

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

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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⁽¹⁾. It has been estimated that by 2 years of age, 70% of cats and 80% of dogs have some form of periodontal disease⁽²⁾. 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^(3–7). 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.

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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 based on their dietary or oral hygiene category, a binary logistic regression was applied to the dental deposit, lymph node size and gingival health scores following adjustment for age.

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)). Binary logistic regression analysis showed that the probability of an oral health problem (defined as an OHI \geq 2) was significantly increased to 56% in cats fed the HP diet compared with 24% in cats fed the dry food format.

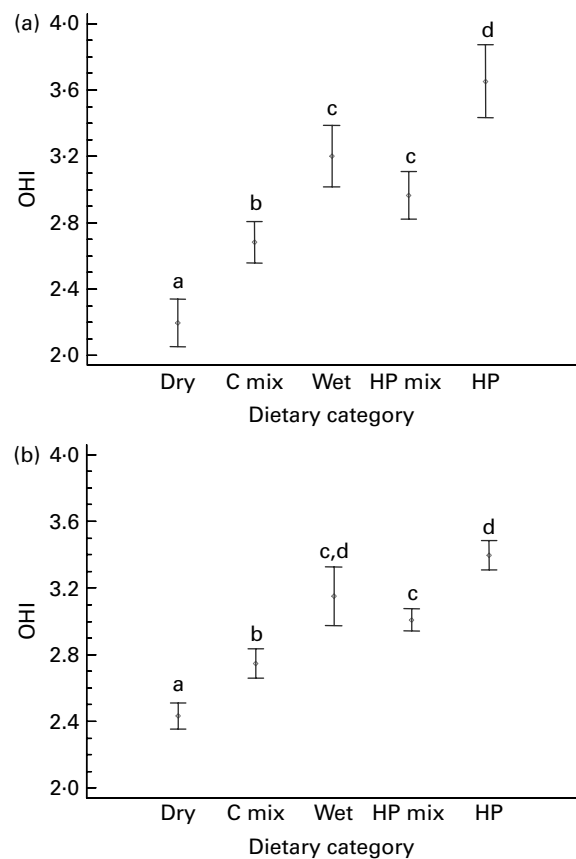


Fig. 1. Oral health index (OHI) v. dietary category for (a) cats and (b) dogs. Age-adjusted data were analysed by means of ANOVA with Bonferroni's correction. Values are means, with 95% CI represented by vertical bars. ^{a,b,c,d} Mean values with unlike letters were significantly different. Dry, dry commercial pet food; C mix, dry and wet mixture of commercial pet food; wet, wet commercial pet food; HP mix, home-prepared plus wet and dry commercial; HP, home-prepared.

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)), daily dental snacks (OHI 2.63 (SD 0.13)) and a combination of tooth brushing and dental snacks a few times per week (OHI 2.64 (SD 0.093)) were all effective in significantly reducing the OHI compared with cats receiving sporadic brushing and dental snacks (OHI 3.19 (SD 0.070)) and those receiving no oral home care (OHI 3.73 (SD 0.047), data not shown). In terms of the physiological relevance of these results, the probability of a cat having an oral health problem was significantly reduced in the daily tooth brushing group (12%), the daily dental treat group (10%) and the group receiving tooth brushing/treats a few times per week (14%) compared with the

other two groups ($P < 0.001$). Cats receiving no oral hygiene at home have a 44% probability of an oral health problem.

There was a significant reduction in OHI in dogs receiving daily tooth brushing (2.43 (SD 0.089)) or daily dental snacks (2.64 (SD 0.066)) compared with all other groups (data not shown). As expected, the group of dogs receiving no oral hygiene care had the greatest mean OHI of 3.50 (SD 0.031). The probability of dogs having an oral health problem was significantly reduced by daily tooth brushing (16%) and daily dental snacks (19%) compared with all other groups ($P < 0.001$). The probability of an oral health problem rises to 37% in dogs receiving no oral hygiene care at home.

Discussion

Previous studies have shown that dietary habits play a key role in influencing the oral health status of cats and dogs^(3–7). 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^(6,7). 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⁽⁸⁾. 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⁽¹²⁾. 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⁽⁷⁾. 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.

The gold standard for the maintenance of good oral hygiene in pets is frequent and thorough tooth brushing^(4,13,14). The present results support the fact that daily tooth brushing in dogs is an effective way of significantly reducing the OHI (2.43 (SD 0.089)) compared with those receiving no oral home care (3.50 (SD 0.031)). Interestingly, daily tooth brushing produces a mean OHI of 2.50 (SD 0.16) in cats and 2.43 (SD 0.089) in dogs, which places these animals somewhere between the consultation required and minor treatment required categories. To further elucidate this effect, binary regression analysis was used, and it demonstrated a significantly reduced probability of having an oral health problem in both cats and dogs receiving daily tooth brushing or daily dental snacks. Although tooth brushing is the gold standard when considering oral care, the associated beneficial effects are reliant first on compliance as well as on both the frequency and the technique. In the present study, there was no means of measuring tooth brushing technique, but the results show that the efficiency of plaque removal achieved by the owner may have been reasonably poor such that the animals still required veterinary intervention. In terms of tooth brushing incidence, the present survey showed that 26% of cats and 44% of dogs received at least sporadic tooth brushing. However, the data represent a discrete point in time and the level of continued compliance is not tracked. A previous study showed that cats placed on a programme of regular tooth brushing only maintain a 40–50% compliance rate after 6 months⁽¹⁵⁾. In comparison with tooth brushing, the feeding of daily dental snacks in the present study appears to achieve similar results. Dental snacks provide a convenient and enjoyable way of maintaining pet oral hygiene, while also helping to strengthen the pet–owner bond. The comparable results for tooth brushing and daily dental treats reported in the present study are therefore likely to be a reflection of the fact that (1) good tooth brushing technique is difficult to achieve, (2) actual tooth brushing compliance is variable and (3) offering dental treats is an easy and rewarding alternative to tooth brushing that requires no technique.

The present study estimates that 45% of dogs and 55% of cats over the age of 2 years had an OHI ≥ 2 , regardless of dietary or oral hygiene habits. When compared with other published periodontal disease incidence estimates, this appears to be reduced⁽²⁾. However, the present study cannot be directly compared with incidence estimates based on clinical assessments of oral health since the animals in the present study were not anaesthetised during OHI assessment. However, these estimates may be used as a comparison when a further similar oral health survey is carried out, in which one of the objectives is to assess whether there has been a change in cat and dog oral health over time, indicating a potential change in owner awareness of the issue.

In conclusion, it is apparent that there is still a need to raise awareness of oral health problems in cats and dogs and to

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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