VETERINARY DENTAL SERVICE
UNIVERSITY of PENNSYLVANIA

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Dr. Tom Lonsdale
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Dear Tom:

Thank you for your comments on the material recently sent to you. I have incorporated several of your suggestions, or made changes based on your comments - updated version enclosed. It seems that we will have to live with a difference of opinion on the use of the word 'cause,' though if that is our only substantial difference, we are doing well!

I will be pleased to supply print-outs of relevant material from the bibliographic database at Penn. If someone associated with the AVA has a copy of "Reference Manager" loaded on their computer, I can send the complete file or disk. If not, I can send print-outs (or disk files in ASCII) of specific search requests. I am also willing to assist the AVA Committee in any other way that seems practical - I mentioned this to Doug Bryden in a follow-up note to the Sydney meeting. As to your nomination to the AVA Executive Committee, good luck. With regard to possible use of anything that I may have said or written, I ask only that it be use in context. Keep me informed.

With best wishes,
Yours sincerely,

Colin E. Harvey
Professor of Surgery and Dentistry

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Effect of the Form of the Diet on the Development of Periodontal Disease in the Dog - A Long-Term Clinical Trial

Introduction

The natural diet of the wild carnivore has a plaque-retarding effect. In rigidly controlling and optimizing the nutritional content, palatability to the pet, and acceptance of commercially available foods by the pet-owning public, pet food manufacturers have created nutrition materials that do not resemble the natural diet of wild carnivores in gross form. In addition, by selective breeding for specific body size, head shape and occlusive pattern, dog owners have created dogs that would not manage well even with a diet that closely resembles that of wild carnivores. By either route, plaque formation is enhanced, inflammatory periodontal disease is more common, and long-term health hazards secondary to intermittent or on-going bacteremia are more likely in an aging pet population. Periodontal disease thus can be considered as a disease of domestication.

Several studies have shown that the form of the diet is much more important in controlling plaque build up and gingival inflammation than is the nutritional content of the diet in dogs. At least over the short-medium term, gross changes in carbohydrate and protein content have no effect on rate of plaque build-up. A diet grossly deficient in calcium leads to secondary nutritional hyperparathyroidism and demineralization of periodontal bone, but does not cause more rapid periodontal tissue break-down. The 'rubber jaw' syndrome of secondary (nutritional or renal) hyperparathyroidism is a periodontosis that does not affect connective and epithelial tissues unless the soft bone permits mobility of teeth that is mechanically harmful.

The general conclusion from reported studies is that a fibrous or dry food diet is beneficial compared to a soft food diet, though canned food and dry food diets have not been compared directly in reported controlled studies in dogs. Even if dry food is somewhat better at retarding plaque formation than is canned food, it is far from optimal: calculus accumulation still occurs, and few studies extend over a long enough period to permit documentation of any disease producing effect of a 'well balanced diet' that is inadequate as a dietary abrasive.

From published studies to date, the optimal oral health diet for dogs contains large pieces, each of which contain calcified material and softer but fibrous material (eg. whole ox-tail or whole trachea-esophagus). These materials may not be attractive to many owners of companion animals, particularly when the material has been partially chewed, and then left for some time as dogs are wont to do. Where esthetics are not a problem, such as in laboratory housed dogs, these materials are effective: for Beagle dogs, half of a raw oxtail given in addition to dry food every two weeks results in accumulation of plaque and calculus per year at a rate that approximates the rate per week in Beagles not given access to the ox-tails. The rapidity of the dietary abrasion effect has been demonstrated with whole versus minced trachea-esophagus fed to dogs - there is a significant increase in gingival fluid flow (a measure correlated with gingival inflammation) within 24 hours when the diet is switched from whole to minced, and vice-versa. Many owners are reluctant to feed 'meat' pieces or bones to their dog or cat because of the purported risk of intestinal irritation, obstruction or perforation. Chicken limb bones that can develop sharp ends during eating, and pork chop or steak bones that have sawn edges that form spikes, probably should not be fed. Large knuckle bones are

acceptable to some owners because they are 'clean', however this means there is little 'flossing' activity during chewing by dogs. The 'ideal' self-flossing material for dogs and cats is a whole prey animal or large part of a carcass that requires much oral work to separate into swallowable sections. Most zoological gardens have reverted to a 'large pieces' menu for carnivores because periodontal disease was rampant during the "mince and mix for balance" era of zoo animal feeding regimes. An often-overlooked source of chewing activity for dogs is the addition of raw vegetables to the diet, particularly items such as broccoli and cauliflower, which are attractive to some animals.

