

Comparison of the guaranteed analysis with the measured nutrient  
composition of commercial pet foods

Peer-reviewed author version

Hill, Richard C.; Choate, Christina J.; Scott, Karen C. & MOLENBERGHS, Geert  
(2009) Comparison of the guaranteed analysis with the measured nutrient  
composition of commercial pet foods. In: JAVMA-JOURNAL OF THE AMERICAN  
VETERINARY MEDICAL ASSOCIATION, 234(3). p. 347-351.

DOI: 10.2460/javma.234.3.347

Handle: <http://hdl.handle.net/1942/9268>

1  
2  
3  
4  
5  
6  
7

**Comparison of the Guaranteed Analysis  
with the Measured Nutrient Composition of Commercial Pet Foods**

Richard C Hill VetMB PhD DACVIM DACVN, Christina J Choate BS, Karen C Scott PhD  
Department of Small Animal Clinical Sciences, University of Florida College of Veterinary Medicine,  
Gainesville, FL 32610  
Address correspondence to Dr Hill

10**Objective** – To compare the guaranteed and measured concentrations of nutrients in pet foods.

11**Data Sample** – Annual inspection reports of pet food analyses from South Dakota (2003-2005), Indiana  
12(2004-2005), Rhode Island, New York and New Jersey (2005-2006), .

13**Procedures** - The guaranteed and measured concentration of crude protein, crude fat, crude fiber, moisture  
14and ash were compared among pet foods. The difference for each nutrient was compared among types of  
15food, between dog and cat foods, among target life-stages, manufacturers and state laboratories.

16 **Results** – The guaranteed and measured concentrations of nutrients in pet foods were significantly  
17different. For all foods, the mean±one standard deviation of the difference was  $1.5\pm2.0\%$  for crude protein,  
18 $1.0\pm1.7\%$  for crude fat,  $-0.7\pm1.3\%$  for crude fiber,  $-4.0\pm3.3\%$  for moisture, and  $-0.5\pm1.0\%$  for ash. The  
19crude protein difference was significantly larger for treats than for dry and canned foods. Crude fat  
20difference was significantly less for dry foods than for canned foods and treats. Crude fiber and moisture  
21differences were significantly less for canned foods than for dry foods and treats. Only crude fiber  
22differences differed among target species, life-stages, manufacturers or laboratories.

23**Conclusions and Clinical Relevance** – Adding 1.5% and 1% to the guaranteed minimums for crude  
24protein and crude fat, respectively, and subtracting 0.7%, 4% and 0.5% from the guaranteed maximums for  
25crude fiber, moisture and ash, respectively, provides a more accurate estimate of the nutrient and  
26calculated metabolizable energy content of commercial pet foods. Nevertheless, the actual composition of  
27a food should be determined where possible.

## 29Introduction

30 The FDA amendments act of 2007 mandates that the Federal Drug Administration should develop  
31ingredient, processing, and labeling standards to ensure the safety of pet food. It is of immediate concern,  
32therefore, whether the major nutrient composition of pet foods is accurately reported on pet food labels.  
33Some manufacturers provide the actual or average proximate analysis of commercial pet foods on a  
34website or in pamphlets<sup>1-3</sup> but a guaranteed analysis on the label represents the only numerical description  
35of the nutrient composition of most pet foods sold in the United States. This guaranteed analysis reports  
36the guaranteed minimum as fed percentage of crude protein and crude fat and the guaranteed maximum as  
37fed percentage of crude fiber and moisture.<sup>4</sup> Some manufacturers also provide a guaranteed maximum as  
38fed percentage of ash and a few other nutrients.

39 The ME density of a pet food is also not reported on the label. A few pet food manufacturers report  
40the ME density on a website or in pamphlets<sup>1-3</sup> but the ME density of most pet foods can only be estimated  
41by calculation from the guaranteed analysis. Some authors have suggested using the guaranteed analysis  
42directly to estimate ME density when the actual analysis is not known<sup>5</sup> and one website currently uses this  
43approach.<sup>6</sup> Nevertheless, using the guaranteed analysis directly assumes that there is no difference between  
44the guaranteed and actual analysis of a food. If this assumption is false then the resulting estimate of ME  
45density is likely to be inaccurate and could lead to inappropriate recommendations as to how much and  
46what to feed an animal.

