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Professional and Home Dental Care of the Adult Dog and Cat

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INTRODUCTION

Without adequate prophylaxis, periodontal disease will occur in the healthiest specimen. It is the most common disease in dogs and cats of any age, according to a 1995 study performed by the University of Minnesota. The study included 67,000 dogs and cats seen sequentially in 57 veterinary hospitals in the United States. Traditionally, the etiology of periodontal disease has been classified as local or systemic. Locally, the factors are those in the immediate environment of the periodontium which lead to its deterioration, while systemically, the factors are a result of the general condition of the patient.

In a healthy dog or cat, normally only a small number of bacteria find their way to the gingival sulcus, and phagocytosis easily controls this minor problem. Think of this as a balanced fulcrum with a small number of bacteria on one side and an unstressed, healthy body with its normal defenses on the other. Periodontal disease will be the result if the fulcrum becomes unbalanced in either direction. Disequilibrium can result when there is an overwhelming infection in the mouth (severe tonsillitis, oral wounds) or if the body becomes stressed systemically, and the oral defenses are compromised.

Some minor body stresses that could upset the balance are pregnancy, obesity, old age or anxiety. The stress might also be more serious, such as organ failure, exemplified by congestive heart failure, renal disease, or liver insufficiency. Animals with endocrine dysfunction, such as diabetes mellitus or autoimmune disease, are also stressed. Any of these stresses can, over an extended period, result in patients that do not cope well with an otherwise easily controlled periodontal insult. When adequate dental hygiene is practiced at home along with appropriate periodic professional dental care, primary periodontal disease with no predisposing factor is unusual. Professional periodic prophylactic periodontal care should be performed on a regular basis to evaluate and maintain the health of the oral cavity.

PROFESSIONAL CARE

PROFESSIONAL DENTAL CARE GUIDELINES FOR DOGS AND CATS

Dental Exam	Age of Dog or Cat	Goal of examination
1st exam	8 weeks	Evaluate occlusion and eruption of primary teeth
2nd exam	12 weeks	Continuing developmental evaluation
3rd exam	16 weeks	Determine if secondary teeth are erupting on schedule
4th exam	6 months	First professional care; juvenile dental care with fluoride
Annual exam and prophylaxis	On-going <i>(Annual care is especially important for the old and infirm!)</i>	Ongoing care for as long as the pet lives

Prophylaxis Protocol and Instrumentation

To properly clean the teeth of dogs and cats, there are six steps to be completed.

1. Preliminary examination and initial planning and charting
2. Removal of deposits and stains from the crowns
3. Removal of deposits and fibrotic material from the gingival crevices
4. Polishing of the tooth surfaces above and beneath the gumline
5. Flushing the gingival crevice
6. Post-prophylactic examination, including radiographs when indicated.

After these steps are completed, the clinician should develop a long-term maintenance plan and educate the client about the need for home care and periodic profes-

sional care. Maintaining good oral health will extend and improve the quality of an animal's life. Caring owners will appreciate dental services for their pets. The receptionist, technician and clinician provide the best service when working as a team, complementing the services each provide, while serving in the best interests of both the client and the patient. The receptionists and technical staff should provide service in accordance with regional law and individual practice policy.

Admission and Preoperative Examination

During admission, a history should be taken, including information about the pet's diet, oral habits and medical history. Perform a brief general physical examination and a more detailed examination of the face, regional lymph nodes, salivary glands, and mouth. It is important to ascertain the owner's perception of type and level of service they are expecting (**Figure 1**). If the routine of the practice is for a technician to admit patients, a clinician should be summoned to evaluate any discovered pathology. Staff should inform clients that appropriate preoperative laboratory



Figure 1. Taking time to enroll a new client is an important step in determining the owner's perception of the type and level of service they expect.

screening is advisable and that general anesthesia will be administered, along with appropriate monitoring safeguards. The owner should agree, in writing, to a therapeutic plan in the event that additional pathology is found during procedure.

DENTAL PROPHYLAXIS: 6 STEPS

Step 1. Charting

Once the animal is anesthetized, the examination continues. The first step is to chart the oral pathology.^{1,4} The examination is performed with the aid of a periodontal probe (**Figure 2**) and measurements at 6 points around each tooth (**Figure 3**), with notations of any pathology made regarding periodontal pockets, is conducted in all four arcades. Pathology notations should include the extent of dental deposits, missing and loose teeth, extrinsic and intrinsic staining, traumatic dental lesions, the ease in which the gingiva bleeds when probed, and locations of loss of gingival attachment. The oral health status should be shared with the client during the release consultation.

Dogs and cats vary in size from 1 to 114 kg and when referring to the depth of the healthy gingival sulcus, normal measurements will be relative to the animal's size. A healthy gingival sulcus in an 18-kg dog is only 1 to 2 mm deep. In cats, it is less than 1 mm deep, and in giant breed dogs, a 3 to 4 mm sulcus might be normal. In dogs other than the



Figure 2. Periodontal probe for charting.



