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Labels Nutrition of Dogs and Cats Dry Food Versus Laboratory Data and Regulation

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Abstract: Quality of pet foods must be primary concern for manufacturers worldwide and their guaranteed levels must be stated on food labels and be followed. This research reports an investigation regarding the guaranteed levels stated on 52 of dogs and cats samples pack labels versus laboratorial data and country regulation. The laboratory data of 44% dogs and cats food samples did not correlate to the levels described on the labels. The data was compared to the international levels of inclusion regulated by the AAFCO for pet food regulation and NRC and regarding nutritional requirements, 50% of Europe and North America samples did not meet the level recommended. Most of the moisture content samples were in the safe range with exception of 4% of North America samples. More attention should be taken by the manufacturers, regarding nutritional values reported on pet food labels and the real content present in the packs food content.

Key words: Dog, cat, food, labels, nutrients, safety

INTRODUCTION

Dry pet food represents the main product of the food industry for pets. This complete food is composed of several ingredients providing nutrients mainly protein, fat and ash which are stated as Nutritional Guaranteed Levels (NGLs) (AAFCO, 2008). Those food groups must supply the nutrients required to meet a balanced metabolism and provide the proper nutrition for the intended use (each pet's life stage). Pet's development, health and longevity depend upon receiving the correct amounts and proportions of those NGLs (Thompson 2008; FEDIAF, 2011). Therefore, the variety of ingredients and the maintenance of the NGLs standards officially established should be prioritized as alterations can affect animal's performance (Carciofi, 2008; Zicker, 2008).

Regarding the importance of fat in the diet of dogs and cats, it is responsible for providing the essential fatty acids and energy as well as to enhance the diet palatability. A minimum amount of dietary fat is also needed as a carrier for the fat-soluble vitamins (Bauer, 2006; Peachey *et al*., 1999). Both animals are able to keep healthy when consuming food that contain a wide range of different fat content, provided that other nutrients are adjusted to account for the changes in energy density. Most of adult's pets today live relatively sedentary lifestyles and do not need high fat concentrations (Case *et al*., 2011). On the other hand, protein in the diets (Crude Protein (CP)) is necessary for the replacement of protein losses in the skin, hair, digestive, enzymes and mucosal cells, as well as amino acid losses from normal cellular protein catabolism (Carciofi, 2008).

Minerals Matter (MM) is represented in the NGLs as ash content. It represents the amount of 2 groups of mineral nutrients required by pets, the macro minerals (Ca, P, K, Na, Cl and Mg) and trace minerals (Fe, Cu, Zn, Mn, Se and I) that are necessary for enzyme functioning and other reactions to keep the metabolism balanced. However, most of them do not have established and/or label stated limit of inclusion on pet foods of different countries regulation. The minerals that are of most practical significance in the nutrition and feeding management of dogs and cats today are Ca and P and quantities have been established for pet food daily consumption (Case *et al*., 2011). Despite this, mineral nutrition problems in dogs and cats are often a result of excesses or imbalances from interactions with other nutrients (FEDIAF, 2011).

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Another important guaranteed level in pet food quality is the moisture content (mc) which when altered, may interfere to pet food safety regarding microorganism growth and deterioration. It is included on the labels as the Safety Guaranteed Level (SGL). Inadequate moisture conditions may influence microbiological contamination, such as fungi, yeasts and bacteria growth in pet food. If it is >12% indicates possible food deterioration and/or further food sanitary problem.

Dry pet foods contain between 6 and 12% of mc (Zicker, 2008). The extrusion process reduces the total mc of the product, thus inhibiting the growth of most organisms. The importance of drying and the mc control during processes and final product storage is crucial to guarantee safe pet food and prevent contaminations (Carciofi, 2008).

