The impact of home-prepared diets and home oral hygiene on oral health in cats and dogs

Catherine Buckley1, Alison Colyer1, Michal Skrzywanek2, Katarzyna Jodkowska3, Grzegorz Kurski4, Jerzy Gawor5 and Michal Ceregrzyn2*

1Waltham Centre for Pet Nutrition, Waltham-on-the-Wolds, Melton Mowbray, Leicestershire, UK
2Mars Petcare, Mars Polska, Kozuszki Parcel 42, 96-500 Sochaczew, Poland
3Warsaw Agricultural University, Warsaw, Poland
4Veterinary Clinic Elwet, Warsaw, Poland
5Veterinary Clinic Arka, Krakow, Poland

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Abstract
Many factors influence the oral health status of cats and dogs. The present study aimed to elucidate the influence of feeding home-prepared (HP) food v. commercial pet food on oral health parameters in these animals and to investigate the effect of home oral hygiene on oral health. The study surveyed 17 184 dogs and 6371 cats visiting over 700 Polish veterinary surgeries in 2006–7 during a Pet Smile activity organised by the Polish Small Animal Veterinary Association. All animals underwent conscious examinations to assess dental deposits, size of mandibular lymph nodes and gingival health. An oral health index (OHI) ranging from 0 to 8 was calculated for each animal by combining examination scores, where 0 indicates good oral health and 8 indicates poorest oral health. Information was collected on age, diet and home oral hygiene regimens. There was a significant effect of diet on the OHI (P < 0.001) whereby feeding the HP diet increased the probability of an oral health problem in both cats and dogs. There was a significant beneficial effect of feeding only commercial pet food compared with the HP diet when at least part of the diet was composed of dry pet food. Daily tooth brushing or the offering of daily dental treats were both effective in significantly reducing the OHI in both cats and dogs compared with those receiving sporadic or no home oral hygiene. Feeding only a dry diet was beneficial for oral health in cats and dogs. Tooth brushing and the offering of dental treats were very effective in maintaining oral health, provided they were practised daily.

Periodontal disease is the most frequently diagnosed oral disease of cats and dogs, with symptoms ranging from mild gingivitis to irreversible damage to the supporting structures of the tooth resulting ultimately in tooth loss. It has been estimated that by 2 years of age, 70% of cats and 80% of dogs have some form of periodontal disease. Many factors contribute towards the oral health status of a pet, and some of these may be influenced by the owner. It is known that diet and level of oral home care are owner-controlled factors that play a role in determining the oral health status of cats and dogs. There is variability in the awareness of health consequences of feeding and dental hygiene within the society; therefore, constant monitoring of the situation is required.

The present survey aimed to observe the current status of oral health among dogs and cats in Poland and to investigate the effect of different diets on oral health parameters in these pets, while also raising awareness of a companion animal’s oral health among owners. In addition, the study investigated the frequency of oral home-care routines involving tooth brushing and the offering of dental treats, and analysed the effect of such regimens on oral health parameters.

Materials and methods

The study, run in conjunction with the Polish Small Animal Veterinary Association as a Pet Smile activity, surveyed 17 184 dogs and 6371 cats visiting over 700 Polish veterinary surgeries in 2006 and 2007. Conscious examinations were performed on animals according to the standard procedures used in small animal practice. In order to obtain a broad and representative dataset, the survey did not employ any inclusion/exclusion criteria.

Abbreviations: C mix, dry and wet mixture of commercial pet food; dry, dry commercial pet food; HP, home-prepared; HP mix, home-prepared plus wet and dry commercial; OHI, oral health index; wet, wet commercial pet food.

*Corresponding author: M. Ceregrzyn, fax +48 22 595 5001, email michal.ceregrzyn@effem.com
All animals in the survey underwent conscious examinations to assess dental deposits, size of mandibular lymph nodes and gingival health. Dental deposits were visually assessed, and a score of 0 was given for clean teeth, 1 for the presence of plaque, 2 for the presence of tartar on several teeth and 3 for the extensive presence of tartar throughout the oral cavity. The size of the mandibular lymph nodes was determined by palpation, and a score of 0 was assigned for normal size, 1 for enlarged size and 2 for markedly enlarged size. Gingival health was measured visually, and a score of 0 was given for healthy gingiva, 2 for gingivitis (identified by the presence of red or bleeding gums) and 3 for periodontitis (defined as gingival recession and/or tooth mobility). An oral health index (OHI) was calculated for each animal by combining scores for dental deposits, lymph node size and gingival health, where an index of 0 indicates good oral health, 1–2 indicates consultation required, 3–5 indicates a problem requiring minor treatment and 6–8 indicates a problem requiring intensive treatment.

For each animal, a questionnaire was completed in which information was collected on age, breed, sex, diet (where HP, home-prepared; HP mix, home-prepared plus wet and dry commercial; dry, dry commercial pet food; wet, wet commercial pet food; C mix, dry and wet mixture of commercial pet food) and any oral hygiene methods used in the home, which may consist of tooth brushing and/or the offering of treats designed for oral hygiene. The categories for oral hygiene were defined as follows: group 1, daily tooth brushing; group 2, daily dental snacks; group 3, tooth brushing and dental snacks a few times per week; group 4, sporadic use of tooth brushing and dental snacks; group 5, no oral hygiene methods used.