47 The size of the difference between the guaranteed and actual analysis of pet foods has not been  
48reported. Several states run a 'sample check program'<sup>4</sup> to determine whether the actual analysis conforms  
49to the label guarantee but these states do not report a statistical summary of the differences measured.  
50When the analysis of a food suggests that the food does not conform to the guarantee then further testing  
51of the food is undertaken and regulatory action may be instigated against the manufacturer by the state feed  
52control officials. Most manufacturers would be expected, therefore, to keep nutrient composition above  
53guaranteed minima and below guaranteed maxima but differences between the guaranteed and actual

54analyses might vary among foods intended for different species, life stages or among manufacturers.  
55Differences above minima would be expected to be small where adding nutrients increases costs but larger  
56where additional nutrients have to be included to provide a safety margin that allows for differences in  
57ingredients and manufacturing conditions.

58       The purpose of this study, therefore, was (1) to determine whether the manufacturer's guaranteed  
59analysis differed from the measured proximate analysis of commercial pet foods, (2) to ascertain the size  
60and variability of this difference and (3) to compare this difference among different types of food, among  
61foods intended for dogs or cats or different life-stages, and among manufacturers and laboratories  
62undertaking the analyses. We also wished to ascertain how much the difference between the guaranteed  
63and actual analysis might affect an estimate of ME density.

64

## 65**Methods and Materials**

66       The agencies in each state listed by Association of American Feed Control Officials (AAFCO) as  
67being responsible for testing commercial pet foods were asked for copies of the annual reports of pet food  
68test results. Many states did not reply, did not perform regular testing or requested a fee for their report.  
69The most recent reports from the five states that provided reports free of charge were used for this study.  
70These reports included the South Dakota Annual Report on Commercial Feeds and Animal Remedies for  
712003, 2004, and 2005, the Indiana Feed Inspection Report for 2004 and 2005, the New York State  
72Department of Agriculture and Markets Commercial Feed Analysis Annual Report for 2005 and 2006, the  
73New Jersey Animal Feeds Key for 2005 and 2006 and the Rhode Island Report of the Inspection and  
74Analysis of Commercial Feeds, Fertilizers, and Liming Materials for 2005 and 2006. Three annual reports  
75from South Dakota were included because South Dakota reported ash analyses, whereas the other States  
76did not. The difference between the guaranteed and measured composition of crude protein, crude fat,  
77crude fiber, ash, and moisture was calculated for each food. The change from guaranteed to measured  
78amount was also calculated as a percentage of the guaranteed amount. Foods were categorized by type of

79diet (canned, dry, treat, liquid, soft-moist/soft-dry or supplemental food or food in a pouch), intended  
80species (dog or cat), intended life-stage (growth, adult, senior or for weight loss), and manufacturer.  
81Manufacturers for which fewer than fifty foods were analyzed were grouped together. These grouped  
82manufacturers were mostly private-label manufacturers. There were very few soft-moist, soft-dry, liquid or  
83supplemental foods and foods in a pouch so differences were compared only among foods identified as  
84being either canned, dry or treat foods.

85 Statistical analyses were performed using a computer statistics program.<sup>a</sup> Data were assessed for  
86normality both visually and using the Shapiro-Wilk test. Most data failed the Shapiro-Wilk test and  
87variances were not equal so data were log transformed prior to analysis. The guaranteed and measured  
88nutrient compositions were compared using a paired T test. The actual nutrient composition and difference  
89between the guaranteed and measured nutrient composition were compared among types of food (canned  
90vs. dry vs. treat) using a general linear models procedure. Differences were then compared, within each  
91diet type, with intended species, life-stage, manufacturer and laboratory as factors in the model.  
92Interactions among these factors were also included in the model. A Bonferroni correction was used for  
93post-hoc multiple comparisons. A type 1 error of less than 0.05 for the whole experiment was considered  
94significant. Results are presented as means  $\pm$  one standard deviation.

95

## 96Results

97 The guaranteed and measured nutrient analyses of 2208 foods manufactured by 204 companies  
98were compared. There were 1158 canned foods, 750 dry foods, 258 treats, 32 other types of food (soft-  
99moist, soft-dry, liquid, supplemental foods or foods in pouches) and 21 foods of unidentified type. The  
100guaranteed analysis was different from the measured analysis for all nutrients ( $p < 0.0001$ ). The mean  
101difference between the guaranteed and actual analysis of all these foods was 1.5% for crude protein, 1.0%  
102for crude fat, -0.7% for crude fiber, -4.0% for moisture, and -0.5% for ash (table 1).

