Short Communication

Variability in content of homemade diets for canine chronic kidney disease

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THERE is strong scientific evidence to support the use of dietary management in chronic kidney disease (CKD) in dogs (Roudebush and others 2010) and prepared therapeutic diets are available, however, veterinarians are often asked to endorse homemade diets instead. Homemade recipes are usually computer-generated (Remillard and Crane 2010), and to the authors knowledge, feeding trials to establish that they are complete and suitable for long-term feeding have not been conducted, nor have controlled, randomised clinical trials to prove efficacy in dogs with CKD.

Recipes for home-prepared diets intended for dogs with CKD have been evaluated using computer software (Larsen and others 2012), and it was concluded that they result in highly variable and often inappropriate diets, and that many recipes would not meet the nutritional and clinical needs of individual patients. Variability in content could also occur depending on raw ingredients selected for inclusion and methodology used to make the food.

Study hypothesis: Homemade rations prepared by several people in accordance with a set recipe would have similar content making them reliable for the management of canine CKD.

Aim: To determine whether veterinary nurses following a homemade recipe would construct diets with similar analyses.

Six veterinary nurses were asked to prepare a homemade diet according to a formula with a declared analysis (Table 1) that has been widely distributed and recommended by veterinarians for dogs with CKD (Elliott and Lefebvre 2006). Each nurse was instructed to acquire their own raw ingredients from local sources and to make up and homogenise 1000 g of the food. 250 g of each food sample was sent to a UKAS accredited laboratory (Foodtest Laboratories, Unit 10a Langthwaite Business Park, South Kirby, Pontefract, West Yorkshire WF9 3AP, UK) for independent chemical analysis for moisture, protein, fat, ash and crude fibre (National Metrology Institutes). Carbohydrate content was calculated according to convention as the remaining percent of content. Samples were also analysed for phosphate content. The 'as fed' analysis was then recalculated to take into account the variable water content in each sample to give values on a dry matter (DM) basis. The approximate energy density of each sample was calculated using conventional values of 8.5 kcal/g fat, and 3.5 kcal/g protein and 3.5 kcal/g carbohydrate. The content of each component was also calculated as a value per 100 kcal in the food, as dogs need to eat sufficient food to meet their daily calorie requirement, so daily nutrient intake is determined by the calorie density of the food. Finally, variances between the content of the submitted samples and the declared analysis of the published recipe were calculated.

There were differences in raw ingredient sources and methodologies used including the following: meat was weighed in its raw state, but one included wrapping; kitchen scales were used to weigh the ingredients, but one meat sample was weighed by the butcher; oil was added either prior to or after cooking; and different vitamin/mineral supplements were purchased 'off the shelf', or in one case, on the advice of a pharmacist.

The results of the food samples analyses are summarised in Table 2.

DM content varied from 24.5 per cent to 26.9 per cent, all of which were similar but lower than the stated value (30 per cent). Energy densities varied from 109.95 to 136.20 kcals/100 g food. There were wide differences in content of all other components. Protein ranged in content from 3.83 to 6.54 g/100 kcals; fat from 5.55 to 7.05 g /100 kcals; carbohydrate from 5.56 to 9.37 g/100 kcals; ash from 0.47 to 1.00 g/100 kcals; fibre from 0.31 to 0.82 g/100 kcals and phosphate from 0.088 to 0.242 g/100 kcals.

There was little correlation between the homemade diets and the published analysis for this recipe, and the highest and lowest values and their variations from the published analysis for this recipe are shown in Table 3. Homemade food sample 4 varied the most as it contained over 76 per cent more protein than the published amount for the recipe.

Although contentious, controlling protein intake may delay the progression of CKD, and it is also important to control clinical signs associated with uraemia, and to reduce protein-associated phosphorus intake (Polzin and others 1983, 1984, Burkholder 2000, Jacob and others 2002). Only one of the diets prepared from the homemade recipe in this study (sample 2) contained the recommended amount of protein for dogs with CKD (14–20 per cent DM—Forrester and others 2010).

Phosphorus retention is a feature of CKD resulting in hyperphosphataemia and secondary renal hyperparathyroidism, and reducing phosphate intake can delay progression and improve survival rates (Finco and others 1992, Barber and others 1999, Polzin and others 2005). Recommended phosphorus intake to manage CKD in dogs is 0.2–0.5 per cent DM (Forrester and others 2010), and all the homemade diets contained phosphorus within this range except two (samples 2 and 3) which contained slightly less. Diet sample 4 contained over 2.5 times the amount of phosphate present in sample 3, which may represent a difference in the content of the mineral supplement added to the diet.

In this small study involving six veterinary nurses living within commuting distance of a city veterinary hospital, there was wide variation in the content of the diets that they produced. It is likely that even greater variation would result if the recipe was followed by pet owners living in other parts of the UK, across Europe or on other continents.

