



BestBETS for Vets

Supporting veterinary clinicians in making evidence-based decisions



Do dental chews prevent dental calculus build up?

Clinical Scenario

Mr Hayes brings his 4 year old Chihuahua, Cheeky, in for his annual health review. During the examination you notice a degree of calculus build up on Cheeky's teeth. You recommend that Cheeky has a scale and polish procedure, but also say that the calculus is likely to recur without regular brushing. Mr Hayes says that Cheeky won't let him brush his teeth and asks whether you think dental chews would help; he specifies that he doesn't think he could 'ethically' buy raw-hide chews for Cheeky. You wonder whether giving dogs non-rawhide dental chews results in less dental calculus build-up.....

3-Part Question (PICO)

In [dogs at risk of dental calculus build-up] does [giving a non-rawhide dental chew vs. nothing] [retard the accumulation of calculus]?

Search Strategy

MEDLINE(R) In-Process & Other Non-Indexed Citations and MEDLINE(R) 1946 to Present using the OVID interface

(dog.mp. OR dogs.mp. OR canine.mp. OR canines.mp. OR canis.mp. OR canid.mp. OR canids.mp. OR Canidae.mp. OR exp Dogs/ OR exp Canidae/)

AND

(calculus.mp. OR dental calculus.mp. OR dental tartar.mp. OR exp Dental Calculus/)

AND

(oral hygiene chew.mp. OR oral hygiene chews.mp. OR oral care chew.mp. OR oral care chews.mp. OR dental care products.mp. OR dental chew .mp. OR dental chews.mp. OR dental dog treat.mp. OR dental dog treats.mp. OR brushing chew.mp. OR brushing chews.mp. OR tartar control dog chew.mp. OR tartar control dog chews.mp. OR dentastix.mp. OR CET Enzymatic.mp. OR oravet.mp. OR Greenies.mp.)

CAB Abstracts 1910 to Present using the OVID interface

(dog.mp. OR dogs.mp. OR canine.mp. OR canines.mp. OR canis.mp. OR canid.mp. OR canids.mp. OR Canidae.mp. OR exp dogs/ OR exp Canidae/)

AND

(calculus.mp. OR dental calculus.mp. OR dental tartar.mp.)

AND

(oral hygiene chew.mp. OR oral hygiene chews.mp. OR oral care chew.mp. OR oral care chews.mp. OR dental care products.mp. OR dental chew.mp. OR dental chews.mp. OR dental dog treat.mp. OR dental dog treats.mp. OR brushing chew.mp. OR brushing chews.mp. OR tartar control dog chew.mp. OR tartar control dog chews.mp. OR dentastix.mp. OR CET Enzymatic.mp. OR oravet.mp. OR Greenies.mp.)

Search Outcome

MEDLINE

- **10** papers found in MEDLINE search
- **1** papers excluded as they don't meet the PICO question
- **0** papers excluded as they are in a non-English language
- **0** papers excluded as they are review articles/in vitro research/conference proceedings
- **9 total relevant papers from MEDLINE**

CAB Abstracts

- **10** papers found in CAB search
- **1** papers excluded as they don't meet the PICO question
- **0** papers excluded as they are in a non-English language
- **0** papers excluded as they are review articles/in vitro research/conference proceedings
- **9 total relevant papers from CAB**

Total relevant papers

9 relevant papers from both MEDLINE and CAB Abstracts

Comments

It appears as though the animals used in Carroll et al. 2020 are the same as those involved in Oba et al. 2021. Therefore Carroll et al. 2020 alone has been assessed, which leaves 8 papers in total for this BET.

Summary of Evidence

Brown and McGenity, 2005, Australia

Title: Effective periodontal disease control using dental hygiene chews

Patient group:

Twelve dogs of mixed breed (7 males – 2 neutered; 5 females – 1 neutered) in the University of New England 'dog holding facilities' in Armidale, Australia. Used a 3 x 3 Latin Square approach, where all three groups of animals were given each of the different dietary regimes over 3 different periods (2-week pre-test phase followed by 4-week test phase). Bodyweight ranged from 3 - 15.2kg; 1-10 years age range.