103 The difference between the analyses of crude protein, crude fat, crude fiber and moisture varied  
104among canned, dry and treat foods ( $p<0.0001$ ; Table 2): the difference between the crude protein analyses  
105of treats was twice that of canned and dry foods ( $p<0.0001$ ); the difference between the crude fat analyses  
106of canned foods and treats was larger than that of dry food ( $p=0.0001$ ); the difference between the crude  
107fiber analyses of dry foods was larger than that of treats, which was larger than that of canned foods  
108( $p<0.0001$ ); and, the difference between moisture analyses of dry foods and treats was slightly more than  
109that of canned foods ( $p<0.003$ ).

110 For each food type, there was no evidence of an effect of intended species or life-stage,  
111manufacturer or laboratory on the difference between the analyses of crude protein, crude fat, moisture or  
112ash. In canned foods, however, the difference between crude fiber analyses was less in adult foods ( $-$   
113 $0.3\pm0.6\%$ ) and growth foods ( $-0.1\pm0.4\%$ ) than in foods for weight loss ( $-1.0\pm1.2\%$ ;  $p<0.0003$ ), was larger  
114in foods manufactured by Iams ( $-0.9\pm2.4\%$ ) than in foods manufactured for private labels ( $-0.2\pm0.6\%$ ;  
115 $p\leq0.009$ ), and there was an interaction between laboratory and manufacturer ( $p<0.0001$ ). In dry foods, the  
116difference between crude fiber analyses was larger in foods analyzed in New York ( $-2.4\pm2.0\%$ ) than those  
117analyzed in Rhode Island ( $-0.6\pm0.3\%$   $p<0.0001$ ), and there was an interaction between intended species  
118and manufacturer ( $p<0.002$ ).

119 The nutrient composition varied markedly among canned, dry and treat diets (Table 2). When this  
120variation in composition was taken into account by calculating the change from guarantee to measured  
121amount of nutrient as a percentage of the guarantee, the percentage change in crude protein, crude fat,  
122crude fiber and dry matter analysis differed among types of diet ( $p<0.0001$ ; Table 2) but the pattern of  
123differences among canned, dry and treat foods changed slightly. The percentage change in crude protein  
124analysis for canned foods and treats was more than for dry foods ( $p<0.0001$ ); the percentage change in  
125crude fat analysis for canned foods and treats was more than for dry foods ( $p=0.0001$ ); the percentage  
126change in crude fiber analysis for dry foods and treats was more than for canned foods ( $p<0.0001$ ); and,  
127the percentage change in dry matter analysis in dry foods and treats was less than in canned foods

128( $p < 0.0001$ ). For each food type, there was again no evidence of an effect of intended species or life-stage,  
129manufacturer or laboratory on the percentage change in crude protein, crude fat, dry matter or ash analysis.  
130In canned foods, however, the percentage change in crude fiber analysis was less for growth foods ( $-$   
131 $15 \pm 38\%$ ) than for foods for weight loss ( $-33 \pm 31\%$ ;  $p \leq 0.01$ ) and was less in foods analyzed in New York ( $-$   
132 $24 \pm 87\%$ ) than in foods analyzed in Rhode Island ( $-25 \pm 14\%$ ;  $p \leq 0.01$ ). In dry foods, the percentage change in  
133crude fiber analysis was larger in foods analyzed in New York ( $-36 \pm 128\%$ ) than those analyzed in Rhode  
134Island ( $-17 \pm 8\%$   $p < 0.0001$ ).

135 Differences in nutrient analyses of liquid foods, soft-moist/soft dry, supplemental foods and foods  
136fed in pouches were within the same range as those of canned, dry and treat foods (Table 3).

137

## 138Discussion

139 This study shows that the measured proximate analysis of commercial pet foods is slightly  
140different from the guaranteed analysis and a more accurate estimate of the major nutrient composition of  
141commercial pet foods can be obtained by adding 1.5% and 1%, respectively, to the guaranteed minima for  
142crude protein and crude fat, and subtracting 0.7%, 4% and 0.5%, respectively, from the guaranteed maxima  
143for crude fiber, moisture and ash. Nevertheless, the difference between the guaranteed and measured  
144analysis showed some variation about these mean values so the recommended adjustments should improve  
145the accuracy of the estimate of diet composition on *average*, but may reduce the accuracy of the estimated  
146analysis of *individual* foods where the actual composition is close to the guarantee. Furthermore, within all  
147types of food, there were a few outlying values where actual food analyses diverged markedly from the  
148guarantee. For such foods, the adjusted estimate of composition would remain wildly inaccurate. It is still  
149better, therefore, to ascertain the actual composition of a food either by analysis or from the manufacturer  
150rather than relying on the guarantee as a measure of the actual analysis even after adjustment.

