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Dental disease in older cats: Facts and figures

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Diseases of the oral cavity are the most prevalent ailments diagnosed in both cats and dogs.[1] Many of these oral diseases, such as periodontal disease, are entirely preventable. Thus, periodontal disease presents an excellent opportunity for veterinarians to educate clients on wellness and disease prevention. Because of the reported association between periodontal disease and certain systemic diseases,[2] the potential is great to positively impact the quality of life for the Pet and Pet family.

In Pets, just as in people, the accumulation of plaque on the teeth leads to gingival inflammation and swelling (gingivitis), as well as halitosis. In its early stages, periodontal disease progression can be reversed with dental cleaning. However, unchecked, the disease can progress to gingival recession with permanent damage to supporting bone and ligaments. Human studies have reported links between periodontal disease and systemic disorders, such as diabetes mellitus and cardiovascular disease.[3,4] Although the exact nature of these associations has not been elucidated, similar population results for Pets could provide evidence for client communication to support prevention and treatment strategies.

Another piece of useful data is the likelihood (pretest probability) that an older cat will be diagnosed with an oral disease. This helps explain why clients should spend the time and resources to prevent periodontal disease. Because knowing specific data can be helpful to clients making the decision to conduct preventive care, such as home

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Odds ratio: A measure of the degree of association (also known as a cross-product ratio or relative odds); for example, the odds of exposure among the cases compared with the odds of exposure among the controls. Both the odds ratio and the relative risk compare the relative likelihood of an event occurring between two distinct groups. Some study designs, however, prevent the calculation of the relative risk and the odds ratio is used instead to estimate risk.

Confounding: Confounding occurs when one risk factor for a disease is also associated with the risk factor being studied. Age, breed, and gender are often confounding risk factors, *e.g.*, age is related to both neuter status and to risk for disease.

Pretest probability: Pretest probability is defined as the probability of the disease diagnosis before the diagnostic test result is known.

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DataSavant's mission is to:

- Explore the health and well-being of Pet populations
- Evaluate new clinical treatments
- Monitor Pets as sentinels of zoonotic disease in family environments
- Transform Pet medical data into knowledge, *i.e.*, open new windows into Pet health care using the Banfield medical caseload and database.

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Table 1: Prevalence of Specific Oral and/or Periodontal Disease Diagnoses for Cats With Periodontal Disease, 5 Years of Age or Older: Banfield Hospitals, 2006

Disease	Case Population (n=16,374)
Dental calculus	39.7%
Gingivitis	28.6%
Periodontal disease, Grade 2	25.1%
Periodontal disease, Grade 1	20.6%
Periodontal disease*	16.2%
Periodontal disease, Grade 3	15.9%
Periodontal disease, Grade 4	4.6%
Gingival recession	1.7%
Periodontal pockets	0.4%
Subgingival calculus.	0.04%

*Grade not specified

brushing and routine oral care at the veterinary hospital, we have conducted a retrospective survey to determine the prevalence of periodontal disease among older cats treated at Banfield, as well as potential risk factors for developing oral disease.

Methods of analysis

For our population analyses, we selected a series of feline in-patients (cases) seen in 2006 that were 5 years of age or older and that had received one or more diagnoses in the oral disease category. From this group, we compared the subset of these patients that had periodontal disease with a sample of 5,000 feline in-patients (controls) that were 5 years of age or older, had been seen in 2006 and had no oral disease diagnoses. Overall prevalence rates for oral disease and periodontal disease were generated from the Banfield in-patient population seen in 2006. The presence of clinical signs for the population with periodontal disease was also quantified. For the purposes of this review, a case of periodontal disease was defined as a feline in-patient with one or more of the following diagnoses in its medical record:

- Gingivitis
- Gingival recession
- Periodontal pockets
- Subgingival calculus
- Periodontal disease (grade not specified)
- Periodontal disease, Grade 1
- Periodontal disease, Grade 2
- Periodontal disease, Grade 3
- Periodontal disease, Grade 4

Periodontal disease grades were defined as follows:

- Grade 1: Inflammation
- Grade 2: Inflammation, swollen gums and early bone loss
- Grade 3: Inflammation, swelling, bone loss and loose teeth
- Grade 4: Inflammation, swelling, pus, bone loss and loose teeth.

Logistic regression, a multivariate

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Table 2: Prevalence of Selected Diagnoses for Cats 5 Years of Age or Older (With and Without Periodontal Disease): Banfield Hospitals, 2006

Disease/Condition	Cases (n=16,374)	Controls (n=5,000)
Overweight	15.6%	3.5%
Obesity	5.0%	1.1%
Heart murmur	5.0%	1.2%
Chronic renal failure	3.3%	3.1%
Aggressive behavior	2.1%	0.8%
Diabetes mellitus	1.9%	1.1%
Dermatitis	1.8%	1.3%
FIV	0.7%	0.3%
Acute renal failure	0.5%	0.4%
Hypertrophic cardiomyopathy	0.3%	0.1%
FeLV	0.2%	0.2%

method, was used to determine the risk factors most important in predicting which cats, ages 5 years or older, were most likely to be afflicted with periodontal disease. Logistic regression is a technique for making risk predictions when the outcome is dichotomous (yes or no). In this analysis, the outcome under consideration is periodontal disease. The potential risk factors considered by the model are age, breed, gender, region and concurrent diagnosis (*e.g.*, overweight, obesity, heart murmur, chronic renal failure, aggressive behavior, diabetes mellitus, dermatitis, feline immunodeficiency virus [FIV] infection, acute renal failure, hypertrophic cardiomyopathy or feline leukemia virus [FeLV] infection). Logistic regression helps reduce the effects of confounding variables on the estimates of disease risk—each factor found to be significantly associated with the outcome can be interpreted as an independent predictor of disease risk.