Study Type:

Randomised controlled trial (cross-over design)

Outcomes:

- Baseline gingivitis score compared with final gingivitis score
- Plaque score
- Calculus score at the end of each 4-week collection

Key Results:

- Dogs fed a daily chew had statistically significantly less calculus build up than dogs in the control group (calculus score 2.15 versus 4.20, respectively; $P < 0.0001$)

Study Weaknesses:

- There were very few animals involved in the study; there was no evidence of any sample size or power calculations carried out
- The methods used were referenced but no mention of validation was made. It was stated that most methods used were modified from the published method
- The scoring system was somewhat difficult to clinically translate to cases
- It was not stated as to whether the outcomes were assessed blind or who scaled or brushed the teeth in the pre-test phase and between phases and whether they were blinded
- The study period the animals were followed for was quite short for this condition (1 month)
- Only aggregated data was presented; with so few animals involved, more baseline data could have been provided
- It was not explicitly stated who funded the study, but one of the two authors was employed by the manufacturer of the dental chews used in the study (Masterfoods)

Attachment:

Evidence appraisal (/soe_attachments/577/4158-CA_RCT_Brown and McGenity

2005_02.05.22.pdf)

Hennet et al., (2006), Likely France

Title: Effectiveness of an oral hygiene chew to reduce dental deposits in small breed dogs

Patient group:

Eighteen small breed female dogs of 5 different breed types (CKCS, Fox terrier, Cairn terrier, Shetland Sheepdog, Teckel). Weight range 5.2 to 10.3kg. Dogs mostly allocated into the 2 groups matched with littermates of same breed, assessed after 4 months.

Study Type: Controlled trial

- Plaque accumulation
- Calculus formation
- Whole mouth score (combination of plaque and calculus scores).

Outcomes:

Other things stated in the results but were not mentioned in the methods were: Bodyweight, stool quality, average chewing time, chewing behaviours

Key Results:

- The authors report that dogs fed the dental chew had significantly less dental calculus (45.8%) than those that didn't have the chew (mean calculus score 6.5 in control group versus 3.5 in the dental chew group; $P < 0.05$); however this varied by tooth (not all statistically significantly different) and details regarding statistical methods and data distributions are unclear (e.g. no confidence intervals were provided).

Study Weaknesses:

- Sample size was not justified (e.g. sample size calculation)
- Not stated if ethical approval was obtained
- There were very few animals involved in this study; the authors did make an effort to match animals in the two treatment groups by using littermates and also narrowed the study population down by just focusing on small breed dogs
- Methods used to measure the outcomes were referenced but some were modified; unknown if methods used were validated
- Statistically, there was insufficient detail provided in some places, particularly whether parametric assumptions were met in relation to the justification of using an ANOVA
- Aggregated results reported only, therefore some detail about the basic data is missing
- Very few numerical details provided. The authors reported a reduction in dental calculus scores in dogs fed a dental chew for 4 months, but significant statistical information is missing from the methods and results about the data gathered (e.g. whether data was normally distributed) which precludes robust interpretation
- Not stated who funded the study although two of the authors worked at the Royal Canin Research Centre (manufacturer of the dental chew used in the study)

Attachment:

Evidence appraisal (/soe_attachments/577/4172-CA_RCT_Hennet et al. 2006_02.05.22.pdf)

Clark et al., (2011), Likely Australia

Title: Effectiveness of a vegetable dental chew on periodontal disease parameters in toy breed dogs

Patient group: 16 toy breed dogs (6 males, 10 females). Not stated where these animals originated from, although it does mention owners consent so assume privately owned animals?

Study Type: Randomised controlled trial (was designed as a cross-over trial)

Outcomes:

- Halitosis
- Gingivitis
- Plaque
- Calculus

Chew time was mentioned in the results but is not mentioned in the methods.