Figure 3. Take measurements at 6 points around each tooth.

largest dogs, most pockets 4 mm deep are abnormal and should be noted on the dental chart; this information should be shared with the client at the release consultation. Teeth with periodontal pockets of this depth can be treated and maintained through conscientious home care. On the other hand, pockets deeper than 4 mm will generally also experience alveolar bone loss (Stage III periodontal disease)^{1,2,5} and most patients should receive additional professional attention through closed or open curettage, medication, or mucogingival surgeries.⁶

Step 2. Removing calculus from the crowns

Heavy supragingival calculus is removed by first freeing large deposits with tartar removing forceps (Tartar Removing Forceps™; Dentalaire, Fountain Valley, CA, USA). The forceps are held so that the long, ribbed, concave jaw easily grasps the cusp of the tooth while the shorter chisel-like jaw breaks the tartar free as the forceps is closed. After large deposits of calculus have been removed, either ultrasonic or sonic scaling is employed to remove remaining debris. Even when ultrasonic equipment is employed, manual instrumentation is still required to remove calculus and stains interdentally and from coronal grooves and fissures.^{1-3,7} Hand scalers are held in a modified pen grasp, as described later in this article for subgingival curets, and the ring finger is placed on an adjacent tooth as a stabilizing fulcrum. The instrument is drawn repeatedly across the rough deposits, removing them and exposing a clean, smooth tooth surface. The entire forearm and hand should be moved as a unit, to reduce wrist and finger fatigue.⁸

Ultrasonic scaling. The tips of most ultrasonic units, such as the Cavitron® (Dentsply International, York, PA, USA), a magnetostrictive unit, vibrate in an elliptical pattern. To use this type of scaler, the tip of the instrument is held at a 45-degree angle to the calculus, using the side of the tip and applying very little pressure on the calculus, to avoid damaging the enamel beneath it. The tips of piezo ultrasonic units (Startec®, Startec Inc., Fenton, MO, USA; and Amdent™, Dentalaire, Fountain Valley, CA, USA) move back and forth, and the sides of these tips are also applied to the calculus, except in places where only the end of the tip will reach. Cavitron-type units operate at approximately 25,000 cycles per second (cps), whereas piezo models operate up to 40,000 cps. Both units vibrate at the tip, in a

range between 0.0254 and 0.0762 mm (about the thickness of a human hair), depending on their power setting. A newer model (Vetroson Millennium™; Summit Hill Laboratories, Navesink, NJ, USA) boasts auto-tuning and dual speeds of 25,000 cps for periodontal therapy and 30,000 cps for routine supragingival prophylaxis. One of the most comprehensive types of magnetostrictive units is one that employs a ferroceramic rod and special 10mm tips that operate in a gentle, circular pattern at 42,000 cps. Antimicrobial solutions of chlorhexidine can be delivered, via a peristolic pump, to the fundus of the periodontal pocket with these newer units. Ultrasonic scalers supply a variety of tips. Broad tips work best on the crowns of teeth, but when scaling interproximally or subgingivally or for cats' teeth, a thin tip is safer and less traumatic.

Ultrasonic scalers are used with a water spray to prevent thermal damage to the scaler's tip, the dental pulp, gingiva or enamel.⁹ The Startec piezo, Vetroson Millennium magnetostrictive, Odontoson and IM3 ferroceramic models create less heat at the tip and can be used without water, though using water is safer, washes away debris and keeps the field visually clear. When in contact with the calculus using any ultrasonic scaler, the tip should always be kept in motion. The tip should never linger in one spot for more than a few seconds. The mechanical pressure should be light enough to avoid damaging the enamel, and the water spray should be adequate to avoid thermal damage.^{1-4,10,11} The power control should be set only as high as is necessary to loosen calculus. The tips of the piezo models and the metal stack in the handle of the magnetostrictive units will eventually need replacing because of metal fatigue. Their longevity is inversely proportional to how often they are used and the power setting employed. Although ultrasonic scalers are often used for subgingival scaling in practice, it is safer to use subgingivally only those units and tips designed for this purpose. If cavitron-style tips are employed subgingivally, very little pressure should be applied to the tip to avoid gouging or burning the tooth roots.^{9,11-14} Additionally, the scaler's tip should contact only calculus; any contact with the enamel can etch and damage the tooth's surface.¹⁵

Sonic scaling. Sonic scalers are an air driven hand piece, supplied as an accessory to an air-driven delivery system.¹³ A sonic scaler vibrates at a lower frequency than an ultrasonic scaler (less than 18,000 cps), creates less heat at the working tip, and does not require water for cooling.^{3,16-18} Because of its lower frequency, a sonic scaler is less apt to damage the tooth enamel or thermally injure the pulp.¹⁴ It does, however, take longer to remove calculus with sonic scaling.

Step 3. Subgingival curettage

Subgingival curettage, which is the essence of dental prophylaxis,¹⁹ may be performed mechanically, with instruments such as the Vetroson Millennium or the Odontoson or IM3 instruments, or performed manually, using periodontal

(subgingival) curets. The goal is to remove the irritating calculus from the gingival crevice where periodontal disease begins.¹² A subgingival curet differs from a supragingival scaler in that it has a gently rounded tip, called a 'toe', instead of a sharply pointed tip. Universal subgingival curets have a single flat surface with a rounded back and two almost parallel cutting edges. Both scalers and curets are held in what is called the modified pen grasp.²⁰ The tips of the thumb and index finger grip the shank and the remaining fingers are held straight, on top of and in support of the index finger (**Figure 4**).¹ The ring finger, or the last finger, should rest against a nearby tooth for greater control of the instrument. The working tip is inserted into the gingival crevice at a 75-degree angle to the vertical root. The toe is drawn along the fundus of the crevice and arched coronally, removing calculus and fibrotic debris simultaneously. The procedure is repeated as many times as necessary at each site, to achieve a clean and smooth gingival crevice.^{15,21} The strength of the wrist and forearm is used rather than relying on the fingers. The ring finger is the fulcrum or pivot point for the curetting motion. If subgingival curettage has not been performed, the teeth have not been adequately cleaned, because this is where disease and malodor begin.

