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**Research article****Cats versus dogs - the impact of species on owner feeding practices**

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**Abstract**

The objectives of this study were to determine if the species of pet influenced owner feeding practices and whether this could impact the nutritional status of pets. Validated questionnaires were purposively distributed at veterinary teaching hospitals, veterinary clinics and private hospitals located in the Bangkok. Associations between species owned and feeding practices were analyzed using a chi-squared test. Three hundred and sixty-five of 495 distributed questionnaires were returned (response rate 73.7%). However, 102 of the returned questionnaires (27.9%) were discarded after assessment of exclusion criteria; thus a total of 263 (53.1% of 495) questionnaires were analyzed. The results indicated differences in owner feeding practices between cats and dogs. Cats were less likely than dogs to be fed by a non-family member ( $P<0.01$ ), or to be provided with an individual food bowl ( $P<0.01$ ). Cats were more likely to be fed *ad libitum* whereas dogs typically received two meals per day ( $P<0.01$ ). Cat owners were more likely to estimate the amount of food that they considered correct to provide than dog owners ( $P=0.03$ ), but less likely to use Body Condition Score (BCS) for estimating the amount to feed ( $P<0.01$ ). Overall, it appeared in this study that many pets may have been at risk of malnutrition due to owner feeding practices. It is recommended that veterinarians should give significant attention to species-specific issues in order to provide customized education for improving pet owners understanding of pet nutrition, as well as pet feeding behavior, to enhance pets' health and wellness.

**Keywords:** : Cats, Dogs, Feeding, Practices

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## INTRODUCTION

Feeding practices, such as number of meals, methods of feeding, the amount of food to feed etc., jointly referred to as “feeding management and environmental factors”, are interlinked elements of the circle of nutrition (Baldwin et al., 2010; Freeman et al., 2011). Together with animal factors and dietary factors, all three interlinked elements help veterinarians to assess the nutritional status of a pet, identify risk factors and help improve pet health and wellness through proper nutritional management.

Centuries of domestication have resulted in pet dogs and cats being bound-up with humans and relying on their owners for survival (Royal Canin, 2004; Royal Canin, 2005). While pets were relying on their owners for nutritional support, their feeding behaviors might also influence owner feeding practices. Therefore, social animals influence others' behavior and altricial species express specific behaviors to influence others in provision of food. Evidence of both animal-animal and infant-human supports the hypothesis of Day et al. (2009) that pets might influence owner feeding practices of the quantity and type of diet using behaviors such as begging, picky eating, etc. Day et al. (2009) also proposed that species of pet may influence various aspects of food provision, although this remains to be tested.

Both domestic dogs and cats are carnivores, but originated in different branches of the order, Carnivora. They have evolved different feeding behaviors and food preferences (Bradshaw et al., 1996; Kane, 1989). For instance, cats tended to have many small meals through the day and night, but dogs eat larger and less frequent meals (Kane, 1989; Rashotte et al., 1984; Thorne, 1992). This feeding behavior of the cat was perceived by owners to show that cats exercise more self-control in food intake than dogs. Dogs were perceived as less in control, likely to overeat and therefore monitoring food intake is a crucial aspect of the owner's view of feeding dogs (Downes et al., 2017). As dogs and cats exhibited different feeding behaviors, the researchers hypothesized that owners would respond differently to the two pet species. The objectives of this study were to determine if the species of pet influenced owner feeding practices and whether this could impact the nutritional status of pets.

## MATERIALS and METHODS

The main ethical principles that were considered in conducting this study followed fundamental elements from the Belmont Report

### Questionnaire

A self-administered questionnaire (SAQ) was developed for this study. The questionnaire was reviewed by two veterinary nutritional experts in order to validate its content. Only validated questions were selected for small scale field testing at Kasetsart University veterinary teaching hospital. The time taken for completion by each respondent was recorded and feedback regarding the questionnaire design and level of understanding were collected using the follow-up interviews. The computer-assisted personal interviewing (CAPI) or computer-assisted telephone interviewing (CATI) form was modified for re-

cording respondent feedback (Statistic Netherlands, 2012).

The questionnaire (available upon requested from the authors), was made up of 23 questions designed to gather information about pet characteristics and owner feeding practices whilst the animal was considered healthy. If the respondent owned more than one species or more than one pet, then the respondent was requested to select a single pet as the subject about which to answer feeding practice questions.

### Sample size and sampling

The sample size of the study was calculated using data from the small-scale test. The G-power program with chi-square test family was used for sample size calculation, based on  $\alpha$ -level of 5%,  $\beta$ -level of 5% and effect size at 0.34. It was concluded that a sample size of at least 174 questionnaires was adequate for testing the hypothesis. A total of 459 questionnaires were distributed to account for the expected response rate (estimated at 40%), withdrawals and exclusions. Convenience sampling was undertaken.