In order to check if the quality GLs stated on the pack labels of dry pet food samples correspond to their inside real content, a research was carried out to evaluate the NGL and SGL indicators of dogs and cats samples from different countries by:

- Laboratory analysis
- Their accomplishment to the labels' declared
- If both are in conformity to the standards established by each country's regulation
- Correct requirement for dogs and cats established by the internationally recognized AAFCO and NRC

MATERIALS AND METHODS

Samples: Dry food (52) for dogs (37) and cats (15) in different life stages (puppy and adult) from several brands, in their original sealed packs.

Chemicals: Reagents-chloride acid, sodium hypochloride, perchloric acid, sulfuric acid, sodium chloride, sodium salicylate, sodium nitroprusside, sodium hydroxide, disodium hydrogen phosphate, all analytical grades (Vetec, Rio de Janeiro, Brazil), Triton X-100 (Sigma Chemical, St. Louis, USA); solvents-methanol, ethyl and petroleum ether analytical grade (J.T. Baker, Texas, USA) and ultrapure water (Millipore, Massachusetts, United States).

Equipment: Drying oven (Fanem, Sao Paulo, Brazil), analytical scale (Shimadzu, Kioto, Japan), vacuum pump (Tecnal, Sao Paulo, Brazil), block digestor (marca), water bath (Quimis, Sao Paulo, Brazil), muffle (Quimis, Sao Paulo, Brazil) and protein analyzer (Leco, Saint Joseph, USA).

Other materials: Non-vacuum desiccators ⌀ 200 mm and membrane filter with 0.45 μm and 0.45 mm for porosity and diameter, respectively (Millipore, Massachusetts, United States).

Pet food regulations: In Canada, feed regulations by Minister of Justice; guide for labeling and advertising of pet foods by the Canadian Government's Competition Bureau of 21/09/2001. In Mexico, Secretary of Agriculture, Livestock, Rural Development, Fisheries and Food SAGARPA and National Service of Health, Food Safety and Quality-SENASICA. In European Union (EU), European Commission 767, 13/07/2009; European Commission 939, 20/10/2010; European Pet Food Industry Federation, 08/2011 (FEDIAF, 2011) and in Brazil, Ministry of Justice, Law n.8078, 11/09/90; Ministry of Agriculture, Livestock and Supply-MAPA, Decree n. 6296, 11/12/2007; NI 30, 05/08/2009 and NI 66, 16/12/2009. Other associations based on international regulation: Association of American Feed Control Officials for pet food regulation (AAFCO, 2008) and National Research Council (NRC, 2006).

Sample collection and preparation: Sealed packs of dogs and cats dry food were purchased randomly from supermarkets and pet stores in North America (Canada and Mexico), South America (Brazil) and Europe Union (Austria, Finland, France, Germany, Italy and Switzerland). From each sample, the inner content and empty packs were separated. For inner content each of them was homogenized by quartering and separated into small portions of 60 g for analysis (CP, fat, ash and mc); empty packs: Proceed the evaluation of information described on labels regarding the GL and packaging characteristics. This information was used to compare with the values obtained from the laboratory analysis.

GL laboratory analysis: The NGL (CP, fat and ash) and SGL (mc) analysis were performed in triplicate in order to investigate the real GLs based on the AOAC (2005) official methods arts, 990.03, 954.02, 900.02 and 930.15 for CP, fat, ash and mc, respectively.

Labels information about guaranteed levels: The dogs and cats pet food labels information regarding the GLs for each sample pack was collected and registered for further comparison to the laboratory data obtained.

Pet food regulations versus labels and laboratory data: Data obtained from the GLs laboratory and labels stated of the pet food samples were correlated to the established standards of the country origin (Canada; Mexico and Brazil, respectively) and checked for Non-conformities

(N_c). In addition to compare the dog and cats, dry food GL laboratory data obtained in this study, researchers utilized the recognized international association of the AAFCO and NRC organization for nutrition quality assurance program, based on nutritional standards and regulations pertaining to the production, labeling and distribution of pet food.