The use of high-speed rotary instruments (Roto-Pro™; Ellman) for root scaling and planing was condemned in 1964 in human dentistry.²² Because of the angle of entry required and the loss of visual and tactile senses, using a high-speed rotary instrument below the gum line may create damaging ledges (similar to the subgingival erosions seen in cats). Based on this fact, these instruments are considered more apt to cause damage during root scaling and planing than are ultrasonic and hand scalers.^{1,16-18} In the same report, the results of four experiments showed that, to a lesser extent, improperly used ultrasonic and sonic scalers could also gouge the smooth surfaces of the roots,²² creating irregular and rough surfaces at pressures greater than 50 to 100 grams. The favored instrument, of many registered dental hygienists in the human field, for subgingival curettage is still the hand curet, which produces the smoothest root surface and, in the hands of a skilled person, is most efficient in removing calculus. If the operator uses rotary instruments subgingivally, caution and diligence should be exercised, using a feather-light touch along with ample water to avoid tooth damage.



Figure 4. Subgingival curettage with modified pen grasp.

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Step 4. Polishing

In the fourth step of a dental prophylaxis, the teeth are polished with paste in a ribbed or webbed flexible prophy

cup attached to a prophy angle (hand piece). The result is a glassy smoothness on the supragingival and subgingival surfaces of the teeth.^{15,21,23-25} When using the prophy angle, light pressure should be applied, keeping the rotational speed to 4,000 rpm, or less, so that the paste will not spin out of the cup. Keep paste in the cup and the instrument moving to avoid thermal injury to the enamel, free gingiva or pulp (**Figure 5**). Polishing paste is supplied in a variety of consistencies ranging from flour pumice (the smoothest) to coarse grades. Flour pumice contains no fluoride or essential oils. The other grades come with or without fluoride and contain one or more essential oils. Hygienists and clinicians have specific preferences for the grade of paste used. Some use a coarse paste followed by a fine-grade paste.



Figure 5. During polishing, avoid thermal injury to gingiva or tooth.

Because animals have shorter lives than people do and their teeth are brushed less often, abrasion of enamel (bruxism) is generally not a problem. Exposed dentin and cementum, which are softer than enamel, however, are more susceptible to abrasion.¹³ The surfaces of the crowns and exposed roots have already been smoothed with hand instruments and polishing is just a final step to make the teeth as clean and smooth as possible. Fine pumice should suffice and is less abrasive than coarse pumice. It is wise to also stock flour pumice to use prior to installing restoratives or orthodontic appliances. In these cases, the teeth will have to be first polished with fluoride-free and oil-free flour pumice before the bonding procedure is performed.

Step 5. Subgingival irrigation

The fifth step in the prophylaxis procedure is to irrigate the gingival sulcus after polishing the teeth. Fibrotic debris, loose calculus or prophy paste, if left behind, will irritate the gingiva and serve as a nidus for inflammation and infection.²⁰⁻²³ Tap water can be used, but an over-the-counter dental rinse, is preferable. Many veterinarians instead use chlorhexidine 0.12% solutions (C.E.T.[®] Oral Hygiene Rinse™; Virbac, Ft. Worth, TX, USA) for antimicrobial effect. Physiologic saline solution and zinc ascorbate (Maxi/Guard™ Solution®; Addison Biological Laboratory, Inc., Fayette, MO, USA) are also good irrigating solutions. To deliver the solution, one can use a 15 ml curved-tip syringe, a special irrigating syringe, or a professional irrigating system.

Step 6. Post prophylaxis examination

When the prophylaxis is complete, the oral cavity, the teeth and the gingival sulci should be examined to make certain they are clean and to detect any pathology that may not have been previously visible. The sharp-pointed shep-

herd's hook end of the periodontal probe/explorer is used to explore the gingival sulcus, quickly inspecting the subgingival surfaces of each tooth. The more delicate the explorer tip, the more acute the tactile perception for detecting surface irregularities or mineral deposits adhered to the tooth surface.

Disclosing solution is a valuable training aid for new technicians; erythrosine red (Veterinary Disclosing Solution™; Girard Inc., Lisle, IL, USA) and fluorescein and are two common types.^{19,26} A dry product, designed for both in-office and home use is a convenient educational tool for clients (First Sight™; Pharmacia, Peapack, NJ, USA). Being careful not to stain the facial hair, the disclosing solution is applied to the teeth with a cotton-tipped applicator and will adhere to and visibly stain any persistent plaque, thus showing pet owners or dental healthcare providers where additional brushing/cleaning is necessary.

DIAGNOSTIC RADIOGRAPHS

After examining the cleaned teeth, suspicious areas are radiographed to help the clinician decide if treatment or extraction is necessary.^{4,27-33} Intraoral radiography is vital for assessment of dental health (**Figure 6**). Radiographic examination provides diagnostic and prognostic information



Figure 6. Intraoral radiography is vital for assessment of dental health.

about the soundness of the roots of the teeth, the width of the periodontal space, and the condition of supporting bone. Maintenance and treatment planning is guided by various factors such as the patient's age, general health, severity of dental pathology, and the owner's willingness

and ability to provide home care and return the pet for periodic professional care. More efficiently, radiographs are taken at the completion of the dental prophylaxis to assist in developing a short- and long-term plan for continuing dental care.

