

Periodontal Literature Review

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INTRODUCTION AND PATHOGENESIS

Periodontal disease is defined as plaque-inducing disease of any part of the periodontium, which includes the gingiva, periodontal ligament and alveolar bone.^{1,2} Periodontal disease is often separated into two conditions: gingivitis and periodontitis. Gingivitis is inflammation of the gingiva, whereas periodontitis is inflammation of the nongingival tissues (periodontal ligament and alveolar bone).¹ The stages of periodontal disease are defined as follows³:

Stage I: Gingivitis

Stage II: Chronic gingivitis not progressing to attachment loss

Stage III: Attachment loss 1 to 3 mm

Stage IV: Attachment loss 3 to 5 mm to furcation

Stage V: Attachment loss 5 to 7 mm with complete furcation exposure, some tooth mobility

Stage VI: Attachment loss to apical end, significant tooth mobility, apical disease present.

CLINICAL BOTTOM LINE

- Periodontal disease is the most common disorder affecting cats and dogs worldwide. Informal estimates put the prevalence as high as 85 percent.
- Disease severity is classified into stages, depending on the degree of change from healthy teeth and gums. These stages range from mild plaque and gingivitis, to gingival recession and degradation of the periodontal ligament, to significant inflammation and loss of teeth.
- Increasing age, small breed size and neutering are risk factors for development of periodontal disease in dogs.
- Periodontal disease has been associated with histopathologic changes in the kidneys, liver and myocardium and has been linked to cardiac diseases in dogs.
- Treatment options include veterinary care, home care and specially formulated diets and treats. Home care, specifically brushing, is the gold standard for prevention, however client compliance is the key factor. Fostering a relationship between clients and the veterinary hospital will help to improve compliance and improve both dental health and overall health in patients.

For ease of use, Banfield uses a four-stage system of periodontal disease classification (*Figures 1A-1D*, page 2). Stage 1 is equivalent to stages I and II above, stage 2 is equivalent to stage III, stage 3 is equivalent to stages IV and V, and stage 4 is equivalent to stage VI. The progression of periodontal disease is outlined in *Figure 2*, page 3. Assessment of attachment loss is critical to staging severity of disease (*Figure 4*, page 7).

FIGURE 1: Stages of Periodontal Disease

FIGURE 1A: Stage 1



Stage 1 involves gingivitis

FIGURE 1B: Stage 2



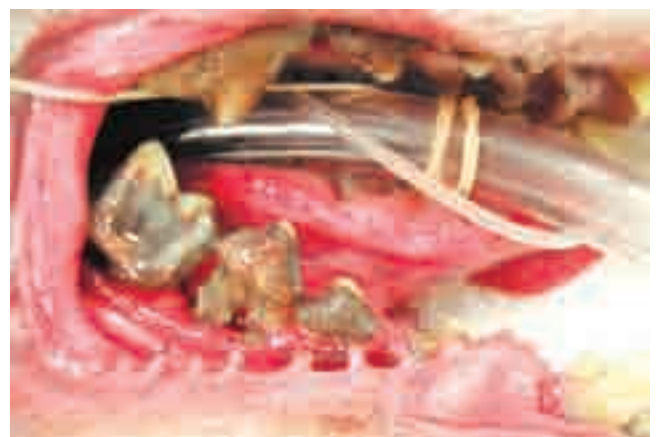
Chronic gingivitis not progressing to attachment loss