In a Japanese study of 2,649 companion animal dogs, the prevalence of calculus ('present' or 'abundant') was significantly lower in dogs fed dry food or 'left overs' compared to canned, soft moist and home-cooked food. In a study of 1500 dogs in the USA that collected more specific data, regression analysis identified body weight and age as significantly correlated, inversely and directly respectively, with increasing calculus deposition and gingival inflammation; correlation with a dry food diet was less significant. Recently, there has been a strong resurgence in interest in feeding 'natural' diets to dogs and cats to prevent periodontal disease.

Purpose

To compare the effects in dogs of food presented in three forms over a long period. Specific questions to be addressed:

1. Can a 'natural diet' keep the mouth healthy (absence of periodontal inflammation)?
2. Is dry food really more effective than canned food in preventing accumulation of plaque and calculus?
3. Is there a difference between processed foods (dry or canned materials) and the 'natural' diet?
4. If there are differences in extent of periodontal disease among diet groups, are there differences in other organs?

Materials and Methods

Dogs will be studied starting at 8-10 weeks of age at start of trial. This will permit the effect of a particular diet on tooth eruption and establishment of gingival anatomy to be included in the study. Dogs will be randomly assigned to one of three groups of 50 dogs, blocked for sex. Following the initial randomization, the means and standard deviations for age and body weight will be compared by t-test; if there are significant differences, the randomization process will be repeated to achieve even distribution of age and weight.

A 6 months of age, each dog will be sedated to permit accurate measurement and recording of the oral criteria (see below). This sedation and observation process will be repeated at 6 month intervals for the 3 year (and potentially 5 year) period of the trial.

Criteria to be examined: For both sides of the mouth, the following tooth surfaces will be observed - buccal and palatal/lingual surface of the upper and lower second incisors and upper and lower canine teeth, buccal surface of the upper third and fourth premolar and first molar teeth and the lingual and buccal surfaces of the fourth premolar and lower first molar teeth (total of 18 teeth, 30 surfaces).

Information to be recorded for each tooth surface (for multi-rooted teeth, the most severely affected area on that surface):

Plaque index
Calculus index
Gingival index
Pocket depth
Loss of attachment
Mandibular bone density - parallel position film taken at same location, exposure factors, for densitometric data.
Mobility
Furcation

Diets to be fed:

Diet 1	Commercially available dry dog food, fed dry, ad-lib; water ad-lib.
Diet 2	Commercially available canned dog food, fed once daily; water ad-lib.
Diet 3	'Natural diet' consisting of chicken (large sections, including skin and bone) or beef meat pieces with bone attached, fed once daily, plus mineral-vitamin supplement feed weekly(?); water ad-lib.

Housing

All dogs to be in individual identical housing, same husbandry practices; preferably with option for exercise.

Other observations

Body weight - recorded monthly
Daily - food consumed - YES/NO (report by attending animal husbandry personnel)
Daily physical observation by technician with report to attending veterinarian if abnormalities noted - e.g., gagging, vomiting.
If there are any diet-related problems (e.g., constipation, obstruction, perforation), note type of material, location, seriousness of problem

Justification of number of dogs to be used

Group n of 50 is proposed because of the surmised low risk of intestinal problems - the group will need to be far larger than the 6-10 per group required for identifying statistical differences in periodontal indices.

Costs

Assuming 150 dogs, housed individually for 3 year, at current Penn rates for purchase of dogs and per diem, the animal cost alone would be about $800,000! This does not include scaling and on-going charting costs. This in unlikely to be financially supportable. It may be possible to arrange to 'rent' breeding dogs from a commercial laboratory (eg., Marshall Farms).

Funding Sources

The most likely funding source is a grant from grouped pet food manufacturers, either in a consortium put together for this purpose, or through an industry-wide existing arrangement (eg., Pet Food Institute). No commercial organization will want to see its product singled out for study with potentially negative results for that product. Perhaps the food for diets 1 and 2 could be donated by 3-5 organizations and used for one to several week periods in rotation, or a 'generic' diet could be selected.

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