled (to which category all speckled also belong), but mottled (including speckled) cannot segregate out self-colored.

An examination of the parents and offspring in the Studbooks shows the data given in Diagram 35.

Diagram 35

	Self-colored brown (with or without chest spot)	Speckled	Brown-and-white-mottled	Total
Self-colored brown X self-colored brown (with or without chest spot)	188	18	5	211
Self-colored brown X speckled	165	118	6	289
Speckled x speckled	(10)	373	19	402
TOTAL	363	509	30	902

In this summary the crossings with brown-and-white-mottled dogs are not taken into consideration, for these are often doubtfully described. They are called "brown-and-white-mottled," "brown-spotted," "brown-mottled and speckled," or "brown-mottled with brown splashes," and so on, and it is not always possible to form a very clear picture of the actual appearance of the dogs. Since the true speckled (those which have more than just a chest spot or speckled paw) are, however, always white-mottled, *tt*, with regard to heredity, the inheritance of white mottling can very well be tested by examination of them.

Diagram 35 shows the following: self-colored brown X self-colored brown gives predominately self-colored brown and only a few speckled, which shows that many self-colored brown must have the formula *TT*. Had they all been *Tt*, a fourth of the offspring should have had *tt* – that is, brown speckled or brown-and-white-mottled. Here, however,

only 23 out of 211 have *tt*, which indicates that about 30 per cent of the self-colored have *TT*, while the rest have *Tt*. In the crossing together of self-colored brown there should then be segregated out 26 with *tt* from a total of 211. As previously mentioned, the difference between the brown-speckled and the white-mottled is that the former contains the *R* gene and the latter, *rr*.

The cross, self-colored brown X speckled, also shows that several self-colored brown have *TT*, for more than half of the offspring are totally brown. According to the segregation counts, for every 124 *Tt*-dogs there are 41 with *TT* or 25 per cent of all self-colored brown dogs.

Speckled X speckled (*tt* X *tt*), which properly indicates a cross between dogs that are speckled or dappled with large brown spots, should give nothing but speckled, *tt* (or brown-and-white-mottled, when *R* is lacking). It is seen that there are 10 dogs that are described as "brown," and these therefore should not occur. The presence of 10 out of 402 is naturally not more than what would be expected through error; and that mistakes exist in the statements becomes quite clear: In the first place, 4 of the 10 are from one litter; this has probably had a father other than the one quoted. In the second, the remaining 6 are all from the same bitch, 51054 Lyna-Jesa of Havrevaenger, which is designated "brown with speckled markings." It must be assumed that the bitch had only a speckled spot on the chest and perhaps on the paws, and it therefore should be considered as self-colored brown (with *T*).

Among the brown-and-white-mottled offspring in the table, some are not clearly designated, for six are called "brown-mottled," one "light-brown-mottled," and two "brown spotted." Of the speckled, two are called "brown-speckled with white markings," but it should be noted that small, almost completely white, spots on the forehead or chest stripes may be present in speckled dogs. These dogs are therefore assumed to be correctly classified.

To examine the offspring from brown-and-white-mottled X brown-and-white-mottled with the help of the studbooks involves, as suggested, uncertainty because one cannot always know just what a definite color designation covers. As a rule, "brown-mottled" may well be assumed to designate brown-and-white-mottled, and there can be no doubt that the designation "brown and white" may also cover it. If the offspring of dogs from these two categories are examined, there is found a total of thirty-two brown-and-white-mottled, together with one "brown-mottled-speckled" and one "brown with a gray chest and gray paws"; these two should not occur, for mottled without speckling (*ttrr*) should not be able to segregate out mottled with speckling (*ttR*); but since, as mentioned, the designation of

the parents is uncertain, one must be content with the fact that, according to the studbook, nearly all individuals have that color which they theoretically should possess.