FIGURE 1C: Stage 3



Attachment loss

FIGURE 1D: Stage 4



Attachment loss to furcation

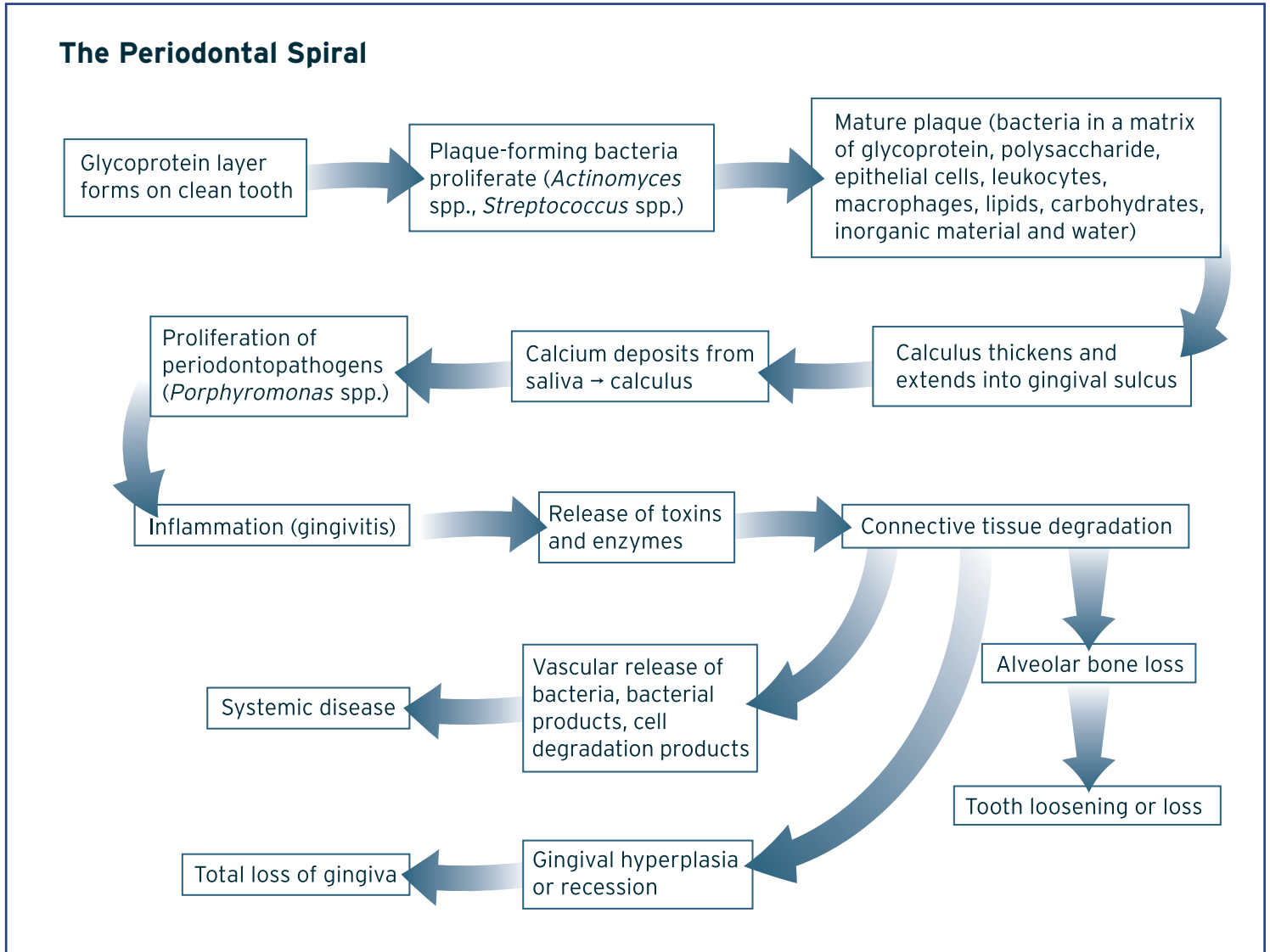
Images courtesy of Gary S. Goldstein, DVM, FAVD, DAVDC

PREVALENCE AND RISK FACTORS

Periodontal disease is reported to be the most common disorder affecting dogs and cats worldwide.^{2,4,5} Lund, et al. reported the prevalence of periodontal disease in dogs and cats as 20.5 percent and 24.2 percent, respectively, with the prevalence of gingivitis being 19.5 percent

and 13.1 percent, respectively.⁴ Informal estimates of periodontal disease can be as high as 85 percent, however it is not always clear whether these surveys include all or only some forms of gingivitis and periodontal disease, or whether they represent estimates based on particular breeds and age groups.² Nonethe-

FIGURE 2: Summary of Periodontal Pathophysiologic Events¹



less, periodontal disease is certainly significant in terms of both its prevalence and pathology.

Few studies have investigated risk factors for the development of periodontal disease. Kyllar, et al. found that the prevalence of periodontal disease was higher in small breed dogs and

older dogs.⁶ Internal research has found that neutering, increasing age and breed are risk factors for the development of periodontal disease.⁷ Breeds most at risk are presented in *Table 1*, page 4. Prevalence of specific diagnoses for dogs with periodontal disease from the 2006 Banfield population is presented in *Table 2*, page 4.



TABLE 1: Purebred Breeds at Risk for Periodontal Disease–2006 Banfield Population⁷