151 In absolute terms, the mean differences in analysis were mostly small but as a percentage of the  
152amount of each nutrient in the diet the mean changes were substantial (5-30%). Such inaccuracy can



153substantially affect any estimate of ME density of the food obtained by calculation. If food is assumed to  
154have a composition described by the mean analyses in table 2 and ME density is calculated using the  
155method recently recommended by the National Research Council for dog foods in 2006,<sup>8</sup> these  
156adjustments would increase the calculated ME density, by 33%, 8% and 8% for canned and dry foods and  
157treats, respectively. Using the older method recommended by the National Research Council that uses  
158modified Atwater factors to calculate ME density,<sup>9</sup> the increase in calculated ME density following  
159adjustment of the guarantee would be 28%, 7% and 8% for canned and dry foods and treats, respectively.  
160Using the guaranteed analysis directly without adjustment to calculate ME directly would result in a  
161substantial overestimate of the amount of food that should be fed to a pet to maintain body weight and  
162could lead to obesity should the owner of that pet follow a recommendation based on this estimate too  
163rigorously.

164       The analyzed amount of crude protein and crude fat was less than the guaranteed minimum in some  
165foods and the analyzed amount of crude fiber, moisture and ash was greater than the guaranteed maximum  
166in others. Nevertheless, examination of the 5% quantiles for crude protein and crude fat and the 95%  
167quantiles for crude fiber, moisture and ash shows that only 5% of foods were more than 0.7% below the  
168guaranteed minimum for crude protein or 1.1% below the guaranteed minimum for crude fat. Similarly,  
169only 5% of foods were more than 0.4% above the guaranteed maximum for moisture or 0.8% above the  
170guaranteed maximum for ash. Less than 5% failed to conform to the guaranteed maximum for crude fiber.  
171Furthermore, it is possible that analytical variation (AV) could explain why these foods appear to contain  
172less nutrient than stated in the guarantee. To aid in determining whether the discrepancy with the guarantee  
173is sufficient to warrant regulatory action, AAFCO provides guidelines as to what AV should be expected  
174for standard analytical methods used for the analysis of pet foods.<sup>4</sup> For example, the AV guideline for  
175measuring moisture is 12% of the guaranteed moisture content. This would be equivalent to 1.2% for dry  
176food with a guaranteed maximum of 10% moisture. Thus, an actual analysis of up to 11.2% moisture could  
177be explained by analytical variation in the dry food, whereas a measurement above 11.2% would be

178considered grounds for further testing or regulatory action. Other AAFCO guideline AVs for major  
179nutrients are also small: the AV guideline for measuring crude protein is  $(20/x + 2)\%$  of the guaranteed  
180percentage (x) of crude protein (0.8% below a guaranteed minimum of 30% protein); the AV guideline for  
181measuring crude fat is 10% of the guaranteed percentage for fat (1% below a guaranteed minimum of 10%  
182fat); the AV guideline for measuring crude fiber is  $(30/x + 6)\%$  of the guaranteed percentage (x) of crude  
183fiber (0.54% above a guaranteed maximum of 4% crude fiber); and, the AV guideline for measuring ash is  
184 $(45/x + 3)\%$  of the guaranteed percentage (x) of ash (0.63% above a guaranteed maximum of 6% ash). Most  
185foods complied with AAFCO regulations, therefore, and only a few foods would have been subjected to  
186additional testing and/or regulatory action.

187       The difference between the guaranteed and actual analysis for crude fat, crude fiber and moisture  
188differed in dry and canned foods and in treats. It is possible, therefore, to make different adjustments for  
189dry and canned foods and treats based on the average differences reported in table 2, e.g., adding 1.2% and  
1900.7% to the guarantee for crude fat in canned and dry diets, respectively and subtracting 3.5% and 4.5%  
191from the guarantee for crude moisture in canned and dry foods, respectively. This more complex  
192adjustment does not confer much advantage, however. Using this more complex adjustment of the  
193guarantee and the 2006 National Research Council method of calculating ME density for dog foods,<sup>7</sup> the  
194increase in calculated ME density would be 26%, 10% and 13% for canned diets, dry diets and treats  
195respectively, which are similar in scale to the changes obtained with the simpler method that does not  
196distinguish the type of diet.