A strange individual is that discussed by Buchwald (1945) – "black-brown" 28465 Bruno-Hubertus-Rosengaarden. The studbook calls him "dark brown with speckled forepaws." There seems therefore to be no doubt that the dog did not look black but brownish. Nevertheless he had given black offspring with several brown bitches, which is inadmissible in Shorthairs. With the brown 25745 Nora Kalbyris he produced the black 31881 Svarta of Vesterlund; with the brown-speckled 29544 Ketty-Claushoej he gave among others, 30737 Pan of Noerlund, which was black with a speckled chest; and with 28839 Wanda-Claushoej, which was brown with speckled forelegs, he gave 30138 Pikas of Langaa, which was black with speckled paws.

Bruno-Hubertus has the pedigree shown in Diagram 36.

Diagram 36

Female 22231 Nixie v. Pniowitz Brown-speckled with a brown head *bbEEttR*	Male 21185 Normann v. Lemgo Brown-speckled with a brown head *bbEEttR*	Female 19424 Frej of Ring White with brown spots *bbEEttrr*
\	/ \	/
	Female 25023 Bessie Claushoej Brown-speckled with a brown head *bbEEttR*	Male 28025 Tycho Brown-speckled *bbEEttRr*
	\	/
	Male 28465 Bruno-Hubertus-Rosengaarden Dark brown with speckled forepaws *bbEETtR* !	

It is easily seen from the pedigree that Bruno-Hubertus cannot have Tycho as a father, as is stated. Bruno-Hubertus' mother, as well as his stated father, had the factor for white mottling, *tt*, in agreement with the fact that their parents had also possessed it. Bruno-Hubertus was, on the other hand, dark brown with speckled forepaws and therefore was "self-colored"; he had a *T*, which neither of the dogs stated to be his parents possessed. Since there is scarcely a possibility that the statement with regard to the dog's mother can be incorrect, the only solution remaining is that it had a father other than Tycho. This is not only a possibility but a necessity. Bruno-Hubertus was actually self-colored (with speckled forepaws), which also appears from the fact that he has produced self-colored offspring (30737 Pan of Noerlund) with brown-speckled bitches – e.g., 29544 Ketty-Claushoej.

A closer examination of this mysterious Bruno-Hubertus reveals that there has always been some suspicion concerning his origin on the part of some of the professional breeders. The dog was Pointerlike and much more slender and fast than the Short-haired Bird Dogs were at that time. This is clearly revealed in a photograph of the dog. Taking everything into consideration, there is no doubt that Bessie Claushoej was mated to a dog of another breed, and that therefore genes were introduced which resulted in Bruno-Hubertus being self-colored instead of brown-speckled and in receiving a coat of a divergent nature – a brown-black color, which in inheritance is black, but which become brownish because hereditary units of unknown nature were introduced by the irregular relation.

Let us attempt to calculate the genetic formulas in some Shorthairs on the basis of the statements in the studbooks. We shall choose the black-speckled 64323 Lis Mona, whose pedigree is given in Diagram 37.

Since all Shorthairs constantly have the factor for the brown color present, they must have *EE*; otherwise red or yellow animals would frequently occur in the bred, which is not, however, the case. The consequence is that at least one of the parents of each black Shorthair is black, while in the Setter, Pointer or Spaniel a black dog may occur from the crossing of brown with red. Since, in addition, all mottled individuals among Lis Mona's ancestors are speckled, it is likely that they all have *RR*.

Lis Mona's father, 55948 Palle of Horndrup, was black with a speckled chest. Since only the chest was speckled, while he otherwise was not so, he had *T* in his formula, for if he had had *tt*, he would have been also speckled over large areas on the body. He must therefore have *TT* or *Tt*. Since one of his parents, the mother, 42680 Lady II, was black-speckled and accordingly had *tt*, her son must have received a *t* from her, and consequently Palle had *Tt* in the formula. We know now that he was *EETtRR*. Finally, as to the *B* gene,

he must have had *Bb*, for only his mother, Lady II, was black, while the father, 40903 Gelsteds Rino, was brown; from him, accordingly, he must have received a *b*. Thus Palle's formula is completely worked out. On the maternal side all are brown-speckled, so that all the animals here must have *bbEEttRR*.