Statistical analyses were performed using Statgraphics Centurion XVI and GenStat® version 12.2 software. The OHI was analysed separately for cats and dogs using ANOVA. Since age was a factor in determining the OHI, the effect of diet and oral hygiene on the OHI was analysed following adjustment for age. Bonferroni’s correction was applied to the data to account for multiple pairwise comparisons. To determine the probability of an animal having an oral health problem was significantly higher in dogs fed the HP diet. The probability of a dog having oral health problems was significantly higher in dogs fed the HP diet compared with those fed the HP diet wet food format did not show a significant difference in OHI when compared with those fed the HP diet. The probability of an dog having oral health problems was significantly higher in dogs fed the diet (41%) compared with those fed the diet (22%) or C mix (30%).

In dogs, C mix feeding resulted in a significantly reduced mean OHI (2.75 (SD 0.044)) compared with those fed the HP diet (3.40 (SD 0.045)) and the HP mix (3.00 (SD 0.034); Fig. 1(b)). Dogs fed the wet food format did not show a significant difference in OHI when compared with those fed the HP diet. The probability of a dog having oral health problems was significantly higher in dogs fed the HP diet (41%) compared with those fed the dry diet (22%) or C mix (30%).

In cats, daily tooth brushing (OHI 2.50 (SD 0.16)) had no significant effect on the oral health index (Fig. 1(a)). Binary logistic regression analysis showed that the probability of an oral health problem (defined as an OHI ≥ 2) was significantly increased to 56% in cats fed the HP diet compared with 24% in cats fed the dry food format.

**Results**

The mean OHI increased with age in both cats and dogs. Following adjustment for age, the mean OHI was significantly reduced in cats fed the dry diet (2.20 (SD 0.073)), wet diet (3.20 (SD 0.095)), HP mix (2.97 (SD 0.073)) and those fed the C mix (2.68 (SD 0.064)) compared with cats fed the HP diet (3.65 (SD 0.11)), indicating that introducing an element of commercial pet food into the diet of cats is beneficial for oral health (Fig. 1(a)).
other two groups \((P < 0.001)\). Cats receiving no oral hygiene at home have a 44% probability of an oral health problem.

Discussion

Previous studies have shown that dietary habits play a key role in influencing the oral health status of cats and dogs. When comparing the three groups of cats and dogs fed only commercial pet food (dry, wet, and C mix), introducing an element of the dry food format significantly improved oral health status \((P < 0.001)\), with the dry food format resulting in a significant reduction in OHI compared with all other formats. The present study therefore shows that feeding dry food format to cats and dogs has clear benefits for oral health compared with the other formats, which is in agreement with previous studies\(^{3-7}\). Although not investigated in the present study, the extent of this benefit is very much dependent on the kibble size and texture, with larger kibbles requiring increased mastication giving rise to improved oral health efficacy compared with smaller, more brittle kibbles due to improved mechanical removal of plaque\(^{30}\). However, it is also important to consider other key areas of companion animal health when selecting the appropriate food format to offer. For example, the urinary tract health benefit of feeding high-moisture food formats has been shown in both healthy small-breed dogs\(^{9,10}\) and cats\(^{11}\). In addition, feeding high-moisture diets gives rise to a reduced daily energy intake due to the low energy density of this format, which may benefit healthy weight maintenance\(^{42}\). The present study shows that feeding both wet and dry diets to cats and dogs within the daily ration significantly reduces the OHI compared with feeding the wet diet and diets containing HP food. Given these data, it would appear prudent to provide a portion of both wet and dry diet formats within the daily ration for a range of health benefits. However, absolute recommendations on the proportions of wet and dry food for ultimate health benefits remain to be established.

The present study demonstrated a high incidence of feeding the HP diet among cats and dogs in Poland. At least an element of the HP diet was fed to 28% of cats and 62% of dogs in the present survey. A previous study showed an association between dietary format and OHI in cats and dogs such that the feeding of a soft diet (which included both HP and wet formats within the category) led to increased OHI compared with feeding mixed or dry formats\(^{37}\). In the present study, the HP diet was not differentiated from the commercially manufactured wet diet, so it was not possible to directly measure the impact of feeding the HP diet in a mixture with commercial pet food. The data from the present study show that the HP and wet diets offer the least benefit to cats and dogs, based on the associated OHI. This is likely to be due to the fact that these formats offer poor mechanical removal of plaque.

In conclusion, it is apparent that there is still a need to raise awareness of oral health problems in cats and dogs and to promote a healthy diet, which can include dry food formats.
educate owners in the benefits of a daily oral care regimen and an appropriate diet. The HP and wet diets are the least beneficial to oral health, while a dry diet provides the greatest level of oral health benefit. Based on the present study, daily tooth brushing or daily dental treat usage is also recommended for pets to further support the oral health benefits achieved via the appropriate diet.

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