Key Results:

- Lower mean calculus score in dental chew group (0.5 +/- 0.24) compared to control group (0.5 +/- 0.24), however the numbers stated are the same. It is likely there is an error in the text, as by looking at Figure 6, the mean calculus score for the control group is above 1.6.
- There was a significant mean reduction of calculus accumulation in dental chew group ($P = 0.0005$)

Study Weaknesses:

- No sample size calculation carried out; small number of dogs were involved
- Methods indicate this study was designed to be a cross-over trial but only the data from the first study period was analysed, making the analysis more akin to that found for randomised control trials
- Little information was given as to the comparison between the dogs in the two groups prior to the start of the study (a small amount of comparison information is mentioned in the discussion). This is subsequently shown to be important as only the data from the first part of the sequence (up to day 28) was analysed
- It is somewhat unclear who administered the chew; presume owners but more detail is required here
- More clarity on the methods used is required. Additional details required in relation to statistical methods, how the dogs were recruited, whether a second scale and polish event happened at day 28 (cross-over point) etc.
- Only data from the first half of the study (prior to dogs crossing over to the other treatment group) was analysed which could have a significant impact on the results
- Further detail is required in relation to the results; there are discrepancies between results given in the text versus figures (e.g. Figure 6 and text for mean calculus scores for control group)
- Methods were referenced and some were modified from the original published version; it was not stated whether these methods were validated or not
- It was not stated whether ethical approval was obtained
- Virbac Animal Health funded the study, the manufacturers of the dental chew used in the study (VeggieDent)

Attachment:

Evidence appraisal (/soe_attachments/577/4173-CA_RCT_Clarke et al. 2011_02.05.22.pdf)

Quest (2013), USA

Title: Oral health benefits of a daily dental chew in dogs.

Patient group: 60 adult entire Beagle dogs (26 males and 34 females) were followed for 28 days, 30 in control group and 30 in daily dental chew group. Ages ranged from 2-8 years, and animals were housed in a facility. Dogs were stratified based on their starting plaque scores

Study Type: Controlled trial

- Outcomes:**
- Halitosis (oral malodor)
 - Plaque
 - Calculus
 - Gingivitis

Key Results:

- Dogs in the dental chew group (1.0) had lower mean calculus scores (0.43 on 4 point scale) than did control dogs (0.97 on 4 point scale; P<0.0001)

Study Weaknesses:

- Study specific to the Beagle breed and entire animals only

- The authors did not justify the total number of dogs involved (e.g. sample size calculation)
- Treatments were not randomly allocated - but an attempt was made to balance the groups for plaque accumulation propensity by stratifying dogs according to pre-cleaning dental plaque scores
- Study carried out in a research facility so there may be limitations to how representative this is to independently owned animals
- Animals were followed for a relatively short period of time (28 days)
- Most methods were referenced and sometimes modifications were made (e.g. plaque formation); it is unknown if these new methods were validated or not
- Aggregated results presented making it challenging to interpret the results; very little information given about the dogs
- It is unclear if the groups were comparable prior to the beginning of the study although dogs were stratified according to pre-study plaque scores
- Study design employed not stated, but likely to be a non-randomised controlled trial.
- Insufficient detail provided about the statistical tests used and the rationale behind their use (e.g. no description as to whether the data was normally distributed or not).
- The funder for the study was not identified; however, one of the authors at the time of the study was affiliated with the company that manufactures the dental chew used in the study

Attachment:



Evidence appraisal (/soe_attachments/577/4174-CA_RCT_Quest 2013_02.05.22.pdf)

Wallis et al. (2018), Likely UK

Title: Validation of quantitative light-induced fluorescence for quantifying calculus on dogs' teeth.

Patient group: 26 Miniature Schnauzers (1.4 – 8.2 years age range) divided into 2 groups (one with dental chew and one without) and followed for 28 days.