Questionnaires were distributed to pet owners at Kasetsart University veterinary teaching hospital (KU-VTH), Chulalongkorn University veterinary teaching hospital (CU-VTH), eight veterinary clinics and five private hospitals located in the Bangkok area between December, 2016 to February, 2017. Veterinary clinics and private hospitals were categorized by average case number per day, into less than 30 cases and equal to or more than 30 cases per day.

### Statistical analysis

Data was analyzed using statistical software, SAS<sup>®</sup>. Chi-Square statistic was used for testing significance. The statistical significance was determined by P-value < 0.05.

## RESULTS

### Descriptive statistics

Three hundred and sixty-five of 495 distributed questionnaires were returned (response rate 73.7%). However, 102 of these 365 questionnaires (27.9%) were discarded as they were incomplete or fell within the exclusion criteria, i.e. the respondent was not the primary feeder, not living in the Bangkok metropolitan region, or the pet was fed a therapeutic diet. A total of 263 (53.1% of 495) questionnaires were analyzed.

Most respondents were from Bangkok (79.5%), the rest lived in the other four provinces of the Bangkok metropolitan region: Pathum Thani (5.7%), Nonthaburi (9.5%), Samut Prakan (4.6%) and Samut Sakorn (0.8%). None of the respondents lived in Nakhon Prathom.

The respondents were predominately female (77.6%); their median age was 35 years. 43.4% of the respondents owned only dog(s), 34.6% owned only cat(s) and 22.1% owned both dog(s) and cat(s). 56.0% of respondents selected a dog as the subject for the feeding practices section and 44.0% selected a cat. Breeds of dogs and cats were grouped into purebreds and mongrel breed (Table 1).

**Table 1** Description of pet characteristics

Breed	Number of Dogs (%)	Breed	Number of Cats (%)
<b>Purebreds</b>	95 (65.1%)	<b>Purebreds</b>	24 (20.5%)
Chihuahua	21 (22.1%)	American Short Hair	2 (8.3%)
Cocker Spaniel	1 (1.1%)	British Short Hair	1 (4.2%)
Golden Retriever	3 (3.2%)	Persian	13 (54.2%)
Jack Russell Terrier	4 (4.2%)	Scottish Fold	4 (16.7%)
Labrador Retriever	2 (2.1%)	Scottish Short Hair	1 (4.2%)
Pekingese	1 (1.1%)	Siamese	3 (12.5%)
Pembroke WelshCorgi	1 (1.1%)		
Pomeranian	22 (23.2%)		
Poodle	16 (16.8%)		
Pug	3 (3.2%)		
Saint Bernard	1 (1.1%)		
Shih Tzu	12 (12.6%)		
Siberian Husky	2 (2.1%)		
Thai Bangkeaw	2 (2.1%)		
<b>Mongrealbreed</b>	51 (34.9%)	<b>Mongreal breed</b>	93 (79.5%)
<b>Total</b>	146 (100.0%)		117 (100.0%)

## Species of pet and owner feeding practices

Key differences in feeding practices were identified between the owners of dogs and cats (Table 2 and Table 3). Cats were less likely than dogs to be fed by non-family member ( $P<0.01$ ) or have an individual food bowl ( $P<0.01$ ). Cats were mostly fed *ad-libitum* whilst meal feeding (twice a day) was the most popular for dogs ( $P<0.01$ ). Cat owners were more likely to estimate the amount of food to give to their cats, compared to dog owners ( $P=0.03$ ). Cat owners were less likely to evaluate Body Condition Score (BCS) for estimating the amount to feed than dog owners ( $P<0.01$ )

**Table 2** Pet species and owner feeding practice: owner control over feeding

Feeding practice	Species of pet		P-value
	Dogs (%)	Cats (%)	
Family member feeder			
Yes	123 (84.3%)	99 (84.6%)	0.9347
No	23 (15.8%)	18 (15.4%)	
Non-family member feeder			
Yes	56 (38.4%)	26 (22.2%)	0.0050
No	90 (61.6%)	91 (77.8%)	

## DISCUSSIONS

### Feeding by non-family member

The findings that cats were less likely than dogs to be fed by a non-family member may be explained by differences in the sociability of cats and dogs. While the ancestors of domestic cats were solitary animals, domestic dogs descended from social ancestors. Indeed, an association between genetics and sociability has been reported in dogs (Shuldiner et al., 2017), and recent research on brain-body size and species sociality support the hypothesis that dogs are more sociable than cats (Shautz and Dunbar, 2010). Thus, being less sociable by nature may lower the chance of cats receiving food from others who are not family members.

Being fed by non-family members could put pets at risk of malnutrition, such as overfeeding, feeding with contaminated food or human food that may be toxic to pets. Nevertheless, 22.2% of cat owners and 38.4% of dog owners in this study allowed their pets to be fed by non-family members. Veterinarians should be aware of this feeding practice and should ask about non-family members involvement in feeding as part of nutritional assessment.