COMMON BREED	RELATIVE RISK (ODDS RATIO*)	CONFIDENCE INTERVAL
Toy Poodle	3.8	3.6, 4.2
Yorkshire Terrier	3.8	3.6, 4.0
Maltese	3.6	3.4, 3.8
Pomeranian	3.3	3.1, 3.5
Shetland Sheepdog	3.3	3.0, 3.6
Cavalier King Charles Spaniel	3.0	2.6, 3.6
Papillion	2.9	2.4, 3.3
Standard Poodle	2.6	2.5, 2.8
Dachshund	2.6	2.4, 2.7
Havanese	2.6	1.9, 3.6
Bichon Frise	2.5	2.4, 2.7
Beagle	2.5	2.3, 2.6
West Highland White Terrier	2.5	2.2, 2.7
Collie	2.4	2.1, 2.8
Miniature Schnauzer	2.3	2.2, 2.5
American Cocker Spaniel	2.3	2.2, 2.4
Basset Hound	2.2	2.1, 2.6
Cock-A-Poo	2.2	1.9, 2.4
Chihuahua	2.0	1.9, 2.0
Welsh Corgi	2.0	1.8, 2.0
Rat Terrier	1.9	1.7, 2.1
Lhasa Apso	1.9	1.7, 2.0
Fox Terrier	1.8	1.7, 2.0
Jack Russell Terrier	1.8	1.7, 1.9
Miniature Pinscher	1.7	1.6, 1.9
Pekingese	1.7	1.5, 1.9
Shih Tzu	1.6	1.5, 1.7
American Eskimo	1.5	1.4, 1.6

*Multivariate model/Controlling for age

Periodontal disease is also a risk for other systemic diseases. Associations have been found between periodontal disease and histopathologic changes in the kidney, myocardium and liver, and between the degree of periodontal disease and risk for cardiovascular disease such as endocarditis and cardiomyopathy.^{8,9}

PREVENTIVE MANAGEMENT AND TREATMENT

Pet owners recognize the importance of dental health, but the majority fail to intervene. A survey found that two-thirds of respondents felt that preventive dental strategies were important, but 63

TABLE 2: Prevalence of Specific Diagnoses For Dogs With Periodontal Disease–2006 Banfield Population⁷

DISEASE	CASE POP. (n=57, 134)
Dental calculus	38.8%
Periodontal disease, Grade 1	29.0%
Periodontal disease, Grade 2	28.1%
Periodontal disease, NOS*	18.2%
Periodontal disease, Grade 3	16.4%
Gingivitis	15.1%
Periodontal disease, Grade 4	5.5%
Periodontal pockets	0.5%
Subgingival calculus	0.2%