Study Type: Randomised controlled trial (cross-over design)

Outcomes: • Calculus build up, measured in 4 different ways

Key Results:

- The primary aim of the study differed from our BET question
- All 4 methods of calculating dental calculus (mean calculus quantity) resulted in dogs given the dental chew having statistically less calculus than those in the control group - mean percent reduction from 'no chew' for 2 x Warrick-Gorrel methods - coverage 38.5 (95% Confidence Intervals CIs 23.7 - 53.3) and coverage x thickness 43.8 (CIs 27.3 - 60.3); for 2 x QLF methods - average mouth 65.8 (CIs 58.1 - 73.4) and weighted mouth 64.9 (CIs 56.6 - 73.1)

Study Weaknesses:

- The primary aim of the study (validation of a novel calculus assessment tool) differed from our BET question; however data generated by this aim were fit for purpose for the BET question
- No details given about weight, sex or neuter status of the dogs which makes the evaluation of patient group characteristics difficult
- The methods used were referenced, but it is unknown if these were validated
- It was not stated whether the outcomes were assessed blind
- Only aggregated results were provided

- Small numbers of animals were involved in the study with a significant proportion of dogs excluded from the analysis (data from only 17/26 dogs - 65% - were analysed) and a lack of detail provided about the dogs. The limitation to one breed, in combination with the points made here, makes it difficult to generalize to other practice environments
- Study was funded by WALTHAM Centre for Pet Nutrition (Mars Petcare). All 4 authors were employees of WALTHAM Centre for Pet Nutrition at the time of the study

Attachment:

Evidence appraisal (/soe_attachments/577/4175-CA_RCT_Wallis et al. 2018_02.05.22.pdf)

Mateo et al. (2020), Spain

Title: Evaluation of efficacy of a dental chew to reduce gingivitis, dental plaque, calculus, and halitosis in toy breed dogs.

Patient group: 17 Toy breed dogs (8 Yorkshire terriers, mean weight 5.2+/-1.6kg and 9 Chihuahuas, mean weight 3.2 +/- 0.7kg) in the Affinity Nutrition Center. No information given about sex or neuter status of dogs; dental chews given once daily.

Study Type: Randomised controlled trial (cross-over design)

- Outcomes:**
- Breath measured for volatile sulfur compounds (VSC)
 - Gingivitis
 - Plaque
 - Calculus

Key Results:

- Overall, dogs given dental chews had statistically significantly reduced calculus scores (mean 1.29 on 4 point scale) as compared with dogs who did not receive the chew (mean 1.01 on 4 point scale; P<0.001) over a 9 week period.
- A decrease in the total calculus score was seen across both the week 4 and week 9 assessments, although this was not assessed statistically

Study Weaknesses:

- Authors state dogs were balanced by breed and randomly assigned to 1 of 2 groups (relating to trial sequence), otherwise not stated as to how the randomisation happened
- Very small sample sizes used without justification
- No statistical results given for measurement of plaque, calculus or gingivitis at each of the two time periods which were short - 4 weeks and 9 weeks)
- Given the small numbers of dogs involved, individual results could have been provided
- There was little discussion as to why some results were not statistically tested
- Study funded by Affinity-Petcare SA (manufacturers of the dental chew used in the study); 4 out of the 5 authors were employed by Affinity-Petcare SA at the time of the study

Attachment:

Evidence appraisal (/soe_attachments/577/4176-CA_RCT_Mateo et al. 2020_02.05.22.pdf)

Carroll et al. (2020), Likely USA

Title: Effects of novel dental chews on oral health outcomes and halitosis in adult dogs

Patient group: 12 adult female Beagle dogs (mean age 5.31+/- 1.08 years and mean bodyweight 13.12 +/- 1.39kg). 4 x 4 Latin square design used (control diet - CT, diet plus Bones & Chews Dental Treats - BC, diet plus Dr Lyon's grain-free dental treats - DL, diet plus Greenies dental treats - GR) across 4 x 28 day periods.