From the formulas it appears that Lis Mona and her possible full brothers and sisters should theoretically show a segregation in the ratio, 1 *BbEETtRR* (black with speckled chest) : 1 *BbEEttRR* (black-speckled) : 1 *bbEETtRR* (brown with speckled chest) : 1 *bbEEttRR* (brown-speckled). Nothing is to be found, however, in the studbooks on Lis Mona's brothers and sisters.

The nose in the Shorthair is brown in brown dogs and black in black dogs.

Diagram 37

Female 46902 Lola of Bred Dark-speckled with a brown head and spots	Male 40178 Haj Brown-speckled	Female 42680 Lady II Black with white speckles	Male 40903 Gelsteds Rino Brown with speckled chest and paws
Siblings: 1 light-speckled, brown head, gray over the nowe, 2 spots, black and tail *bbEEttRR*	Siblings: 0	Siblings: 0	Siblings: 4 brown with speckled chest and paws, 1 brown speckled *bbEETtRR*
\	/	\	/
Female 55985 Bessie of Haarslev Mark Dark-brown-speckled		Male 55948 Palle of Horndrup Black with speckled chest	
Siblings: 1 brown-speckled with a brown head 1 light-speckled with brown head and spots *bbEEttRR*		Siblings: 0	
\		/	

Female 64323
Lis Mona
Black-speckled

Siblings:
0
BbEEttRR

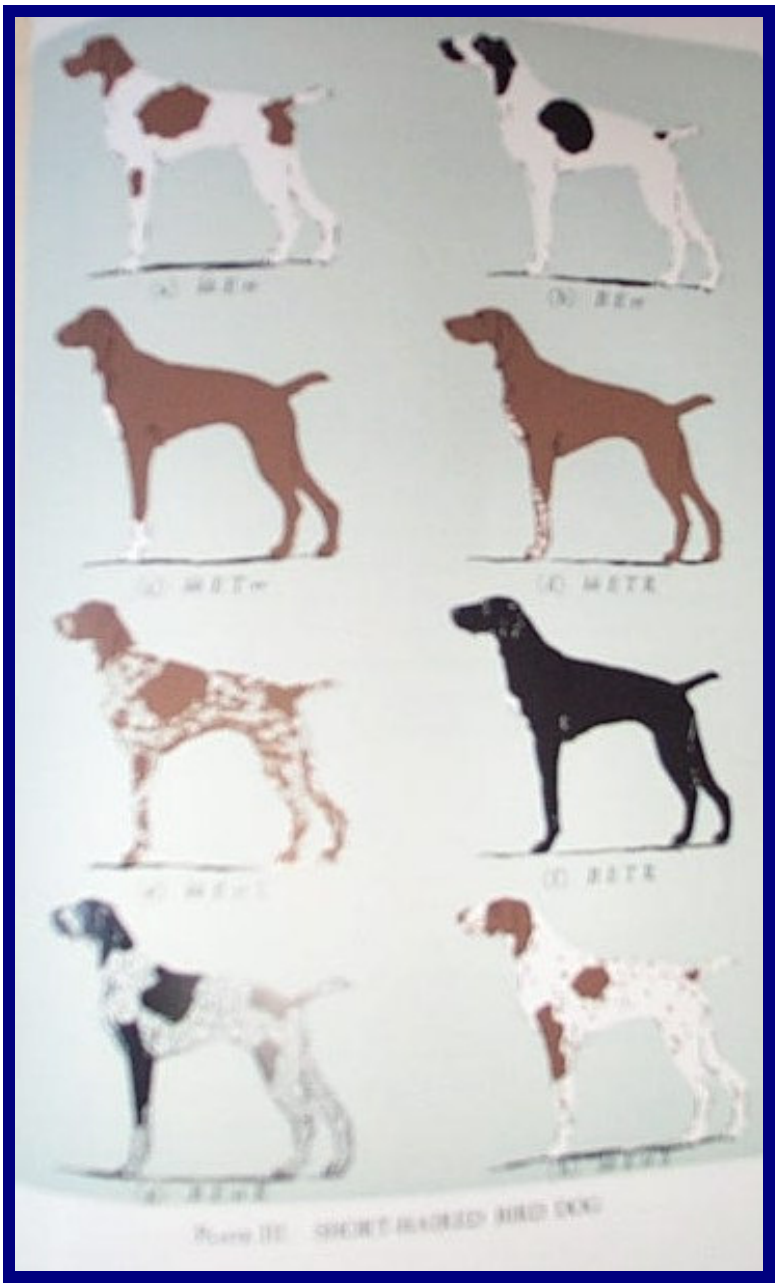
The various types of Short-haired Bird Dogs have the following formulas:

bbEEttrr	1. Brown-and-white-mottled; the white pure white (Plate III, figure a)
bbEEttR	2. Brown-and-white-mottled; the "white" parts brown-speckled; consequently, brown-speckled with brown spots (Plate III, figure e)
bbEETrr	3. Self-colored brown, possibly with a pure white chest spot and white paws (Plate III, figure c)
bbEETR	4. Self-colored brown, possibly with a speckled chest spot and speckled paws (Plate III, figure d)
BEEttrr	5. Black-and-white-mottled; the white pure white (Plate III, figure b)
BEEttR	6. Black-and-white-mottled; the "white" parts gray-speckled; consequently gray-speckled with black spots (Plate III, figure g).
BEETrr	7. Self-colored black, possibly with a pure white chest spot and white paws
BEETR	8. Self-colored black, possibly with a gray-speckled chest spot and gray-speckled paws (Plate III, figure f)

A formula as, for instance, no. 3 thus indicates that these dogs have *bb* and *EE*, and either *TT* or *Tt*, together with *rr*.

There is also the gene *S* which causes small dark spots in the white parts of white-mottled dogs. A dog of the formula *bbEttrrS* is, accordingly, brown-and-white mottled with distinct, small brown spots in the white; such dogs are common (Plate III, figure h).

Finally, brown dogs can be light or dark brown. The latter shade seems to be dominant.



(Note: the above dogs are labelled as:

(a) Brown-and-white-mottled (bb E tt)	(b) Black-and-white-mottled (B E tt)
(c) Self-colored brown with a white chest spot and white paws (bb E T rr)	(d) Self-colored brown with a speckled chest spot and speckled paws (bb E T R)
(e) Brown-speckled with large brown spots (bb E tt R)	(f) Self-colored black with a gray speckled chest spot (B E T R)
(g) Gray-speckled with large black spots (B E tt R)	(h) Brown-and-white-mottled and with small brown spots caused by the belton gene (bb E tt S)

The essential rules of inheritance thus are:

Brown X brown	always gives brown, never black, offspring
Black X black	can give either nothing but black offspring, or 75 per cent black and 25 per cent brown
Black X brown	can give both black and brown, as a rule 50 per cent of each color; rarely nothing but black offspring
Self-colored X self-colored	can segregate at most 25 per cent white-mottled or speckled
Pure white-mottled X pure white-mottled	gives nothing but pure white-mottled
Speckled X speckled	Never gives self-colored, but either nothing but speckled or at the most 25 per cent pure white-mottled
Self-colored X speckled	Gives either nothing but self-colored or 50 per cent self-colored and the rest speckled or pure white-mottled
Light brown X light brown	Gives nothing but light brown offspring
Dark brown X dark brown	Gives either nothing but dark brown offspring or 75 per cent dark brown and 25 per cent light brown
Light brown X dark brown	Gives either nothing but dark brown offspring or 50 per cent dark brown and 50 per cent light brown

Owing to incomplete designation of the various shades of brown in the studbooks it has not been possible to verify the last three assertions.

