



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.

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Phosphorus in senior cat food

Several senior cat foods purport to maintain kidney function. To substantiate the claim, the foods make special reference to their low phosphorus content. There is no experimental evidence that phosphorus restriction prevents feline chronic kidney disease, but there are good indications that it does. This calls for assessment of the amount of dietary phosphorus that protects kidney health.

Phosphorus is an essential mineral nutrient. Shortage causes movement disturbances in adult cats. Total phosphorus in commercial cat food normally originates from animal and plant ingredients, and added phosphorus-containing mineral salts. Excessive phosphorus intakes may trigger and/or enhance the development of kidney disease. About 30% of aged cats presented to clinics have chronic kidney insufficiency (1). The signs seen by the owner are lack of appetite and energy, frequent urination, increased thirst and weight loss.

Chronic kidney failure cannot be healed, but appropriate dietary treatment retards progression of the disease, phosphorus restriction seeming to be crucial. In cats with experimental kidney disease, a low-phosphorus diet reduced deterioration of renal structure. In healthy cats, low versus high phosphorus intake improved kidney function and curbed calcification of kidney tissue. Thus, there are four pieces of indirect evidence for low dietary phosphorus averting feline kidney disease.

It can be suggested that phosphorus amounts of 0.5 to 0.7% in dry senior food, and 0.10 to 0.14% in wet food, contribute to maintaining kidney health. Many senior cat foods, whether or not making kidney-health claims, contain more phosphorus. Cat owners may scrutinize the declared phosphorus level of the intended purchase. Noteworthy, prevention of kidney disease by less phosphorus should probably start in adulthood.

P absorption

Dietary phosphorus (P) comes in inorganic and organic phosphates. In adult cats, urinary P excretion was directly related to the dietary content of NaH_2PO_4 (2). Apparent total tract absorption of P from the phosphate was around 75%. As P intake increased, the dietary Ca:P ratio decreased, which amplified P absorption. Increasing Ca:P ratios markedly reduce P absorption in cats (3-6) because more insoluble calcium phosphate is formed in ileal digesta (7).

Apparent absorption of P in commercial dry cat food was on average 33% (8, 9), but can be much higher for wet food (10). Generally, P is more available from animal than plant ingredients, both being outdone by inorganic phosphates (11).

Requirement

For adult cats, the minimum P requirement and recommended allowance have been set at 0.08 and 0.16 g/MJ metabolizable energy (12). P balance was maintained at 0.14 g P/MJ with Ca:P ratio of 1.8 and 67% P absorbability (2). Excretion data for diets differing in P content and Ca:P ratio were used for P requirement estimation through factorial calculation; the outcome was 0.22 g/MJ (6). A diet with 0.08 mg P/MJ and Ca:P ratio of 4.0 induced locomotor disturbances (6). Considering observations (2) as to kidney function, the tentative, safe upper limit of P conforms to 0.60 g/MJ (12).

Renal function

High P consumption degrades kidney function indicators. P intake, within levels of 0.29 to 0.86 g/MJ, was negatively correlated with creatinine clearance in adult cats (2). In a cross-over study (13, 14) with feeding periods of 29 days and a wash-out period of one year, the high- (0.89 g P/MJ; Ca:P = 0.4) versus low-P diet (0.30 g P/MJ; Ca:P = 1.3) lowered creatinine clearance by 23% (14). Microalbuminuria was seen in 9 out of the 13 cats when fed the high-P diet.

Kidney disease model

Cats with experimentally reduced renal mass were fed a diet with 0.66 or 0.18 g P/MJ, but P was not the only variable (15). P restriction diminished kidney mineralization, fibrosis and inflammation as based on histological examination, corroborating other model studies (16, 17).

Renal calcification

Seemingly, antagonizing kidney mineralization retards progression of renal failure. In healthy cats, a diet with 0.14 g P/MJ (Ca:P = 2.5) in place of 0.29 g P/MJ (Ca:P = 1.3) reduced the concentration kidney calcium (18). The anti-calcifying effect may support kidney health.



Clinical trials

Low-P, low-protein dietetic foods can delay loss of kidney function in cats with spontaneous chronic kidney disease (19-22). Moreover, increased survival time (21), decreased mortality (22) and improved quality of life (19) have been reported. According to a retrospective (23) and prospective (21) study, a kidney diet may elongate median survival time by 9 to 12 months.

Senior diets

In case-control studies, type of diet (dry, wet) was not identified as risk factor for chronic feline kidney disease (24), while high P intake was in one study (25), but not in another (26). Experimental research suggests that P restriction reduces the risk of chronic kidney disease, making low-P, senior cat food a prudent choice. In practice, 0.3 to 0.4 g P/MJ (27) may be considered low.

A 2003 report (28) shows that five senior cat foods that claimed to prevent kidney disease, and linked their alleged low-P content with the claim, contained 0.26 to 0.90 g P/MJ, indicating that low-P claims can be misleading (29). By using current brochures, it was calculated that 12 dry, senior cat foods of different brands have P levels from 0.28 to 0.72 g/MJ. The range was 0.28 to 0.70 g/MJ for five foods with both low-P and kidney-health claims.

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.