Study Type: Randomised controlled trial (cross-over design)

Outcomes:

- Gingivitis
- Plaque
- Calculus scoring
- Halitosis
- Component analysis of diets and treats (e.g. dry matter, gross energy etc.)
- Consumption of dental chews

Key Results:

- The authors report a statistically significant reduction (DL 36.9%, GR 31.6%, BC 20.4%) in calculus coverage least squares means in dogs fed dental chews versus controls over a 28 day period.

Study Weaknesses:

- Sample size was not justified
- 4 x 4 Latin square cross-over trial; no information given as to randomisation of allocation sequence which is important given the short time period of each 'square' (28 days) and the potential for a carryover effect
- The dentist cleaning each dog's teeth between Latin square rounds also did the assessment at the end of the study, so although blinded, could potentially have remembered the animals (scaled the same dog's teeth at least 4 times)
- Very little numerical detail given, results in percentage reductions and histogram with means only
- Dogs consuming less than 85% of assigned chews by weight over each experimental period had data excluded from the analysis (= 4 dogs in total, two from DL, and 1 each from BC and GR groups; therefore only 8 animals data analysed). Given the lack of allocation detail, this could impact significantly on the results
- The clinical significance of the results is unclear due to a lack of data reporting (statistical methods and results)
- Funded by Chewy, Inc. (manufacturers of one of the dental chews)

Attachment:



Evidence appraisal (/soe_attachments/577/4177-CA_RCT_Carroll et al. 2020_02.05.22.pdf)

Gawor et al. (2021), Likely Poland

Title: Comparison of a vegetable-based dental chew to 2 other chews for oral health prevention

Patient group: Client owned dogs (unknown as to where recruited from) enrolled in two trials: Trial 1 involved 45 dogs less than 10kg (2 breeds) and Trial 2 involved 60 dogs between 15-30kg (15 different breeds). Each trial had 3 groups of animals in them; 1 control, 1 Veggiedent chew - VF - and either Hills Prescription Diet Dental Care Chews (Trial 1 - RC1) or Greenies, Mars Petcare (Trial 2 - RC2)

Study Type: Randomised controlled trial

- Gingivitis (via Gingival Bleeding Index, GBI)
 - Plaque (via plaque index)
 - Calculus (via calculus index)
- Outcomes:**
- Oral health index (OHI; sum of scores relating to lymph node condition, dental lesion and gingivitis, plaque and tartar)
 - Total mouth periodontal score-gingivitis (TMPS-G; adjusted GBI to the size of the teeth and size of the dog)

Key Results:

- Calculus index was statistically significantly lower in both chew groups compared to control in both trials (all $P < 0.01$) after 30 days. Compared with controls, calculus index in trial 1 was reduced by 42% (RC1; 0.51 mean \pm 0.23 SD) and 55% (VF; 0.40 mean \pm 0.18 SD); and in trial 2 was reduced by 32% (RC2; 0.61 mean \pm 0.25 SD) and 55% (VF; 0.40 mean \pm 0.23 SD).
- There was no difference found between the RCs or VF groups in either trial.

Study Weaknesses:

- It wasn't stated if the groups were comparable prior to intervention
- More details about how the animals were recruited and their features would have been beneficial
- There was no justification of the specific sample size used in the study
- The oral health index is a composite value of 4 outcomes (including gingivitis, plaque and calculus) measured so not sure of the value of this as an outcome as some parameters will be considered twice
- Further detail is required (e.g. pre-cleaning oral indices prior to the commencement of the trial)
- Only aggregated results were given
- There was a lot of text in the discussion section about the superiority of the comparator chew (VF) compared with the other chews in relation to gingivitis. This trial was not designed to determine superiority and without confidence intervals, it is difficult to assess these two chews comparatively
- The research was 'supported' by Virbac who manufacture the VF product used in the study; one of the authors was a Virbac employee at the time the manuscript was published

Attachment:



Evidence appraisal (/soe_attachments/577/4178-CA_RCT_Gawor et al. 2021_02.05.22.pdf)

Comments

It is interesting to note that all the studies assessed were sponsored by manufacturers of dental hygiene chews. This in itself is not a negative finding but is unusual, particularly given the large number of relevant studies returned from the search. It is possible that our search strategy was not adequate to return all relevant studies; however, if this was not the case, it would be beneficial for independent studies to be generated in the future for comparison.