These findings suggest that homemade diets should be compounded by experienced people, in addition to the findings of a recent

TABLE 1: Recipe for a homemade diet recommended for dogs with chronic kidney disease (Elliott and Lefebvre 2006)

Ingredients		Amount (g)
Recipe for homemade ration		
Beef, minced meat, 20% fat		250
Potato, cooked, with skin		700
Rapeseed oil		50
A low-phosphorus mineral and vitamin supplement		
	Per cent in dry matter	g/100 kcal
Claimed analysis for this ration		
The diet prepared in this way contains 30% dry matter and 70% moisture		
Protein	19	3.7
Fat	34	6.6
Available carbohydrate	36	7.0
Fibre	4	0.8

Veterinary Record (2014) doi: 10.1136/vr.102223

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Provenance not commissioned; externally peer reviewed
Accepted February 5, 2014

TABLE 2: Homemade food analyses

Food sample	1	2	3	4	5	6
DM g/100 g	24.7	26	26.9	24.5	25.4	24.9
Energy density kcals/100 g	109.95	128	136.20	114.75	129.10	121.62
Protein						
As fed analysis (g/100 g food)	6.6	4.9	7.0	7.5	6.2	7.7
DM basis (protein % of DM)	26.72	18.85	26.02	30.61	24.41	30.92
Related to energy density (g/100 kcals)	6.00	3.83	5.14	6.54	4.80	6.33
Fat						
As fed analysis (g/100 g food)	6.1	8.1	9.6	7.2	9.3	8.6
DM basis (fat % of DM)	24.70	31.15	35.69	29.39	36.61	34.54
Related to energy density (g/100 kcals)	5.55	6.33	7.05	6.27	7.20	7.07
Carbohydrate						
As fed analysis (g/100 g food)	10.0	12.0	8.6	7.8	8.1	6.9
DM basis (carbohydrate % of DM)	40.49	46.15	31.97	31.84	31.89	27.71
Related to energy density (g/100 kcals)	9.10	9.37	6.31	6.80	6.27	5.67
Ash						
As fed analysis (g/100 g food)	1.1	0.6	0.9	0.9	0.9	0.8
DM basis (ash % of DM)	4.45	2.31	3.35	3.67	3.54	3.21
Related to energy density (g/100 kcals)	1.00	0.47	0.66	0.78	0.70	0.66
Fibre						
As fed analysis (g/100 g food)	0.9	0.4	0.8	1.1	0.9	0.9
DM basis (fibre % of DM)	3.64	1.54	2.97	4.49	3.54	3.61
Related to energy density (g/100 kcals)	0.82	0.31	0.59	0.96	0.70	0.74
Phosphate						
As fed analysis (g/100 g food)	0.177	0.115	0.120	0.278	0.137	0.159
DM basis (phosphate % in DM)	0.29	0.17	0.17	0.46	0.21	0.26
Related to energy density (g/100 kcals)	0.161	0.090	0.088	0.242	0.106	0.131

DM, Dry matter

TABLE 3: Maximum variations between the homemade samples (S=n) and the published analysis for this recipe (variance if lower than stated –; higher than stated +)

	Lowest value in homemade food (% difference)		Highest value in homemade food (% difference)	
Parameter	DM	/100 kcals	DM	/100 kcals
DM	24.5 (S4*)		26.9 (S3*)	
variance	–18.33%	–	–9.33%	–
Protein	18.85 (S2*)	3.83 (S2*)	30.92 (S6*)	6.54 (S4*)
variance	–0.79%	+3.51%	+62.74%	+76.76%
Fat	24.70 (S1*)	5.55 (S1*)	36.61 (S5*)	7.20 (S5*)
Per cent variance	–27.35%	–15.91%	–7.68%	+9.09%
Carbohydrate	27.71(S6*)	5.67 (S6*)	46.15 (S2*)	9.37 (S2*)
variance	–23.03%	–19.00%	+28.19	+33.86%
Fibre	1.54 (S2*)	0.31(S2*)	4.49 (S4*)	0.96 (S4*)
variance	–61.50%	–61.25%	+10.00%	+20.00%

*Samples S1–S6.
DM, Dry matter

study (Stockman and others 2013) which concluded that formulation of recipes for home-prepared diets requires expert input to minimise the risk of problems, and that recipes should be obtained from, or evaluated by, board-certified veterinary nutritionists or veterinarians with advanced training in nutrition. The problem of variability between raw ingredients and mineral supplements could be reduced by provision of further detail in the recipe. For example, in the recipe used in this study, further information could have been provided about how to construct and cook the food, and how to select a suitable mineral supplement.

The hypothesis was not proved. Unless recipes for homemade diets are sufficiently detailed they do not result in foods with consistent analyses when they are prepared by different people. Veterinarians should not have confidence in the use of homemade diets prepared by pet owners for the management of CKD in their dogs, or for any other clinical condition.

Acknowledgements

The author would like to thank the following staff members at Pride Veterinary Centre: Jennie Porter, Liz Moore, Selena Oliver, Zoe Lawlor, Chrissy Joseph and Linsay Seaton for preparing the foods for this study.

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Veterinary Record

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Veterinary Record 2014 174: 352 originally published online February 27, 2014
doi: 10.1136/vr.102223

Notes