PERFORMING NONSURGICAL EXODONTIA

There will be occasions when teeth will require extraction at the time of routine dental care. The indications for extraction during a periodic prophylaxis are extremely mobile teeth affected by advanced periodontal disease,^{7,34-38} or even moderately mobile teeth.³⁹ Teeth that are malpositioned, crowded teeth, and retained primary teeth should be extracted, as well as ones with fractured crowns if endodontic treatment is refused,^{7,35-37,40} or periodontally affected teeth if the owner cannot or will not provide home care and return the pet for periodic professional care. Left in place, retained primary teeth encroach on their adult counterparts, causing the adult teeth to lose part of their

periodontal attachment and predisposing them to periodontal disease and early loss.⁴¹ Supernumerary teeth should also be extracted if they are causing crowding and periodontal problems.^{7,35-37,41} In order to alleviate discomfort, displaced teeth that interfere with teeth or soft tissue in the opposing arch should be extracted if the client refuses other treatment, or if the clinician is not capable of performing other treatments, such as coronal reduction, occlusal equilibration, or orthodontic adjustment.⁴¹ It is best to extract teeth after they have been cleaned and radiographed, and their condition has been fully evaluated.

SCHEDULING FUTURE DENTAL CARE

Once the teeth are clean, the patient's oral health is reevaluated and a long-term dental program is developed or updated. Notations are made in the medical record and in the instructions for home care, and entries are posted for the hospital's recall system. A recall system is essential to a successful prophylactic program, because most clients are unlikely to schedule periodic appointments without first being reminded to do so. Dogs and cats with healthy teeth and gums will benefit from annual professional dental care because deposits and putrefied food accumulate in the gingival sulcus. Animals that have early to moderate periodontal disease and crestal bone loss, should be scheduled for semi-annual professional care.^{1,5,6,34-46} Pets with advanced-level periodontal bone loss will benefit from tri-annual professional care to prevent the condition from progressing.^{38,39,46}

Many factors determine the appropriate interval between prophylaxis appointments. Clients interested in providing a high level of oral health for their pet should be encouraged to do so, and the office staff should provide reinforcement. The office can provide pamphlets and visual aids to supplement in-clinic demonstrations and to provide information on proper nutrition and oral home care. (Pamphlets are available at minimal cost from the AVMA and AAHA, and at no charge from many distributors of veterinary oral hygiene products.) Clients often appreciate the offer to schedule a complimentary check-up visit to critique their home efforts, and the visit allows the clinician to evaluate and adjust the recall interval appropriately.

Once periodontal disease is present, more frequent professional care and more persistent, preferably daily, home care is required to maintain adequate oral health. If a patient has periodontal disease and the owner is resistant to more frequent professional care visits, it is appropriate to schedule a free consultation one month after prophylaxis to evaluate the effectiveness of home care. If, at this time, it is judged that a one-year interval between prophylaxis visits will compromise the patient's health, another consultation should be scheduled in five months. Usually a client will recognize the need for professional care at the six-month recall, or, if that appointment is declined, they will usually acknowledge later that annual visits are inadequate. Usually the owner will recognize the return of halitosis, gin-

givitis and calculus, and agree to schedule for more frequent professional dental care.

More than any other patients, senior animals require periodic dental care⁶ to prevent the added stress of chronic oral infection, which can complicate other systemic conditions and worsen overall health. Owners of older patients will also be reassured, knowing that the prognosis for an older animal that has recently developed periodontal disease is better than for a younger animal. The owner is more likely to be able and willing to provide intensive home dental care for a short interval than for the 12 or 14 years remaining in the life of a younger dog or cat.

HOME CARE AND DIETARY MANAGEMENT OF THE CANINE AND FELINE DENTAL PATIENT

The home care oral hygiene program for dogs and cats should begin as soon as all of the adult teeth have erupted, or after appropriate professional care has been provided. The burden of caring for the teeth shifts to the owner when a dental patient is discharged from the clinic (**Figure 7**). Commitment and compliance will be greatly improved when the veterinary staff guides and supports the owner's efforts by explaining and demonstrating how to brush the animal's teeth and by scheduling recall appointments.



Figure 7. Client participation in a dental management program is extremely important. Demonstrate proper brushing techniques to the client (A) and provide educational material (B).

The best time to teach an owner how to care for their pet's teeth is during the release consult following routine professional dental care. If the owner has not been providing dental home care for the pet, it is best to schedule some time to demonstrate how the teeth and gums should be cared for, and to obtain a commitment by the owner to begin brushing the pet's teeth between professional care visits. It is important to speak directly with the person who will be responsible for the home care, rather than relying on another family member to pass on instructions.

Caring for Pet's Teeth at Home

The level of home care recommended for a patient must be acceptable to the client, or the patient probably will receive no care. The more successful the client is in caring for the pet's teeth, the less frequently the pet will require professional dental care and general anesthesia. Clients must realize that there is no panacea to replace adequate home dental care.