RESULTS AND DISCUSSION

The GLs laboratory data obtained from the dogs and cats dry food samples of different countries varied slightly from those stated on their own labels and regulatory standards. Table 1 and 2 show the differences between labels and laboratory analysis data, their comparison to countries established standards and the statistics variation obtained between same origin samples.

GLs laboratory data versus analytical values of labels: The real inner pack needs to accomplish to the label GLs stated. Despite that in the Canada and EU regulation some tolerance between GLs laboratory data and GLs labeled are allowed (FEDIAF, 2011) (Table 3).

Some variations were detected for both GLs indicators (NGL and SGL) described on the labels by the laboratory analysis as folloews (Table 1).

NGL: From the total samples data obtained on either CP, fat or ash, 42% (22) of samples were not in accordance to the NGLs described on each dogs and cats food label with 51 (20), 34 (13) and 15 (6)% of them produced and commercialized in EU, South and North America, respectively. The variations were mainly on the fat and ash levels, followed by CP in less extent though. The fat content was reduced from the labels stated in 25% (13) of the samples (77 and 23% of dogs and cats foods, respectively) being 54% (7) from EU and 46% (6) in South and North America.

Regarding ash, 19.2% (10) had N_c to the label stated, exceeding the maximum allowed for such food types (maximum of 15.04%). On the other hand, the CP N_c levels detected corresponded to 11.5% (6) of the dogs (3) and cats (3) food samples. They did not correlate to those labels stated with N_{cs} in 67 and 33 % of dogs and cats food, respectively. Important to emphasize that although, those N_cs were detected per individual samples, some of them were simultaneously inadequate in 13.4% (7) of dog's samples for two levels of NGLs (CP, fat and/or ash). Those difference (N_{cs}) on the laboratory x labels detected in the samples of the current study may be related to either, the lack of quality standards settings by each country´s supervisory bodies and/or laboratory control.

SGL (mc): Most of the laboratory data obtained showed to be rather similar to those stated, both on the dogs or cats labels and their regulation established standard (Table 2). Only 11.5% (6) of the samples did not correlate to the label mc, thus exceeding the maximum allowed (security mc established). There is no limit of mc for pet food, estimation between 6 and 12% can be often considered as safe (Zicker, 2008; Case *et al*., 2011). Only two samples (EU and South America) were detected presenting high mc (15.8 and 16.2%, respectively). Despite this, the higher mc levels can compromise the safety and stability of those pet food providing moisture conditions for fungi and bacteria growth, as well as chemical deterioration. The laboratory data obtained showed that some samples (44%) did not match (N_{cs}) to the labels information, thus contradicting the regulations of dogs and cats dry food.

Countries regulation for pet food GLs standards: Regarding the pet food Gls standards set by regulation of each country, most of the Gls stated on

Table 1: Guaranteed levels from laboratory data versus described on the pet food labels and their non-conformities

		Laboratory data GL (%)				Packs labels GL±tolerance allowed (%)*				Laboratory data x pack label N_c			
		NGLs			SGL	NGLs			SGL	NGLs			SGL
Pet species	Total	CP (min)	Fat (min)	Ash (max)	mc (max)	CP (min)	Fat (min)	Ash (max)	mc (max)	CP (min)	Fat (min)	Ash (max)	mc (max)
North America													
Canada													
Dogs	3	41.60	16.53	8.00	7.90	40.0-1.5	18.00±0.5	NS	10.0	C	N_c**	C	C
		33.76	14.08	6.72	7.60	34.0-1.5	14.00±0.5	NS	10.0	C	C	C	C
		30.45	16.23	6.57	8.40	29.0-1.5	16.00±0.5	NS	10.0	C	C	C	C
Cats	4	36.89	18.35	9.11	8.60	33.0-1.5	20.50±0.5	8.8	NS	C	N_C**	C	NA
		31.46	12.45	4.75	7.90	31.0-1.5	11.00±0.5	NS	12.0	C	C	C	C
		36.49	12.22	6.82	8.00	34.0-1.5	13.00±0.5	NS	12.0	C	N_C**	C	C
		41.94	20.50	8.18	7.40	42.0-1.5	20.00±0.5	NS	10.0	C	C	C	C
Mexico													
Dogs	3	28.21	11.19	7.33	9.10	27.0	11.0	NS	12.0	C	C	C	C
		27.68	11.61	8.05	5.90	27.0	10.0	10.0	11.0	C	C	C	C
		28.68	15.36	7.60	7.80	29.0	13.0	8.0	12.0	N_C**	C	C	C