197       The number of analyses was large (>500) for crude protein, crude fat, crude fiber and moisture but  
198low (39) for ash. This low number is partly because a maximum guarantee for ash is not required in the  
199guaranteed analysis and partly because only the South Dakota laboratory reported measuring ash. The  
200mean difference between the guaranteed and measured analysis for ash is a less reliable estimate, therefore,  
201than the estimate for other nutrients but an accurate estimate of the difference from a guarantee is of  
202limited value because a guarantee for ash is rarely listed on the pet food label. An estimate of the actual ash

203content of a pet food is essential, however, for calculating ME density of the many foods as the  
204carbohydrate content of the food can only be estimated by difference, as nitrogen free extract (NFE), after  
205the ash content has been estimated. The mean ash content was 6% in dry and 2% in canned foods. These  
206values can be used directly, therefore, without adjustment when calculating the nutrient and ME density of  
207pet foods for which the ash content is unknown.

208 A further potential limitation of this study was the method of sampling. The choice of State  
209laboratories was a sample of convenience and the choice of foods was decided by the State laboratories. It  
210is possible, therefore, that the foods chosen may not be representative of all foods sold in the United States  
211and a more extensive body of data obtained more systematically might provide slightly different results.  
212This is especially true for ash because a guarantee is probably mostly provided for foods where the  
213manufacturer wishes to emphasize the lack of ash in the diet. Thus, a more representative sample might  
214discover a mean ash content of pet foods that is higher than that reported here. On the other hand, the  
215values for other nutrients are likely to be more representative as a guarantee is always required for the  
216other nutrients and foods from a large number of manufacturers were tested

217 In conclusion, the actual analysis of pet foods differs from the manufacturers' guaranteed analysis.  
218An adjustment should, therefore, be made to the guaranteed analysis to obtain a more accurate estimate of  
219the nutrient and ME density of a food when only the guaranteed composition of a diet is known.  
220Nevertheless, variation in the difference between the actual analysis and the guarantee among individual  
221foods suggests that there is no substitute for ascertaining the actual composition of a food.

222

## 223Footnotes

224a: SAS 9.1.3, SAS Institute Inc., Cary, NC

225

## 226References

2271. Hill's Key to clinical nutrition. Topeka, KS: Hill's Pet Nutrition, Inc. 2007

2282. Iams veterinary formulas product reference guide. Dayton, OH: P&G Petcare, 2007.
2293. Royal Canin veterinary diet product guide. St Charles, MO: Royal Canin USA, Inc., 2006
2304. Association of American Feed Control Officials. AAFCO Model bill and regulations. In: 2007 Official  
231Publication Association of American Feed Control Officials Incorporated. Atlanta: American Association  
232of Feed Control Officials, 2007:79-183.
2335. Case LP, Carey DP, Hirakawa DA and Daristotle L. Energy and water. In: *Canine and feline nutrition:*  
234*a resource for companion animal professionals* 2<sup>nd</sup> ed. St Louis MO: Mosby, 2000:3-14.
2356. [http://balanceit.com/gaconvertor/p01\\_index.php](http://balanceit.com/gaconvertor/p01_index.php), Aug 2007
2367. Ad hoc committee on dog and cat nutrition. Energy. In: *Nutrient requirements of dogs and cats.*  
237Washington: National Academies Press, 2006:28-48
2388. Subcommittee on dog nutrition. Nutrient requirements and signs of deficiency. In: *Nutrient*  
239*requirements of dogs* Washington: National Academies Press, 1985:2-38.

240**Table 1 – The difference between guaranteed and measured percent as fed analysis in all pet foods<sup>a</sup>.**

Nutrient	Mean	Standard Deviation	Median	5% quantile	95% quantile	Minimum	Maximum	N
Crude Protein	1.5	2.0	1.4	-0.7	4.1	-13.9	34.4	2200
Crude Fat	1.0	1.7	0.8	-1.1	3.7	-9.2	16.8	1431
Crude Fiber	-0.7	1.3	-0.4	-3.0	-0.1	-11.0	8.9	695
Moisture	-4.0	3.3	-3.9	-8.8	0.4	-22.2	10.2	573
Ash	-0.5	1.0	-0.5	-2.2	0.8	-4.7	1.4	39

241

242**a:** Negative values indicate a measured analysis that was less than the guaranteed crude protein and crude

243fat minimum, and the crude fiber, moisture and ash maximum.