Hereditary Factors

The following is a list of the hereditary factors (taken from Chapter XIII, Inherited Factors (Genes) in Dogs) listed in alphabetical order, according to their designation:

A. Epistatic red factor, which produces a red color in dogs possessing the factors for a black or a brown coat.

B. (Yellow) red factor. *aaB*-dogs are red or yellow-red, tan-colored.

C. Self-colored-coat factor, in contrast to a series of color patterns:
c^{bi} ("bicolour"), which produces two colors in both black and brown dogs – i.e., lighter, red-yellow-brown, tan-colored in black dogs (black and tan) and corresponding, but usually more yellow, markings in brown dogs (liver and tan). [It is sometimes stated that red dogs can have bicolored markings; they may thus be called "red and lemon." Mrs. G. Pouw-Neumann of Voorthuizen, Holland, has, for example, observed the bicolour markings in red $Aac^{bi}c^{bi}$ Dachshund pups during the first weeks of their life (personal communication).] The markings include a portion of the head (spots over the eyes, on the cheeks, on the sides of the nose, and in the ears) and sometimes the back parts of the legs, and the chest, together with the anus and the underside of the tail. The black or brown color is here modified to a tan color. Examples of two-colored dogs are the Gordon Setter, many Dachshunds, and Shepherds. c^{bi} is usually manifested only when the gene *E* is present, and it is recessive with respect to *C*. The bicolour character is unequally expressed in the different breeds, and, among others, is considerably less pronounced in the English Setter and certain other white-mottled breeds, in Bassets, and in Spaniels. Here the color can be confined to a few dots or small spots on the nose or legs, while the white color, which is due to *tt* (see *T*-gene), can be so extensive that it obliterates the essential parts of the characteristic bicolor pattern. In connection with *tt*, which produces white-mottling, $c^{bi}c^{bi}$ produces tricolored

dogs. See also the section on gene *I*, which must be present too if the bicolour markings are to occur.

c^{sa} ("saddle"), which limits the black coat to a saddle-shape or covering on the back, as in the Airedale Terrier, while the rest of the animal is tan.

c^{br} ("brindle"), which limits the black coat to tigerlike, black cross stripes on a lighter tan-colored background, as in certain Boxers and Great Danes. In addition, these animals always have a black nose, and the black color is extended to form a mask.

c^{ma} ("mask"), which limits the black coat to a mask, while the rest of the dog is red-yellow, tan-colored.

C^{t}, which is dominant over all the others and produces total blackness in dogs possessing the character for black clor. The gene is epistatic to the wild-color gene *G*.

There are thus six alleles in this series, and they are dominant over each other in the following order:

>

c^{sa}

$$C^{t} > C > c^{bi} > c^{br} > c^{ma}$$

I have observed a hybrid between an Airedale Terrier with c^{sa} and a Boxer with c^{br}. It was distinctly wire-haired and brindle without "saddle," which shows that c^{br} is dominant to c^{sa}. It is not known how c^{sa} behaves with respect to c^{ma}.

D. "Dilution" factor, the gene for normal color formation. The dog with *dd* receives a greatly diluted color. *D* is therefore a recessive dilution gene. Black dogs with *dd* become "blue". See also gene *Z*.

E. Brown factor, which in itself produces a brown coat – lighter or darker chocolate brown or liver brown. The tip of the nose and the balls of the feet are brown. *E* + *B* produces a black coat through a complementary effect.

F. Albino gene; *F* is essential for coloring. Dogs with *ff* are practically white even when, according to the remaining gene combination, they ought to be colored. In *ff* animals all colors are bleached to such an extent that they are practically invisible. Only the coat color is affected, while the eye color and nose color are unaffected. True albinos with red eyes are rare and are due to another recessive albino-gene.

G. Wild-color factor, which produces in dogs with the factor for black (*B* + *E*) a wolf color and in brown dogs (*E*), a brownish wild color, i.e., the colored hair becomes white in the middle. Shepherds often have the *G* gene. The gene is hypostatic to *C*'. *B* + *E* + *C*' + *G* produces therefore a totally black coat, while *B* + *E* + *C* + *G* produces the wild color. *G* is nearly hypostatic to *A*, *A* + *B* + *E* + *G* giving a red coat. At birth, however, the puppies may show a faint wild coloring.