Table 1: Continue

Pet species	Total	Laboratory data GL (%) NGLs CP (min)	Fat (min)	Ash (max)	SGL mc (max)	Packs labels GL±tolerance allowed (%)* NGLs CP (min)	Fat (min)	Ash (max)	SGL mc (max)	Laboratory data x pack label N_c NGLs CP (min)	Fat (min)	Ash (max)	SGL mc (max)
European Union													
Austria/Finland/France/Italy/Switzerland													
Dogs	10	27.15	13.53	6.71	8.70	25.0±3.0	16.0±2	6.00±1	8.00±1	C	N_C**	N_C***	N_C***
		24.68	12.82	6.36	8.70	25.0±3.0	16.0±2	6.00±1	8.00±1	C	N_C**	N_C***	N_C***
		30.05	15.80	7.40	7.50	29.0±3.0	19.0±2.4	6.50±1	8.00±1	C	N_C**	N_C***	C
		17.33	16.17	5.49	15.8	17.0±2.2	14.5±2	7.00±1	20.00±1.6	C	C	C	C
		23.81	11.47	6.89	8.90	23.0±2.9	13.0±2	7.00±1	NS	C	N_C**	C	NA
		9.77	5.60	2.82	9.30	10.0±2.0	7.6±2	2.95±1	10.00±1	N_C**	N_C**	C	C
		9.34	5.70	2.65	9.70	10.0±2.0	5.0±2	2.50±1	9.50±1	N_C**	C	N_C***	N_C***
		12.31	6.93	4.14	9.80	12.0±2.0	6.5±2	6.00±1	NS	C	C	C	NA
		14.41	7.24	11.25	10.0	14.0±2.0	6.0±2	14.50±1.8	NS	C	C	C	NA
		15.58	7.56	4.07	10.3	15.0±2.0	8.0±2	8.00±1	NS	C	N_C**	C	NA
Cats	6	27.70	11.27	8.42	9.30	29.0±3.0	9.0±2	8.50±1.1	11.00±1	C	C	C	C
		27.74	9.72	9.00	9.50	29.0±3.0	9.0±2	8.50±1.1	11.00±1	C	C	N_C***	C
		32.62	12.19	6.37	8.00	32.5±3.0	13.0±2	6.80±1	10.00±1	C	N_C**	C	C
		32.89	11.59	7.28	9.00	32.0±3.0	11.0±2	8.00±1	NS	C	C	C	NA
		28.69	9.98	9.08	9.40	28.0±3.0	8.5±2	9.00±1.2	NS	C	C	C	C
		29.45	9.64	6.92	9.50	30.0±3.0	10.0±2	8.00±1	NS	C	N_C**	C	C
South America													
Brazil													
Dogs	21	24.46	12.66	6.67	7.80	23.0	12.0	8.00	12.0	C	C	C	C
		26.80	13.52	10.06	11.90	25.0	10.0	10.00	10.0	C	C	N_C***	N_C***