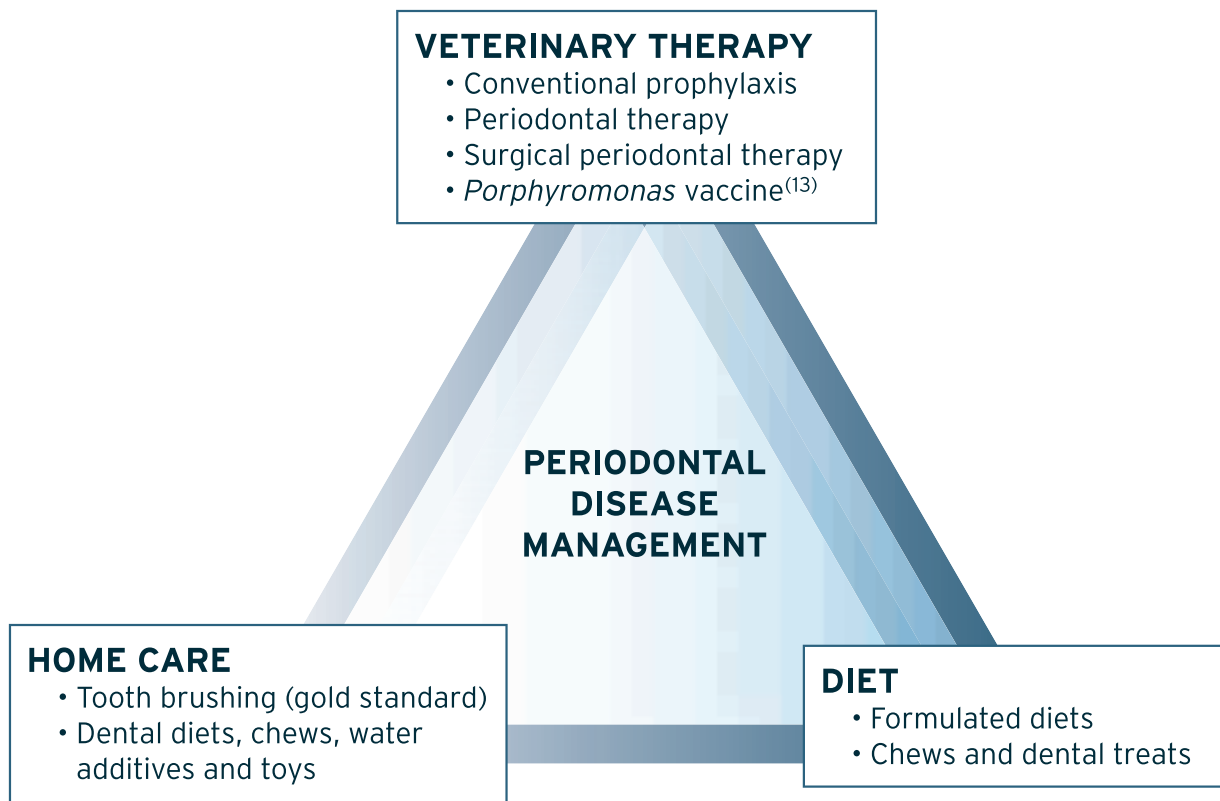
*Not otherwise specified

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percent had never had their Pets' teeth cleaned.¹⁰ Preventive dental care reduces halitosis, salivation and oral pain, improving the general well-being of patients and the bond between owners and their Pets. Options for the treatment and prevention of periodontal disease, include veterinary therapy, diet and home care (Figure 3).¹¹ Some of these products have been reviewed by the Veterinary Oral Health Council (VOHC), which reviews efficacy data and recognizes products with proven efficacy for mechanical control of plaque, or mechanical or chemical control of calculus.¹²

A vaccine targeted against the periodontopathogen *Porphyromonas gulae* has recently been developed and has been granted conditional licensure by the U.S. Department of Agriculture (USDA).¹³ Initial experiments in rodent models show potential for use in prevention of periodontal disease, and further evidence on its efficacy in dogs is being gathered. Veterinary therapy can be used for both prevention and treatment of periodontal disease. Regardless of why veterinary therapy is undertaken, follow-up

FIGURE 3: Options for Treatment and Prevention of Periodontal Disease



and ongoing monitoring in collaboration with the client are important to reinforce the importance of dental health and maintaining an effective dental health program.

Diet-based therapies include formulated dental diets, dental chews and dental toys. Dental diets are formulated to be more abrasive than regular diets, providing a mechanical cleaning action and have been shown to provide plaque, calculus and stain control in cats and dogs when used after dental prophylaxis.¹⁴ Some authors have claimed that a more “natural” diet (based around raw bones or prey analogues) is abrasive and more natural and, therefore, better for dental health. Raw bones are beneficial for dental health, provided they are not fed too frequently or chewed too vigorously, as this can increase the frequency of slab fractures.¹⁴ However, raw bone-based diets do not reduce the prevalence of periodontal disease. Clarke and Cameron compared calculus scores and periodontal disease prevalence between a group of domestic cats and a group of feral cats and found that calculus scores were higher in domestic than feral cats, but there was no significant difference in the prevalence of periodontal disease between the two groups.¹⁵ Dental chews such as cartilaginous materials, rawhide or specially formulated hygiene chews, some of which meet VOHC standards, provide a mechanical or enzymatic cleaning action and can be an effective adjunct to a dental health regimen.¹⁶ Similarly, dental chew toys can provide chewing exercise and some tooth cleaning action without trauma to the teeth.¹¹

Home care that includes daily brushing is the gold standard, however adoption of brushing and compliance with brushing instructions remain a challenge. The survey discussed previously found that only 22 percent of Pet owners have ever brushed their Pets’ teeth.¹⁰ Miller, et al. conducted a study to investigate compliance with brushing instructions and found that six months after the periodontal therapy at the veterinary clinic, 53 percent were still brushing more than three times a week. Nine percent were brushing at ineffective intervals and 38 percent had stopped brushing altogether. If teeth are already healthy, brushing three times a week will be sufficient to maintain health,¹⁷ however if calculus is already present, then brushing must be performed once daily to return teeth to health.^{17,18} Tooth brushing is best performed with a toothbrush,¹¹ however rubber finger brushes, gauze sponges and dentifrices (pastes, liquids or powders used to maintain oral hygiene) are also useful.¹¹ Passive methods for maintenance of dental health at home include dental diets, dental chews, dental toys and water additives. Passive home care is recommended as an addition to active care or for patients that will not allow brushing. Water additives can be a useful addition to the home care regimen, however products containing chlorhexidine (including toothpastes) should be used with caution in the long-term.¹⁹

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FUTURE RESEARCH/ADDITIONAL QUESTIONS

Client compliance and the long-term effect of dental care strategies are perhaps the most important aspects to assess in the future. Further research will help to shed understanding on the relationship of periodontal disease to other systemic diseases and help to guide therapy based on the stage of periodontal disease. This information will help to inform both veterinarians and clients, increase awareness of the importance of periodontal

disease, and hopefully improve both treatment and prevention rates.

ABOUT THE AUTHOR

Patrick Shearer, BVMS, PhD, graduated from Murdoch University School of Veterinary and Biomedical Sciences in Perth, Western Australia. Dr. Shearer joined the Banfield Applied Research and Knowledge (BARK) team as an associate medical advisor in 2009. He and his wife, Danielle, have two dogs and two cats.

FIGURE 4: Probing a Periodontal Pocket



Image courtesy of Gary S. Goldstein, DVM, FAVD, DAVDC

Probing a periodontal pocket allows the practitioner to assess attachment loss, which is critical to staging severity of disease.

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