**Table 3** Pet species and owner feeding practice: main meal management

Feeding practice	Species of pet		P-value
	Dogs (%)	Cats (%)	
Individual food bowl			
Yes	144 (98.6%)	96 (82.1%)	<0.0001
No	2 (1.4%)	21 (18.0%)	
Number of meals			
1 meal	10 (6.9%)	0 (0.0%)	<0.0001
2 meals	68 (46.6%)	9 (7.7%)	
3 meals	5 (3.4%)	7 (6.0%)	
>3 meals	0 (0.0%)	3 (2.6%)	
<i>Ad libitum</i>	63 (43.2%)	98 (83.8%)	
Food measurement			
By estimation	122 (83.6%)	109(94.0%)	0.0314
By measuring cup	23 (15.8%)	7 (6.0%)	
By weight	1 (0.7%)	0 (0.0%)	
Given diet following feeding guide			
Yes	53 (39.0%)	38 (33.9%)	0.4123
No	83 (61.0%)	74 (66.1%)	
Evaluating BCS for food amount			
Yes	105 (72.4%)	63 (54.3%)	0.0024
No	40 (27.6%)	53 (45.7%)	

### Provision of individual food bowls for pets

Having an individual food bowl helps minimize inter-pet aggression over food. It prevents eating competition between pets which can lead to under- or over-eating and helps pet owners monitor food intake more accurately for each pet. Despite the benefits of an individual food bowl for each pet, many owners did not provide an individual food bowl, especially for cats. This study found that 18.0% of cats did not have individual food bowls. This finding is consistent with the study of Heidenberger (1997) in Germany, which reported that 24% of pet cats did not have individual food bowls. In contrast, most dog owners in this study provided an individual food bowl for their dogs (98.6%).

The difference of owner practice in providing individual food bowls for dogs and cats may be related to the owner's attitude and interpretation of the pet's species specific behavior. Dog guarding behaviors, including food guarding, have continued despite domestication (Thorne, 1992). The dogs evolved this behavior to help obtain food and help them contend in competitive situation (Macdonald, 1983; Maier, 1998). Although food guarding behavior was unlikely to cause injury, owners interpreted this behavior as aggression toward other dogs or people. Thus, owners used an individual food bowl to prevent unwanted behavior, resulting in high number of dogs having individual food bowls. Unlike dogs, food guarding in cats was not obvious and could be overlooked by pet owners, resulting in a lower proportion of cats having an individual food bowl compared to dogs. Aside from owners' attitude and perception toward dog food guarding, owners' perception of less self-control in dogs regard their intake which reported in Downes et al. study (2017) could be another underlying rationale.

### **Feeding pattern**

As cats were well known for their preference of having small meals with high frequency, typically 10 to 20 meals throughout the day and night (Thorne, 1992). To serve a cat's natural feeding behavior, cat owners used "free feed" or "the *ad libitum*" method about twice as often as dog owners.

Whilst *ad libitum* was a common feeding practice well suited to the urban lifestyle of the pet owner, about 30 to 40% of dogs and cats can become overweight or obese when fed *ad libitum* (National Research Council, 2006). Thus, pet owners should routinely assess their pet's weight and body condition in order to adjust the feeding practice to maintaining healthy weight.

### **Amount to feed**

Using a measuring cup to estimate the portion size for dry pet food has been shown to be inaccurate, and overtime potentially results in development of overweight pets as well as failure of a weight management program (German et al., 2011). Although BCS is one of the common tools available for veterinarians and pet owners to manage a pet's healthy weight, previous studies reported that owners inaccurately assess BCS in dogs (Eastland-Jones et al., 2014; Gerstner, K. and Liesegang, A., 2017; Jagatheesonet al., 2016; White et al., 2011; Yam et al., 2017). Both inaccurate assessment of BCS by pet owners and incorrect estimation of amount of wet or dry dog food to feed was described in one study (Yam et al., 2017). Thus, inaccuracy in estimating the amount to feed and inaccurate assessment of BCS may pose a high risk for over- or under-feeding in both dogs and cats. Therefore, veterinarians should not only emphasize usage of BCS, but further education should be provided to help build pet owner competence in properly feeding their pets.

## CONCLUSIONS

The nutritional status of an animal cannot be determined without nutritional assessment. Despite full assessment, it appeared in this study that many pets may have been at risk of malnutrition due to owner feeding practices. For this reason, practicing veterinarians should follow the American Animal Hospital Association (AAHA) nutrient assessment guidelines or World Small Animal Veterinary Association (WSAVA) 5 vital signs in order to evaluate and monitor dog and cat nutritional status.

Additionally, veterinarians should give particular attention to species-specific issues in order to provide nutritional advice to pet owners to enhance pets' health and wellness.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest

## AUTHOR AND CONTRIBUTION

Pailin Petison did data collection, data analysis, manuscript preparation. Chalernpol Lekcharoensuk did conceptual structure

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