		21.35	9.93	8.76	8.80	20.0	7.0	10.00	12.0	C	C	C	C
		29.59	10.42	5.27	7.70	25.0	10.0	8.00	14.0	C	C	C	C
		32.85	13.64	6.24	8.60	29.0	13.0	8.00	12.0	C	C	C	C
		25.10	11.31	7.09	7.00	21.0	7.0	10.00	10.0	C	C	C	C
		19.76	8.79	7.26	9.30	19.0	7.5	9.00	12.0	C	C	C	C
		28.51	12.24	10.61	8.70	27.0	7.0	10.00	10.0	C	C	N_C***	C
		23.27	9.62	11.29	8.40	22.0	8.0	12.00	12.0	C	C	C	C
		29.78	11.14	8.42	16.20	30.0	10.0	13.20	12.0	N_C**	C	C	N_C***
		27.83	10.74	7.70	8.90	27.0	9.0	10.00	12.0	C	C	C	C
		20.07	7.07	6.74	8.70	19.0	5.5	9.00	22.0	C	C	C	C
		21.47	9.59	10.6	9.50	21.0	8.0	12.00	12.0	C	C	C	C
		19.71	7.81	7.15	9.20	19.0	7.5	9.00	12.0	C	C	C	C
		24.22	10.42	10.35	8.30	23.0	13.0	10.00	12.0	C	N_C**	N_C***	C
		24.38	12.39	7.61	8.40	23.0	12.0	8.50	10.0	C	C	C	C
		24.37	12.72	5.88	8.70	23.0	12.0	8.50	10.0	C	C	C	C
		27.30	13.52	7.99	9.20	26.0	14.0	8.50	10.0	C	N_C**	C	C
		30.56	12.5	5.62	8.80	28.0	13.0	8.50	10.0	C	N_C**	C	C
		20.36	9.20	9.40	7.90	20.0	7.0	10.00	12.0	C	C	C	C
		36.89	12.48	6.23	11.90	24.0	12.0	8.00	10.0	C	C	NA	N_C***
Cats	5	27.31	10.54	15.04	7.10	31.0	10.0	12.00	12.0	N_C**	C	N_C***	C
		30.34	9.03	8.30	8.20	30.0	8.0	11.00	12.0	C	C	C	C
		18.72	7.37	7.20	10.00	19.0	6.5	12.00	12.0	N_C**	C	C	C
		24.31	9.52	9.51	7.90	21.0	7.0	10.00	10.0	C	C	C	C
		26.34	8.18	5.80	8.70	24.0	8.0	4.00	12.0	C	C	N_C***	C
Average		25.60	10.62	8.18	9.00	23.8	9.38	9.58	11.75	NA	NA	NA	NA
Minimum		18.72	7.07	5.27	7.00	19.0	5.50	4.00	10.0	NA	NA	NA	NA
Maximum		36.89	13.64	15.04	16.20	31.0	14.0	13.20	22.0	NA	NA	NA	NA
SD		4.49	1.96	2.21	1.85	3.75	2.49	1.86	2.35	NA	NA	NA	NA
RSD (%)		0.17	0.18	0.27	0.20	0.15	0.26	0.19	0.20	NA	NA	NA	NA