A comprehensive home care dental hygiene program consists of five levels of care:

- Tooth brushing
- Dentifrices and breath enhancers
- Diet/pet food
- Hard edible treats
- Gingival exercise

In recent years, many articles on the effectiveness of home care and products have been published in the *Journal of Veterinary Dentistry* alone, attesting to the benefits that can be achieved through home care efforts.⁴⁷⁻⁶³ An animal with a healthy oral cavity will eat better, have better breath, enjoy better overall health and temperament, and be more acceptable in the home.

TOOTH BRUSHING

The hallmark of home care is brushing the teeth.⁶⁴⁻⁶⁶ If the owner begins brushing their pet's teeth when the gingival tissue is healthy, shortly after the adult teeth have erupted, they can usually maintain good oral health by brushing the teeth two or three times a week. The veterinary staff should provide instructions on the best way to begin. In general, dogs will be easier to work with than cats, but with patience, both species can become accustomed to the routine.

Dogs. To encourage a dog to tolerate having its teeth cleaned, the client might find beginning success by rubbing the teeth with a piece of gauze dipped in bouillon and wrapped around the index finger. The client should be instructed to start with the front teeth, and as the dog becomes accustomed to having its teeth rubbed, extend the excursion to include the caudal teeth. The tongue will help keep the lingual side of the teeth clean; therefore it is most important to brush the buccal surface, especially in the area of the maxillary carnassial and molar teeth because the parotid and zygomatic salivary ducts open dorsal to them.^{19,24,67,68} The owner should reward the dog with praise, a treat, a meal or a play period after each home care session.

When the animal is comfortable with this procedure, the owner should then use veterinary toothpaste and a soft child's toothbrush or toothbrushes designed for veterinary use. Dogs may dislike some human toothpastes because the detergents in them may cause frothing, foaming, and even gastric distress when swallowed. The gingival crevice is the most important area to brush. The brush is moved forward and backward, parallel to the gum line with the bristles in the gingival sulcus. The mechanical aspect and the frequency of the brushing are the most important factors in removing plaque.²⁴ The animal's head usually moves up and down during the brushing process, resulting in the traditional oval-brushing pattern recommended by dentists for people.

If a client is too busy or unwilling to perform daily or even weekly preventive home dental care, the office might dispense and recommend that the owner use a hand instrument periodically to remove calculus deposits from the tooth and exposed root surfaces. The double-ended hoe-shaped

dental scaler sold by many veterinary distributors is least harmful to the gingival tissue.⁶⁹ Because the dog is not anesthetized, to avoid injury to the pet and the person, pet owners should not attempt to curet the fundus of the gingival sulcus thoroughly. Root scaling and subgingival curettage will not be complete, which is why periodic professional care is important, but an increased level of oral hygiene will be achieved. The frequency of professional care will be directly related to the quality of home care delivered and the current status of the pet's periodontal health.

Cats. Cats present different problems because many will not permit their teeth to be brushed. Owners, however, will find that patience and a gentle approach will often win out, and many cats will permit their teeth to be brushed periodically. The client should begin by massaging the side of the cat's muzzle in a rostral to caudal direction. Most cats will tolerate this because it simulates their natural behavior when they rub up against a person or object and inconspicuously mark the property with their saliva. An owner can then raise the lip and similarly massage the gums with a finger. The third step is to wrap gauze around one finger and gently rub the teeth and gums.

After the cat accepts having its teeth and gums massaged, the next step is to introduce a toothbrush. One successful technique, for the cat's first experience, is to use the liquid from a can of tunafish as a "dentifrice" on a soft, small toothbrush. The final step, before actual brushing, is to introduce the cat to a dentifrice by squeezing some onto the end of a finger and offering it to the cat. If the product is acceptable, it may then be used on the toothbrush to clean the buccal surface of the teeth. In feline home care, we generally rely on the cat's rough tongue to distribute excess dentifrice to the lingual surfaces of the teeth.

DENTIFRICES

The goal of dental home care is to remove plaque from the tooth surfaces and the gingival sulcus before it mineralizes into calculus, a process that can occur within one week.¹⁹ To help reach this goal, there are many dental products — pastes, gels, sprays, solutions, and powders — available for veterinary patients.

There are many dentifrices on the market with a wide range of claims. Many dentifrices contain calcium and silicates as abrasives,^{6,70-75} oxygenating ingredients or antibacterial and virucidal ingredients such as chlorhexidine.^{24,76-78} In addition, there are products that claim to promote gingival health through the inclusion of zinc compounds, sulfur compound chelators, and chlorhexidine.

Palatability is a very important factor in home care dental products. If clients are expected to perform daily or even weekly brushing, spraying or flushing of their pets' mouths, patient compliance is a must. Many flavors are employed: beef, malt, poultry, fish, vanilla-mint, and mint. Home care is most effective when the dentifrices are brushed vigorously, with a toothbrush, into the crevice

beneath the gumline.²⁴

If the owner prefers, an adequate dentifrice can be made by mixing 1 tablespoon of baking soda, 1 teaspoon of water and ¼ teaspoon garlic salt (to make it more palatable). This makes a paste that most dogs will accept. Cats usually prefer the paste without garlic. If the dog or cat is a cardiac patient, one can substitute salt replacers (potassium chloride) and garlic powder for the garlic salt and baking soda. (Baking soda is best avoided in the “Over 40” pet because of its sodium content.)