To quantify risk, we estimated the relative risk (RR) using the odds ratio (OR)[5] for the association between age, breed, gender and the disease of interest. A relative risk greater than 1 suggests a positive association between an outcome and a factor, whereas a relative risk less than 1 suggests an inverse relationship between a factor under study and a disease outcome. A relative risk equal to 1 reflects no association.

For our analysis, we required a p-value of .05 to determine statistical significance. The p-value represents the probability that the association between the outcome and factor under consideration is at least as extreme as that generated by logistic regression, assuming the result happened by chance alone. Confidence intervals were estimated for each odds ratio (relative risk). The confidence interval represents the range in the risk estimate variability if the population was sampled numerous times.

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Table 3: Multivariate Results: Predictors of Periodontal Disease in Cats 5 Years of Age or Older: Banfield Hospitals, 2006

Variable in model	Relative risk*	Confidence interval
Overweight	5.0	4.3 to 5.9
Heart murmur	4.5	3.5 to 5.9
Obesity	4.5	3.4 to 5.9
FIV	2.8	1.6 to 4.9
Aggressive behavior	2.2	1.5 to 3.0
Himalayan	1.6	1.3 to 2.0
Diabetes mellitus	1.5	1.1 to 2.0
Spayed or neutered	1.5	1.23 to 1.8
Persian	1.3	1.1 to 1.6
Siamese	1.3	1.1 to 1.5

*Estimated using the odds ratio

Results

There were 103,934 in-patient cats aged 5 years or older identified from the client records in U.S. Banfield hospitals during 2006. Oral disease was diagnosed in 55,455 cats from this population, a prevalence of 53.4 percent; 16,374 cats were diagnosed with periodontal disease, a prevalence of 15.8 percent. The mean age of the case group was 9.8 years, while the mean age of the control population was 9.7 years.

For the cats diagnosed with periodontal disease, the following clinical signs were reported: tartar on teeth (94.2 percent), swelling or inflammation of gums (69.5 percent), infected pockets in gums (18.1 percent), receded gums (17.7 percent) and bad breath (13.0 percent).

Table 1 (page 18) details prevalence in the periodontal disease case group for selected oral and periodontal conditions. In *Table 2* (page 20), prevalence for diseases hypothesized to be associated with periodontal disease are listed for the case group vs. the control population. Statistically significant results from the multivariate analysis can be found in *Table 3* with relative risk and confidence intervals.

Discussion

Overall prevalence of periodontal disease in cats 5 years or older was nearly 16 percent; about one in six cats in this age group seen in the Banfield population had some degree of periodontal disease. And, based on our multivariate analysis, older cats with periodontal disease are more likely to be spayed or neutered than those without periodontal disease and are more likely to be Himalayan, Siamese or Persian. They are also more likely to be concurrently diagnosed as overweight or obese and to have heart murmur, aggression, diabetes mellitus or FIV infection.

The odds of being diagnosed as overweight, obese or with a heart murmur were

about five times greater for cats with periodontal disease than those without. The concurrent diagnosis of aggressive behavior is an interesting finding and may reflect a behavioral response to the pain that can accompany severe periodontal disease.

These findings may be useful in providing education to clients about feline periodontal disease. Knowing the odds that their Pet might be diagnosed with periodontal disease can be very helpful to clients making decisions about prophylactic treatment. Even aside from understanding the risk factors associated with this disease, knowing the high prevalence (pretest probability) of periodontal disease can also provide a strong motivation for adhering to a home practice of tooth brushing and to the expectation of bringing in their Pet for an annual dental cleaning at the veterinary hospital.

Using results from epidemiologic studies, veterinarians can present compelling rationales for prevention strategies and treatment, as well as build strong client relationships. Using such data to communicate Pet risk establishes trust and respect and helps the client make medical decisions.

Consider, for example, this dialogue between a veterinarian and client about Sally, a 2-year-old spayed Himalayan female. "Mr. Olson, based on Sally's breed and spay status, she is at an increased risk for periodontal disease. Research suggests that cats with periodontal disease are more likely to be diagnosed with diabetes and obesity. It is important, as she ages, for her to have regular dental care, which includes daily teeth brushing at home and dental cleanings at our clinic once a year. This preventive approach can help her maintain an excellent quality of life."

However, although the associations found in our analysis are important for future study hypotheses and as tools for client communication about risk, it is important to highlight that these results cannot be used to determine whether periodontal disease was caused by obesity or vice versa. Future studies will be important to study the exact mechanism of disease causality.

Nonetheless, to ensure timely public health, policy interventions are often staged before knowing the exact mechanism of the disease process (*e.g.*, promoting use of clean needles in the light of associations between AIDS diagnoses and intravenous drug use). As such, veterinarians can use these results as evidence to provide compelling rationale for client education recommendations for preventive care strategies. We don't have to understand the exact immune or inflammatory processes that may be involved to make a difference in a Pet's health.

References

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