GL = Guaranteed Level; N_C = Non Conformity; NGLs = Nutritional Guaranteed Levels; SGL = Safety Guaranteed Level; CP = Crude Protein; mc = Moisture content; NS = Not Stated; C = Conformy; NA = Not Applied; *Tolerance allowed by Canadian and EU regulation (FEDIAF, 2011); **Lower than the label statement; ***Higher than the label statment; Pet food samples = NGLs, SGL; SD = Standard Deviation; RSD = Relative standard deviation

the labels of different countries were in Conformity (C) to their own GL regulation standards (Table 1 and 2).

Canada: The advertising and labeling of pet food is an accepted standard in the Canadian pet food industry. Regarding the compulsory GL labeling of pet foods, it states as NGL information of CP, fat, fiber and mc. The ash statement is not required. All samples evaluated in the current study declared on the label those GLs (CP and fat, including fiber).

The Canada regulations do not govern the production of pet food at the manufacturing level, on what is contained in them and Recommendation for Daily Intake (RDI).

Table 2: Statistics variation of guaranteed levels obtained with laboratory data of dogs and cats dry foods versus minimum recommended levels established by international standards

			NGLs (%)								
			Crude protein			IS		Fat			
Species	Life stage	No. of samples/total	Average	SD	Range	AAFCO	NRC	Average	SD	Range	
North America											
Dogs	Adult	6/10	31.73	5.31	27.68-41.60	>18.0	>20.0	14.16	2.31	11.19-16.53	
Cats	Adult	4/10	36.69	4.28	31.46-41.94	>26.0	>17.5	15.88	4.18	12.22-20.50	
European Union											
Dogs	Puppy	2/10	9.55	0.03	9.34-9.770	>22.0	>21.0	5.65	0.07	5.6-5.7	
	Adult	8/10	20.66	6.56	12.31-30.05	>18.0	>20.0	11.44	3.79	6.3-16.17	
Cats	Adult	6/6	29.84	2.34	27.7-32.890	>26.0	>17.5	10.73	1.08	9.64-12.19	
South America											
Dogs	Puppy	5/21	29.90	1.96	27.83-32.85	>22.0	>21.0	12.05	1.15	10.74-13.64	
	Adult	16/21	24.31	4.43	19.76-36.89	>18.0	>20.0	10.71	2.00	7.07-13.52	
Cats	Adult	5/5	25.40	4.32	18.72-30.34	>26.0	>17.5	8.93	1.22	7.37-10.54	

	NGLs (%)						SGL (%)				
	IS		Ash			IS*		mc			IS**	
Species	AAFCO	NRC	Average	SD	Range	AAFCO	NRC	Average	SD	Range	AAFCO	NRC
North America												
>5.0	>5.0	7.37	0.62	6.57-8.050	NE	NE	7.78	1.06	5.90-9.10	NE	NE	
>9.0	>8.0	7.21	1.89	4.75-9.110	NE	NE	7.97	0.49	7.40-8.60	NE	NE	
European Union												
>8.0	>13.0	2.73	0.12	2.65-2.820	NE	NE	9.50	0.28	9.30-9.700	NE	NE	
>5.0	>5.0	6.53	2.27	4.07-11.25	NE	NE	9.96	2.52	7.50-15.80	NE	NE	
>9.0	>8.0	7.84	1.14	6.37-9.080	NE	NE	9.11	0.57	8.00-9.500	NE	NE	
South America												
>8.0	>13.0	7.71	1.96	5.62-10.61	NE	NE	10.24	3.33	8.60-16.20	NE	NE	
>5.0	>5.0	8.02	1.83	5.88-11.29	NE	NE	8.92	1.33	7.00-11.09	NE	NE	
>9.0	>8.0	9.17	3.55	5.80-15.04	NE	NE	8.38	1.07	7.10-10.00	NE	NE	

NGLs = Nutritional Guarantee Levels; SGL = Safety Guarantee Levels; IS = International Standard; mc = Moisture content; SD = Standard Deviation; AAFCO = Association of American Feed Control Officials; NRC = National Research Council; NE = Not Established; *There is no limit of inclusion established (estimative of 5.0-8.0%); **There is no limit established (estimative of 6.0-12.0%)

Mexico: The GL standards of that country for pet food are based in the SAGARPA and SENASICA regulations and the International Association and Organization AAFCO and NRC. It is compulsory the declaration of CP, fat, ash, including fiber and mc. Just one sample did not declare ash in the label in the current study.

European Union: For the EU official GL standards, it is compulsory the declaration of CP, fat, ash, including fiber, however the indication of mc is optional. EU samples labels were in accordance to the regulation.

Brazil: The pet food regulation consider as compulsory declaration of CP, fat, ash and fiber. The standards settings are a way to reduce the variation among manufacturers on the commercial pet food available and to get balanced diet that meets animal's nutritional needs. Moreover, the code of consumer protection (art.31) requires that the consumer should be informed clearly about the features and quality of the product. The current Brazilian GL label evaluation showed that all sample packs had information of NGLs and SGL.

