11.2 Coat colour types in mammals, colour genes

The colour of the hair is determined by the content of melanin grains. The black, brownish colours are produced by eumelanin and the reddish, yellow colours by pheomelanin. The latter can be dissolved in HCl. If the hair does not contain any melanin grains it becomes white, this is caused by air bubbles in the hair. This produces the white colour, just like air in or under the ice.

Melanin is formed by the amino acid tyrosine through a long row of biochemical reactions which all affect the coat colour. The melamine is produced in a cell type, which are called melanocytes. The number of and the hormonal influence on these cells can also give rise to variations in the colour.

Figure 11.2 shows a list of the best known colour genes.

Figure 11.2

Agouti locus (A locus)

Dominant Yellow A^y-
Dominant Black A-
Recessive Black and tan a^t-
Recessive Yellow aa

The Airedale terrier shown on the last page has the genotype Black and tan a^ta^t, black on the back and tan on the belly and extremities.

Brown locus (B locus)

Dominant Black B-
Recessive Brown bb

Brown genotype bb occurs in many dog breeds

Albino locus (C locus)

Dominant Colour C-
Recessive White cc

Albino genotype cc in the red-eyed Angora rabbit

Dilution locus (D locus)

Dominant Black D-
Recessive Silver dd

Silver genotype in swine

Extension locus (E locus)

Dominant Black E-
Recessive Yellow ee

Pink eyed dilution locus (P locus)

Dominant Black P-
Recessive Yellow pp

X-linked Orange locus (O locus)

Females:
Dominant Black oo
Heterozygote Black/Yellow Oo
Recessive Yellow OO

Males:
Dominant Black o
Recessive Yellow O

The heterozygote Oo has a mixed colour type due to random X-chromosome inactivation. The mixed colour can vary from a nearly perfect mixture to large spots of yellow or black depending on when the random inactivation takes place.

Somatic mutations in colour genes: In some domestic species, such as fox and cat, a dominant gene occurs, which reduces the pigmentation to a light cream colour, see Figure 11.3.

The shadow mutation is very unstable as it easily mutates back to normal colour type. The somatic back mutation takes place under the foetal development while the melanocyte population is formed. In the foxes of the Shadow colour type a visible somatic back mutation occurs in about 2 % of a population. Figure 11.3 shows a back mutation in a Shadow fox. Animals containing the Shadow mutation often have eyes with different colours, one brown and one blue.

Figure 11.3.
Somatic back mutation in the Shadow gene for colour. The entire ear has normal colour on a Shadow blue fox, which is normally cream coloured all over the body.