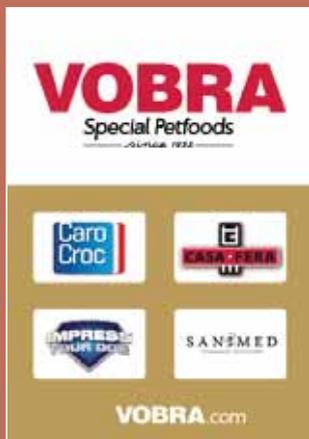




Dr A C Beynen was professor of veterinary nutrition at the Faculty of Veterinary Medicine, Utrecht University, The Netherlands in the period of 1993-2007.



Diet and Hair Colour in Cats and Dogs

There is a wide variety of coat colours in dogs and cats. Hair colour is genetically controlled, including graying in older animals. Aged, resting hairs ready to be shed may be lighter at the ends. Factors causing hair discolouration are of concern to dog and cat owners, especially those who exhibit and/or breed. Nutrition affects the synthesis of pigments that are deposited in hairs growing from the skin. Hair colour changes may also involve the covering of hair shafts or chemical changes within.

Porphyrin in saliva of dogs turns red when exposed to sunlight. Excessive licking may stain white hairs rust-brown. Tear fluid may be responsible for reddish staining seen around the eyes of some dogs. Use of certain shampoos is said to give hair a red hue. A study (1) showed that ultraviolet light increased the brightness of white-hair samples from dogs, whereas exposure to heat and humidity blackened the hairs. Thus, sunlight and use of hairdryers could bleach and darken hair.

More than 20 years ago, certain commercial foods allegedly caused coat colour to turn red in dogs (2). Possible culprits are two protein constituents: the amino acids phenylalanine and tyrosine. Low dietary levels induce reddish hair coat in black animals, whereas high intakes maintain or restore black hair colour. To maximise black hair colour, the sum of phenylalanine and tyrosine in dry cat food should be at least 1.5 percent (0.9 g/MJ) and perhaps more in dog food. Petfood labels do not declare the two amino acids, but manufacturers can be contacted for the amounts.

Both copper and zinc deficiency causes facial hair to turn grey in black dogs. Commercial, complete foods normally have the two elements in abundance as supplemental zinc and copper are added. However, some home-prepared diets can be deficient in copper and zinc (3).

Hair Pigmentation

Albino dogs and cats lack pigmentation of hair, skin and eyes. White-coated dogs have, by visual colour assessment, white, cream and/or reddish hairs without or with microscopically detectable pigment (1). Hair colours reflect variable profiles of melanin pigments. For pigmentation to reach its full genetic potential, the diet must deliver adequate amounts of substrates and catalysts.



Dogs and cats take in dietary tyrosine or synthesise it from phenylalanine, an essential amino acid. Tyrosinase catalyses the conversion of tyrosine into dopaquinone - common precursor of all melanins. Tyrosine may also act as feed-forward activator of the pathway to black eumelanin (4, 5). Copper is a cofactor for tyrosinase, the missing enzyme in albinism.

Black Cats

Cats require much more phenylalanine plus tyrosine for black hair colour than for growth. Maximal growth in kittens on a tyrosine-free, purified diet required 0.37 g phenylalanine/MJ metabolisable energy while about half of this amount could be replaced by tyrosine (6). For both

sustaining fully black hair and maximal growth in kittens, the US National Research Council (7) recommends 1.14 g phenylalanine plus tyrosine/MJ, with a minimum of 0.24 g phenylalanine/MJ.

Young black cats were fed one of 15 purified diets containing isonitrogenous mixtures of crystalline amino acids as sole nitrogen source, but providing variable contents of phenylalanine and tyrosine. None of the diets compromised weight gain. The results indicate that ≥ 0.92 g phenylalanine plus tyrosine/MJ maintains black hair color (8, 9), which is supported by the feeding of gelatin-based diets with added tyrosine (8, 10). In two adult queens, the gelatin diet (0.51 g phenylalanine, 0.13 g tyrosine/MJ) changed hair colour from black to reddish brown (8).

Black Dogs

For puppies (≥ 14 weeks), the recommended allowance of phenylalanine plus tyrosine is 0.60 g/MJ, with 0.24 g/MJ as minimum for phenylalanine (7). Black puppies (Newfoundlands, Labradors) were fed diets containing 1.16, 1.59 or 1.95 g phenylalanine plus tyrosine/MJ (11, 12). Dietary details are not given. After 5 months, the low level of aromatic amino acids had induced a reddish hair coat, while the high intake produced deeper black than the mid-level (13).

Copper and Zinc

Beagles aged 5 weeks received a copper-deficient diet (0.05 mg copper/MJ) (14). Three months later, the animals had gray hairs on their face (14, 15). The explanation may lie in copper's role as

co-factor of tyrosinase. Hair graying was not reported for experimental copper deficiency in kittens (16).

Zinc deficiency in dogs causes dull and rough coat and skin lesions including scaling and crusting. Black puppy patients (Labradors) with skin disease related to zinc deficiency had pronounced graying of hair (17). Adult, black and brownish-black dogs consuming a zinc-deficient diet (0.40 mg zinc/MJ) developed scaly neck skin and gray head hairs after four weeks (18). Labrador Retriever puppies fed a zinc-deficient diet also lost hair colour (19).

Suboptimal zinc intake may diminish zinc content, growth (20) and darkness (17-19) of canine hair, but the direction of causality is unclear. Remarkably, graying of hair was not reported on experimental zinc deficiency in kittens (21), English Pointer (22) and tricolored (breed not indicated) pups (23). In the kittens, hair thinning and losing gloss was noted.

Food Additives

Dogs challenged with diets containing a green food colouring (24) or an orange-coloured docosahexaenoic acid ethyl ester (25) showed greenish and yellow-tinted hair, respectively. The substances apparently got into hair shafts.

List of references is available on request from the author (beynen@freeler.nl)

Dr Anton C Beynen writes this exclusive column on dog and cat nutrition every month. He is affiliated with Vobra Special Petfoods.