Table 3: Tolerances allowed for guaranteed levels in pet food by the Canadian and EU regulation

	GLs			
Countries	NGLs	SGL	Content (%)	Tolerance allowed
Canada				
CA	CP	NA	≤24	1% absolute
	Fat	NA	All amounts	±0.5% absolute
European Union				
EC	CP/fat	NA	≤24	3% absolute
			≤16×<24	12.5% of the declared value
			<16	2% absolute
	Ash	NA	≤24	3% absolute
			≤8×<24	12.5% of the declared value
			<8	1% absolute
	NA	mc	≤12.5	8% of the declared value
			≤5×<12.5	1% absolute
			≤2×<5	20% of the declared value
			<2	0.4% absolute

GLs = Guaranteed Levels; NGLs = Nutritional Guaranteed Levels; SGL = Safety Guaranteed Levels; CP = Crude Protein; NA = Not Applied; mc = Moisture content

Laboratory data versus GLs requirement for dogs and cats: Laboratory data should accomplish to the reference nutrient profile standards established by the internationally recognized AAFCO and NRC. These

agencies provide a mechanism for developing and implementing uniform and equitable laws, regulations, standards and enforcement policies and establish nutrient recommendations for dog and cat foods. Table 2 shows the statistic variation observed in the laboratory data versus the international levels of inclusion regulated by the AAFCO e NRC.

The NGLs vary among the animal species (dogs and cats) and life stages. The pets nutritional recommendations by those International institutions were compared to the data obtained from the laboratory samples evaluated.

CP for dogs: The AAFCO's nutrient profiles for dogs (2008) recommends that for adult maintenance should contain at least of 18%. Similarly, the NRC recommends a minimum CP requirement of 20% for adult maintenance dog (Schaeffer *et al*., 1989; NRC, 2006). The CP requirement of growing puppies needs to be significantly higher than for adult dogs where minimum protein requirements should be up to 22% for growing dogs (Gessert and Phillips, 1956). The AAFCO and NRC recommend minimum levels of 22 and 21% for puppies, respectively (NRC, 2006; AAFCO, 2008). In the current data obtained, the minimum CP requirement for adults was respected in all samples of South and North America with averages 24.31 and 31.73%, respectively. Only four samples of EU did not meet the minimum CP requirement for adult dogs (N_c: 17.33, 12.31, 14.41 and 15.58 %). For puppies, 100% of EU samples were N_c with the minimum protein requirement (9.34 and 9.77%) while samples from South America were conform to the recommendations (range of 27.83-32.85%).

For cats: The cats' nutrient requirement regarding protein is substantially higher than dog (Dickinson and Scott, 1956). The AAFCO (2008) for cat foods suggest a higher level of CP for inclusion in commercially prepared foods. For adult maintenance, level of 26% of the diet is indicated whereas the NRC minimum requirement is 17.5%. All samples (100%) were conforming to recommendation.

Fat for dogs: The AAFCO (2008) recommendation is a fat minimum of 5% for adult maintenance and 8% for growth. For NRC (2006), most dry dog foods that are in the market for adult maintenance and puppies contain between 5 and 13% of fat content, respectively. The minimum requirement for adults was followed by all samples analyzed, ranging between 6.3-16.53% with average of 10.71, 11.44 and 14.16% in South America, EU and North America, respectively. In 100% of the EU puppy samples, the addition of 5.6 and 5.7% of fat was in N_c with recommended requirement whereas the South America samples were conforms to requirement for this life stage. The 1.5% difference in fat content can make a significant difference in a product's caloric density and palatability (Case *et al*., 2011). Puppies that are not fed adequate amounts of fat can have developmental problems and growth deformities.