BREATH ENHANCERS

Over-the-counter chewable tablets, distributed by a number of manufacturers, are available. Products such as these improve the sociability factor of pets which, more than ever before, are being accepted as family members.

DIET

Improved nutrition is one of the reasons pets are living longer. One of the best ways owners can contribute to the well being of their pets is to buy the best food they can afford. Unlike people, carnivores do not chew their food. Most of their teeth are designed for puncturing, grasping, tearing, and shearing the meat from a carcass before briefly crushing it with their molars and swallowing it. Dry foods are best for the teeth because they are abrasive, which helps remove plaque from the crowns of the teeth, and because they are less likely than canned foods to become packed in the gingival crevices.^{19,67,70} More detailed information about diets and oral health are discussed elsewhere in this proceedings.

HARD TREATS

Hard treats are good, but mostly only clean the crown of the tooth. Carnivores generally either gulp their food, or give one quick crunch and then gulp it down. Even though the benefit is brief, treats do help by providing abrasion to the supragingival tooth surface.

GINGIVAL EXERCISES

The goal, here, is to recreate the natural carnivore oral behavior as it hunts it prey, kills it, tears the skin and meat from the carcass and devours it, often bones and all. Bone chewing can cause gastrointestinal problems in domestic pets. Chewing on bones or other objects harder than the teeth can also damage and break dog and cat teeth. A pink, purple, gray, or tan tooth is a dying or dead tooth, a condition often caused by chewing on objects harder than the teeth. Bone chewing also causes buccal fractures in upper carnassial teeth; lingual fractures in lower carnassial teeth, and splitting of upper first molars. Rawhide chew toys, biscuits, synthetic bones, knotted ropes, and other such products

provide exercise for the gums and abrasive action to help provide gingival exercise and to remove plaque from the crowns of the teeth. It is safest for dogs to chew on items softer than their teeth.

CONCLUSION

A comprehensive oral health care program for a dog or cat includes both professional and home care segments. The home care will best consist of tooth brushing, dentifrices and breath enhancers, diet, treats, and Gingival exercise.

The level of the animal's oral health, combined with the owner's willingness and ability to provide adequate preventive home dental care for their pet, should be periodically monitored and charted in the medical record. The strength of a successful dental prophylactic program comes from frequent and good home care and a supportive recall system to ensure that the pet receives periodic professional care appropriate to its oral health and the level of home care being performed.

REFERENCES

1. Holmstrom SE, Frost P, Eisner ER. Dental Prophylaxis. In: *Veterinary Dental Techniques*, 2nd ed. Philadelphia: WB Saunders, 1998; 133-166.
2. Harvey CE, Emily PP. Periodontal disease. In: *Small Animal Dentistry*. St. Louis: Mosby, 1993; 89-144.
3. Wiggs RB, Lobprise HB. Periodontology. In: *Veterinary Dentistry — Principles and Practice*. Philadelphia: Lippincott-Raven, 1997; 186-231.
4. Robinson J, Gorrel C. Oral examination and radiography. In: Crossley DA, Penman S eds. *Manual of Small Animal Dentistry*. Gloucestershire, UK: British Small Animal Association, 1995; 35-49.
5. Holmstrom SE, Frost P, Eisner ER. Periodontal therapy and surgery. In: *Veterinary Dental Techniques* 2nd ed. Philadelphia: WB Saunders Co, 1998; 167-213.
6. Eisner ER. Periodontal disease in pets: the pathogenesis of a preventable problem. *Vet Med* 1989; 84:97-104.
7. Gorrel C, Robinson J. Periodontal therapy and extraction technique. In: Crossley DA, Penman S eds. *Manual of Small Animal Dentistry*. Gloucestershire, UK: British Small Animal Association, 1995; 139-149.
8. Holmstrom SE, Frost P, Eisner ER. Ergonomics and general health safety in the dental workplace. In: *Veterinary Dental Techniques* 2nd ed. Philadelphia: WB Saunders Co, 1998; 497-514.
9. Barrington EP. Scaling, root planing and gingival curettage. In: Levine N sr. ed. *Current Treatment in Dental Practice*. Philadelphia: WB Saunders Co, 1986; 218-228.
10. Grove TK. Periodontal therapy. *Compend Cont Ed* 1983; 5:660-668.
11. Holmstrom LA. Preventive dental techniques. *Proceedings*. 3rd Annual Veterinary Dental Forum 1989; 29-31.
12. Ross DL. The Oral cavity. In: Kirk RW ed. *Current Veterinary Therapy* VI. Philadelphia: WB Saunders Co, 1977; 918-921.
13. Holmstrom SE. Equipment for veterinary dentistry. In: *Small Animal Dentistry*. Lawrenceville, NJ: Veterinary Learning Systems, 1989; 4-11.
14. Loos B, Kiger R, Egelberg J. An evaluation of basic periodontal therapy using sonic and ultrasonic scalers. *J Clin Periodont Res* 1987; 14:29-33.
15. Ross DL, Colmery BH III. Teeth and oral cavity. In: Bojrab MJ ed. *Current Techniques in Small Animal Surgery* 2nd ed. Philadelphia: Lea & Febiger, 1983; 114-119.
16. Wiggs RB, Lobprise HB. Dental equipment. In: *Veterinary Dentistry — Principles and Practice*. Philadelphia: Lippincott-Raven, 1997; 1-28.
17. Holmstrom SE, Frost P, Eisner ER. Dental equipment and care. In: *Veterinary Dental techniques* 2nd ed. Philadelphia: WB Saunders Co, 1998; 31-92.
18. Gorrel C, Penman S. Dental equipment. In: Crossley DA, Penman S

