Inheritance of coat colour in the Anatolian Shepherd dog

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Abstract

The predominant colour of the Anatolian Shepherd dog varies from a dark fawn to light red, with a variable black muzzle and face (mask). Evidence is presented that the colour is due to the dominant yellow allele \( A^y \) of the agouti locus. Two other frequent colours are white spotting, due to the piebald allele \( s^p \), and the chinchilla allele \( ch \). Two rarer colours are the agouti wolf-grey wild type \( A^+ \) and a light fawn with a blue facial mask, due to the dilution allele \( d \).

Introduction

It is important to investigate the inheritance of coat colour variants for different breeds of dog, since it is becoming apparent that while a few generalisations can be made to cover all breeds, a number have mutant alleles not present in other breeds (Robinson, 1982).

The Anatolian Shepherd dog is one of a number of very ancient utility breeds of dog which have been developed over thousands of years in Eastern Europe and the Middle East. They are large, powerfully built, animals and are employed primarily as guard dogs for herds of sheep. They occur in a number of coat colours. Specimens have been imported into the United States and into Britain where they are being bred under strict supervision to maintain their integrity as a breed.

Material and results

The Anatolian breed is not numerically large and careful records have been kept by the breed clubs for almost all of the litters produced by the imported dogs and their descendants. These have been made available for a study of the mode of inheritance of the various colours. The analyses of frequencies of phenotypes representing the mutant genes were accomplished by the method of truncated assortment, upon the assumption of complete or almost complete ascertainment (Emery, 1976). The mean litter size for the data is \( 7.02 \pm 0.38 \), which is a typical value for large bitches (Robinson, 1982) and is indicative that there has been no or little selective culling prior to registration.

The most frequent variety is known as fawn, in which the coat colour varies from fawn to light red. The majority of fawns have a melanic facial ‘mask’ covering most of the muzzle and face. The adult coat is basically fawn but has a variable overlay of dark guard hairs. Microscopic examination of the hairs revealed that most, if not all, of the secondary guard hairs are pale proximally to the skin but become more yellowish distally and are tipped with black pigment.

A number of grey colored individuals were observed which might be mistaken for dark fawns except that the distribution of dark coloured hairs was more general and the base of the hairs was light slate blue. Microscopic examination of the secondary guard hairs revealed that these are darkly pigmented except for a subapical band of
yellow. These individuals have the appearance of
the wolf-grey genetic wild type of the dog. The first
category of entries of Table 1 indicate that the
fawn behaves as a dominant to the grey. It may
be inferred that the fawn colour is produced by the
dominant yellow allele (A<sup>y</sup>) and the grey by the
wild type allele (A<sup>+</sup>) of the agouti series (Little,
1957; Robinson, 1982). This finding augments the
few cases in the literature of the dominance of A<sup>y</sup>
to the wild allele. The presence of the melanic
facial mask is additional evidence that fawn is
produced by A<sup>y</sup> because recessive yellow (e) is
epistatic to mask (Robinson, 1982).

A large proportion of Anatolian dogs have
white markings, which is confined to the face,
shoulders and stomach for the lighter marked in-
dividuals, but over much of the body for the exten-
sively marked. The pertinent entries of Table 1
indicate that the white markings are inherited as
a recessive to the self (non-white). The white
pattern may be ascribed to the piebald allele (s<sup>p</sup>)
of the white spotting series of alleles (Little, 1957;
Robinson, 1982). It is known that the expression
of white is extremely variable for this allele
(Robinson, 1982). The eyes of the piebald are
dark brown except in some extremely white
individuals when the irises may be blue or hetero-
chromatic brown/blue.

The colour referred to as white by breeders is
not truly white but is a light cream. The eyes are
a normal dark brown and the nose is black. The
last entries of Table 1 indicate that the white
colour is inherited as a recessive to fawn. The
allele is depicted as chinchilla (ch) since the
phenotype is fully compatible with the description
given by Little (1957) for the allele, where the
yellow pigment is degraded to cream or white
while the black is unaffected (eyes and nose).

A single blue diluted dog has been reported,
bred from normal fawn parents. The body fur was
pale fawn and the mask was distinctly bluish. The
irises of the eyes were light brown and the nose
leather was slate-blue, two features which are
typical of the dilution (dd) phenotype (Robinson,
1982).

The presence of the melanic facial mask is not
an aspect of the dominant yellow phenotype. The

<table>
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<th>Mating</th>
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<th>Expected</th>
<th>χ²</th>
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<td>A&lt;sup&gt;+&lt;/sup&gt; x s</td>
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</table>

χ² has 1 df.

majority of fawn Anatolian display variable ex-
pression of the mask but a few do not. It was
difficult to obtain precise data on the inheritance
of mask but the observed variation implied that
mask is probably polygenic determined instead of
being supposedly monogenic (Little, 1957).

Discussion

The Anatolian Shepherd dog is essentially a
working breed and has been bred for thousands
of years with scant regard for coat colour. The
result is that the dog populations of Eastern
Turkey are polymorphic for colour, although the
predominant colour is fawn. Miss Naltaka
Czartoryska has travelled throughout the region
and her photographic records indicate the
presence of black and brindle, two known colour
mutant phenotypes (Little, 1957; Robinson,
1982), in addition to the colours described in this
report.

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