For cats: In general, cat foods contain slightly higher amounts of dietary fat than do most dog foods. The current AAFCO (2008) minimum fat recommendation for cats during all life stages is 9%. For NRC (2006), dry maintenance cat foods contain between 8 and 13% fat. Regarding the data obtained, the average of different countries was in conformity of minimum requirement and just two samples of North America was N_c, with amounts of 18.35 and 20.5%, values above the NRC recommended. The consumption of dietary fat in excess in commercial dry food can lead to increased body fat and obesity (Case *et al*., 2011).

Ash: There is no limit of inclusion established in regulation of pet foods either for dogs and cats. An estimate of ash in high-quality dry pet food generally is between 5 and 8% (Case *et al*., 2011). In the results obtained, they ranged from 2.65-15.04% for dog puppy and cat adult, respectively. Two samples of adult dog from EU (4.14 and 4.07%) and one sample of adult cat from North America had less ash (4.75%) than the estimative of inclusion recommended. The excess of ash was observed in 12 samples of dog and cats food (1, 3 and 8 samples of North America, EU and South America, respectively), with amounts ranging between 9.08-15.04%.

Nutritional diseases are rarely seen in dogs and cats when they are fed good quality commercial food or nutritionally balanced diets. For regulation, manufacturers of pet food have rules and self-control programs to ensure safe and healthy food production. If certain nutrient levels are outside the values stated in this guide, manufacturers should be able to prove that the product provides adequate and safe intakes of all required nutrients (FEDIAF, 2011).

CONCLUSION

Data of this study showed that the nutritional guaranteed levels labeled in dog and cat food available in the international market followed the standards of each country's legislation and the recommendation requirements established by the recognized institutions, AAFCO and NRC, ensuring the pet's health. Dogs and cats owners have the right to know the food products

quality veracity they are buying. Data obtained should be considered as an indication of the products quality evaluated for further pet food investigations by authorities monitoring.

REFERENCES

AAFCO, 2008. Association of American Feed Control Officials. AAFCO Official Publication, Atlanta.

AOAC, 2005. Association Official Method of Analysis of Chemistry. In: Animal Feed. Thiex, N.J.W. (Eds.). 18th Edn., AOAC International, Maryland.

Bauer, J.E., 2006. Facilitative and functional fats in diets of cats and dogs J. Anim. Vet. Med. Assoc., 229: 680-684.

Carciofi, A.C., 2008. Sources of protein and carbohydrates for dogs and cats. Revista Brasileira de Zootecnia, 37: 28-41.

Case, L.P., L. Daristotle, M.G. Hayek and M.F. Raasch, 2011. Canine and Feline Nutrition. 3th Edn., Mosby, St. Louis, MO., Pages: 542.

Dickinson, C.D. and P.P. Scott, 1956. Nutrition of the cat. II. Protein requirements for growth of weanling kittens and young cats maintained on a mixed diet. Br. J. Nutr., 10: 311-316.

FEDIAF, 2011. European pet food industry federation. Nutritional Guidelines for Complete and Complementary Pet Food for Cats and Dogs, pp: 75.

Gessert, C.G. and P.H. Phillips, 1956. Protein in the nutrition of the growing dog. J. Nutr., 58: 415-421.

NRC, 2006. National Research Council: Nutrient Requirements of Dogs and Cats. 2th Edn., National Academy Press, Washington, DC., Pages: 424.

Peachey, S.E., J.M. Dawson and E.J. Harper, 1999. The effect of ageing on nutrient digestibility by cats fed beef tallow, sunflower oil, or olive oil-enriched diets. Growth, Dev. Aging, 63: 61-70.

Schaeffer, M.C., Q.R. Rogers and J.G. Morris, 1989. Protein in the Nutrition of Dogs and Cats. In: Nutrition of the Dog and Cat, Burger, I.H. and J.P.W. Rivers (Eds.). Cambridge University Press, New York.

Thompson, A., 2008. Ingredients: Where pet food starts. Top. Companion Anim. Med., 23: 127-132.

Zicker, S.C., 2008. Evaluating Pet Foods: How confident are you when you recommend a commercial pet food? Top. Companion Anim. Med., 23: 121-126.