- eds. *Manual of Small Animal Dentistry*. Gloucestershire, UK: British Small Animal Association, 1995; 12-18.
19. Harvey CE, et al. Oral dental, pharyngeal and salivary gland disorders. In: Ettinger SJ, ed. *Textbook of Veterinary Internal Medicine*. Philadelphia: WB Saunders Co, 1982; 1126-1187.
 20. Wilson JB. Dental prophylaxis: basic rationale and methodology. *Vet Tech* 1988; 9:238-243.
 21. Grove TK. Periodontal disease. *Compend Cont Ed* 1982; 47:564-570.
 22. Belting CM, Spjut PJ. Effects of high speed periodontal instruments on the root surface during subgingival calculus removal. *J Amer Dent Assoc* 1964; 69:50-56 and 578-584.
 23. Frost P. *Canine dentistry; a compendium*. East Hanover, NJ: Nabisco Brands Inc, 1980; 33-34.
 24. Hawkins BJ. Periodontal disease; therapy and prevention. *Vet Clin N Amer* 1986; 16:835-849.
 25. Craig RG, et al. Finishing, polishing and cleansing materials. In: *Properties and Manipulation* 4th ed. St. Louis: CV Mosby, 1987; 114-132.
 26. Eisenmenger E, Zetner K. Periodontal diseases. In: *Veterinary Dentistry*. Philadelphia: Lea & Febiger, 1985; 131-150.
 27. Eisner ER. Intraoral radiography: an indispensable diagnostic aid. *Vet Med* 1988; 83:1131-1141.
 28. Eisner ER. Problems associated with dental radiography. In: Manfra SM ed. *Problems in Veterinary Medicine Dentistry*. Philadelphia: March, 1990; 2:1:46-84.
 29. Eisner ER. Intraoral radiography: a guide to interpretation. *Vet Med* 1988; 83:1217-1221.
 30. Holmstrom SE, Frost P, Eisner ER. Dental Radiology. In: *Veterinary Dental Techniques* 2nd ed. Philadelphia: WB Saunders Co, 1998; 107-131.
 31. Eisner ER. Oral-dental radiographic examination technique. In: Holmstrom SE guest ed. *Clinics of North America, Small Animal Practice – Dentistry*. Philadelphia: WB Saunders Co. 1998; 28:5:1063-1087.
 32. Mulligan TW, Aller MS, Williams CA. Interpretation of periodontal disease. In: Aller MS, ed. *Atlas of Canine & Feline Dental Radiography*. Trenton, NJ: Veterinary Learning Systems, 1998; 104-123.
 33. Wiggs RB, Lobprise HB. Dental and oral radiology. In: *Veterinary Dentistry Principles and Practice*. Philadelphia: Lippincott-Raven, 1997; 140-166.
 34. Eisner ER. Treating the early stages of periodontal disease. *Vet Med* 1989; 84:97-104.
 35. Wiggs RB, Lobprise HB. Oral Surgery. In: *Veterinary Dentistry – Principles and Practice*. Philadelphia: Lippincott-Raven, 1997; 232-258.
 36. Harvey CE, Emily PP. Oral surgery. In: *Small animal dentistry*. St. Louis: Mosby, 1993; 312-377.
 37. Holmstrom SE, Frost P, Eisner ER. Exodontia. In: *Veterinary dental techniques* 2nd ed. Philadelphia: WB Saunders Co, 1998; 215-254.
 38. Eisner ER. Treating the advanced stages of periodontal disease. *Vet Med* 1990; 85:140-158.
 39. Eisner ER. Treating moderate periodontitis in dogs and cats. *Vet Med* 1989; 84:768-776.
 40. Emily P. Extraction and oral-nasal fistula. In: Kirk RL ed. In: *Current Veterinary Therapy X*. Philadelphia: WB Saunders Co, 1989; 948-951.
 41. Eisner ER. Malocclusions in cats and dogs: recognizing dental misalignments; selecting the proper therapy. *Vet Med* 1988; 83:1006-1032.
 42. Nikiforuk G. Toward a caries-free society. In: Levine N sr. ed. *Current Therapy in Dental Practice*. Philadelphia: WB Saunders Co, 1986; 491-496.
 43. Eisner ER. Nonsurgical and surgical tooth extraction and oronasal fistula repair, Part I. *Vet Practice Canine Practice* 1996; (Sept/Oct)21:5:12-15.
 44. Wiggs RB, Lobprise HB. Pedodontics. In: *Veterinary Dentistry – Principles and Practice*. Philadelphia: Lippincott-Raven, 1997; 167-185.
 45. Main KE, et al. Fluorosis in dogs due to fluoride in dog food. *Mod Vet Pract* 1987; 68:540-543.
 46. Holmstrom SE. Marketing veterinary dentistry. In: Wiggs RB, Lobprise HB eds. *Veterinary Dentistry – Principles and Practice*. Philadelphia: Lippincott-Raven, 1997; 580-597.
 47. Miller BR, Harvey CE. Compliance with oral hygiene recommendations following periodontal treatment in client-owned dogs. *J Vet Dent* Jan.-March 1994; 11:1:18-25.
 48. Harvey CE, Shofer FS, Laster L. Association of age and body weight with periodontal disease in north american dogs. *J Vet Dent* Oct.1994; 11:3:89-94.