The BET authors had concerns that some of the papers were quite short in length; it is unknown if this is an effect of the journal of publication (e.g. word limits) or some other factor. This is likely to have influenced the level of detail provided in the description of the methods, results and discussion sections. In some studies, the name of the study design used was not stated or the stated design was unlikely to be what was executed based on the descriptions of the study. Without adequate detail, robust appraisal of study validity is difficult.

Of the 8 studies assessed, all provided some evidence that support the use of chews. Across the studies, different chews were given made up of different ingredients, configured shapes etc. Additionally, the base diets given to the dogs differed between the studies. There were some differences as to how the same outcomes (e.g. calculus) were measured and where the studies were conducted (e.g. research centres versus independently owned animals). All of these factors make comparisons between studies challenging.

The time periods for most of these studies were short (e.g. 21-56 days) and provision of information as to the randomisation of allocation sequence in some was not given; it is for this reason that carryover effects must be considered here. It would be better to have studies run over longer time periods to see if long term use reduces the level of clinical intervention required.

Finally, it was not stated in all studies whether animals were subject to other oral hygiene measures (e.g. teeth cleaning) concurrently. Ideally, teeth cleaning would be the priority oral hygiene method to accompany the use of dental chews for this purpose, alongside other potential interventions.

Bottom line

Non-rawhide dental chews appear to retard calculus build up, however, consistent and sometimes significant study design weaknesses across the 8 studies included in this BET make it difficult to draw definitive conclusions.

Disclaimer

The BETs on this website are a summary of the evidence found on a topic and are not clinical guidelines. It is the responsibility of the individual veterinary surgeon to ensure appropriate decisions are made based on the specific circumstances of patients under their care, taking into account other factors such as local licensing regulations. **Read small print (/disclaimer)**

References

Brown WY, McGenity, P, (2005). Effective periodontal disease control using dental hygiene chews. *Journal of Veterinary Dentistry* **22**: 16-19.

Hennett P, Servet E, Venet C, (2006). Effectiveness of an oral hygiene chew to reduce dental deposits in small breed dogs. *Journal of Veterinary Dentistry* **23**: 6-12.

Clark DE, Kelman M, Perkins N, (2011). Effectiveness of a vegetable dental chew on periodontal disease parameters in toy breed dogs. *Journal of Veterinary Dentistry* **28**: 230-235.

Quest BW, (2013). Oral health benefits of a daily dental chew in dogs. *Journal of Veterinary Dentistry* **30**: 84-87.

Wallis C, Allsopp J, Colyer A, Holcombe LJ, (2018). Validation of quantitative light-induced fluorescence for quantifying calculus on dogs' teeth. *Journal of Veterinary Dentistry* **35**: 187-194.

Mateo A, Torre C, Crusafont J, Sallas A, Jeusette IC, (2020). Evaluation of efficacy of a dental chew to reduce gingivitis, dental plaque, calculus, and halitosis in toy breed dogs. *Journal of Veterinary Dentistry* **37**: 22-28.

Carroll MQ, Oba PM, Sieja KM, Alexander C, Lye L, de Godoy MRC, He F, Somrak AJ, Keating SCJ, Sage AM, Swanson KS, (2020) Effects of novel dental chews on oral health outcomes and halitosis in adult dogs. *Journal of Animal Science* **98**: 1-7.

Oba PM, Carroll MQ, Alexander C, Somrak AJ, Keating SCJ, Sage AM, Swanson KS, (2021) Dental chews positively shift the oral microbiota of adult dogs. *Journal of Animal Science* **99**: 1-14.

Gawor J, Jodkowska K, Klim E, Jank M, Nicolas CS, (2021). Comparison of a vegetable-based dental chew to 2 other chews for oral health prevention. *Journal of Veterinary Dentistry* **38**: 131-138.

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