H. "Harlequin" factor, the gene that produces in the Great Dane, Dunkerhound, Dachshund, and others the well-known harlequin pattern – irregular, large or small, roundish black spots on a white or gray background in dogs possessing the factor for a black coat (*B* + *E*). The gene in a double dose causes deafness, blindness, and so on (see page 45).

I. "Interaction" factor, which exerts an effect in dogs having $c^{bi}c^{bi}$, as the bicolour (black and tan) character is not exhibited when I is lacking. Therefore black and brown dogs that have $c^{bi}c^{bi}$, do not become black and tan, or liver and tan, when the animal possesses *ii*. Neither are the dogs with the tricolour factor tricolored if they lack *I*. Black dogs with $c^{bi}c^{bi}$ *Tii* (see gene *T*) are black; black dogs with $c^{bi}c^{bi}$ *TI* are black and tan. White-mottled dogs with $c^{bi}c^{bi}$ *ttii* are black-and-white-mottled, but when they have $c^{bi}c^{bi}$ *ttI*, they are tricolored.

K. Short hair is dominant over *k*, long hair. Probably there are more alleles and also modifying genes to be found which cause varying degrees of short-hairedness and long-hairedness.

L. Short crooked legs, which is dominant, even though not completely, over *l*, which produces normal legs. There are also modifying genes which influence leg length.

R. "Roan," or dappled, also often called "speckled", which is dominant over nonspeckled. Speckling can only be exhibited in white-mottled dogs, i.e., dogs with *tt*. (See, however, the comments on page 97, para. 1: It is worth noting that those self-colored dogs that have white on the chest and paws, especially if they are of the formula *Tt*, are often able to reveal whether or not they contain the roan gene. If *R* is present the small white areas will usually be dappled.)

R gives rise to the appearance of rather uniformly distributed pigmented hair on a white background, as, in many Spaniels, Shorthairs, etc., *rr* produces nonpigmented white. In extreme cases, the "white" parts in the mottled *R*-dogs are so abundantly supplied with colored hair that these areas seem also actually dark, as only a very few white hairs remain, expecially in certain short-haired and wire-haired bird dogs.

See further the effect of the *S* gene.

S. Small spots, "belton," also called "speckled," which greatly resembles the gene *R*. Produces in white-mottled, therefore *tt*-dogs, small spots of pigmented hair on the white background. The small white spottiness is dominant over the pure white, *ss*.

In short-haired dogs the small spots are sharply delimited; in log-haired dogs they are more blurred.

When *S* and *R* are present together, the "white" parts become dappled and possess darker spots.

S is especially well known in the English Setter, which is designated as "blue belton," "tricolour belton," or "lemon belton." The *S* gene also occurs in the Pointer and Shorthair.

T. Total-color, whole-color, "self-color" factor, versus *tt*, which produces a white-mottled coat. *TT* and particularly *Tt*-animals can, however, have white chest spots and white paws, especially forepaws, and also, but more rarely, a white tail tip and a white blaze.

T+ $c^{bi}c^{bi}$ produces "bicolour" in black dogs and in brown dogs – black and tan and liver and an, respectively – but only when *I* is present; and *tt*+ $c^{bi}c^{bi}$ produces tricolored dogs, but only when the *I*-gene is present. See the description of the *I*-gene.

W. Wire hair, epistatic to *K* (short hair) as well as *k* (long hair). *W*+ *K* and *W*+ *kk* therefore produce in both cases a more or less wire-haired coat and bushy eyebrows and whiskers, but dogs of the first formula have probably shorter hair than dogs with *W*+ *kk*.

Z. Cinnamon-colored, "Zimtfarben," intensity factor. Brown and red dogs that lack *Z* and therefore have *zz* receive a lighter color than *Z*-dogs. The eyes are also lighter.