 49. Robinson JGA. Chlorhexidine gluconate – the solution to dental problems. *J Vet Dent* 1994; 12:1:29-30.
 50. Gruet P, Gaillard C, Boisrame B, Duffaut D, Grimoud AM, Camy G. Use of an oral antiseptic bioadhesive tablet in dogs. *J Vet Dent* Sept. 1995; 12:3:87-92.
 51. Stookey GK, Warrick JM, Miller LL, Katz BP. Hexametaphosphate-coated snack biscuits significantly reduce calculus formation in dogs. *J Vet Dent* March 1996; 13:1:9-12.
 52. Gorrel C, Rawlings JM. The role of a ‘dental hygiene chew’ in maintaining periodontal health in dogs. *J Vet Dent* March 1996; 13:1:31-34.
 53. Gorrel C, Rawlings JM. The role of tooth-brushing and diet in the maintenance of periodontal health in dogs. *J Vet Dent* Dec. 1996; 13:4:139-144.
 54. DuPont GA. Understanding dental plaque; biofilm dynamics. *J Vet Dent* Sept. 1997; 14:3:91-94.
 55. Gorrel C, Inskeep G, Markwell PJ. Effect on canine oral health of adding chlorhexidine to a dental hygiene chew. *J Vet Dent* Sept. 1997; 15:3:129-135.
 56. Gorrel C, Inskeep G, Inskeep T. Benefits of a “dental hygiene chew on the periodontal health of cats. *J Vet Dent* Sept. 1998; 15:3:135-143.
 57. Gorrel C, Warrick J, Bierer TL. Effect of a new dental hygiene chew on periodontal health in dogs. *J Vet Dent* June 1999; 16:2:77-82.
 58. Gorrel C, Bierer T. Long-term effects of a dental hygiene chew on the periodontal health of dogs. *J Vet Dent* Sept. 1999; 16:3:109-115.
 59. Tenovuo J, Illukka T, Vahe T. Non-immunological defense factors in canine saliva an effects of a tooth gel containing antibacterial enzymes. *J Vet Dent* March 2000; 17:3:136-140.
 60. Hennem P. Effectiveness of an enzymatic rawhide dental chew to reduce plaque in Beagle dogs. *J Vet Dent* June 2001; 18:2:61-64.
 61. Clarke DE. Clinical and microbiological effects of oral zinc ascorbate gel in cats. *J Vet Dent* December 2001; 18:4:177-183.
 62. Hennem P. Effectiveness of a dental gel to reduce plaque in Beagle dogs. *J Vet Dent* March 2002; 19:1:11-14.
 63. Logan EI, Finney O, Hefferren JJ. Effects of a dental food on plaque accumulation and gingival health in dogs. *J Vet Dent* March 2002; 19:1:15-18.
 64. Harvey CE, Emily PP. Periodontal disease. In: *Small Animal Dentistry*. St. Louis: Mosby, 1993; 89-144.
 65. Wiggs RB, Lobprise HB. Periodontology. In: *Veterinary Dentistry – Principles and Practice*. Philadelphia: Lippincott-Raven, 1997; 186-231.
 66. Holmstrom SE, Frost P, Eisner ER. Dental prophylaxis. In: *Veterinary Dental Techniques* 2nd ed. Philadelphia: WB Saunders Co, 1998; 133-166.
 67. Ross DL, Colmery BH III. Teeth and oral cavity. In: Bojrab MJ ed. *Current Techniques in Small Animal Surgery* 2nd ed. Philadelphia: Lea & Febiger, 1983; 114-119.
 68. Frost P. *Canine dentistry, a compendium*. East Hanover, NJ: Nabisco Brands Inc, 1980; 24-33.
 69. Wilson JB. Dental prophylaxis; basic rationale and methodology. *Vet Tech* 1988; 9:238-243.
 70. Studer E, Stapley RB. The role of dry food in maintaining healthy teeth and gums in the cat. *VM/SAC* 1973;68:1124-1126.
 71. Colmery BH, Frost P. Periodontal disease; etiology and pathogenesis. *Vet Clin N Amer* 1986;16:817-833.
 72. Craig RG, et al. Finishing, polishing and cleansing materials. In: *Dental Materials: Properties and Manipulation* 4th ed. St Louis: CV Mosby, 1987; 114-132.
 73. Walter CD, et al. Clinical evaluations of a zinc sulfate/ascorbic acid mouth rinse. *Clin Prevent Dent* 1986; 8:5-12.
 74. Auer JK, et al. The effects of ascorbic acid supplementation on periodontal tissue ultrastructure in subjects with progressive periodontitis. *Int J Vitamin Nutr Res* 1982; 52:333-341.
 75. Navarro HEM, Baynardo CR. The influence of vitamin C in the healing process in children with gingivitis. *Odontol (Mexico)* 1983; 1:8-14.
 76. Harrap GJ, Saxton CA, Best JS. Inhibition of plaque growth by zinc salts. *J Perio Res* 1983; 18:634-642.
 77. Aller MS. Home dental care for pets, in *Proceedings*. 2nd Annual Veterinary Dental Forum, 1988; 42-45.
 78. Eisner ER. Chronic subgingival tooth erosion in cats. *Vet Med* 1989; 84:378-387.