244

245

246

**Table 2 – The measured nutrient composition and the difference between guaranteed and measured as fed analyses for canned, dry and treat pet foods**

Food type	Crude Protein	Crude Fat	Crude Fiber	Moisture	Ash
Measured % as fed nutrient composition					
Canned	10.4 <sup>a</sup> ± 2.2 (1156)	6.1 <sup>a</sup> ± 2.5 (601)	1.0 <sup>a</sup> ± 0.5 (448)	74.5 <sup>a</sup> ± 6.5 (328)	2.2 <sup>a</sup> ± 0.6 (22)
Dry	29.3 <sup>b</sup> ± 5.9 (739)	12.6 <sup>b</sup> ± 4.2 (646)	2.7 <sup>b</sup> ± 1.7 (139)	6.7 <sup>b</sup> ± 3.6 (150)	5.9 <sup>b</sup> ± 0.9 (12)
Treat	22.1 <sup>c</sup> ± 13.8 (253)	8.5 <sup>c</sup> ± 3.0 (152)	2.0 <sup>c</sup> ± 1.3 (86)	13.5 <sup>c</sup> ± 11.7 (91)	5.2 <sup>b</sup> ± 1.8 (5)
Change in nutrient composition as % of total diet					
Canned	1.3 <sup>a</sup> ± 1.2 (1156)	1.2 <sup>a</sup> ± 1.5 (601)	-0.3 <sup>a</sup> ± 0.6 (448)	-3.5 <sup>a</sup> ± 3.4 (328)	-0.4 ± 0.7 (22)
Dry	1.6 <sup>a</sup> ± 2.0 (739)	0.7 <sup>b</sup> ± 1.8 (646)	-1.8 <sup>b</sup> ± 1.8 (139)	-4.6 <sup>b</sup> ± 2.4 (150)	-0.3 ± 0.9 (12)
Treat (all)	2.4 <sup>b</sup> ± 3.6 (253)	1.6 <sup>a</sup> ± 1.8 (152)	-1.1 <sup>c</sup> ± 1.4 (86)	-4.9 <sup>b</sup> ± 3.7 (91)	-1.6 ± 2.2 (4)
Change in nutrient composition as % of guaranteed composition					
Canned	15 <sup>a</sup> ± 14 (1156)	25 <sup>a</sup> ± 29 (601)	-17 <sup>a</sup> ± 53 (448)	16 <sup>a</sup> ± 16 (328) <sup>dm</sup>	-10 ± 32 (22)
Dry	7 <sup>b</sup> ± 20 (739)	9 <sup>b</sup> ± 42 (646)	-30 <sup>b</sup> ± 104 (139)	5 <sup>b</sup> ± 3 (150) <sup>dm</sup>	-5 ± 16 (12)
Treat	15 <sup>a</sup> ± 22 (253)	36 <sup>a</sup> ± 64 (151)	-25 <sup>b</sup> ± 44 (86)	6 <sup>b</sup> ± 7 (91) <sup>dm</sup>	-15 ± 22 (4)

Values are means ± one standard deviation with N in parentheses. Negative values indicate a measured analysis that was less than the guaranteed crude protein and crude fat minimum, and the crude fiber, moisture and ash maximum

a,b,c- means with different superscripts within a column are significantly different (p<0.05)

dm- values are presented as the change in guaranteed to measured dry matter composition as a percent of the guaranteed minimum dry matter content (100- maximum guaranteed moisture content)

258**Table 3 – The difference between measured and guaranteed percent as fed analysis for liquid, soft**  
259**moist or soft dry foods, and supplements<sup>a</sup>.**

Nutrient	Liquid food			Soft-moist or Soft-dry food			Supplemental food		
	Mean	Range	N	Mean	Range	N	Mean	Range	N
Crude protein	0.4	0.1 to 0.8	2	1.1	-0.3 to 2.6	9	0.9	-10.8 to 6.7	9
Crude fat	-1.8	-4.1 to 0.4	2	1.2	0.9 to 1.5	3	4.9	-1.1 to 10.7	3
Crude fiber			0	0.1		1			0
Moisture	-0.1		1			0	-4.1		1
Ash	-0.3		1			0			0

260

261**a:** Negative values indicate a measured analysis that was less than the guaranteed crude protein and crude  
262fat minimum, and the crude fiber, moisture and ash maximum.