Investigation of the efficacy of a dietetic food in the management of chronic enteropathies in dogs

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Abstract

Background Chronic enteropathies (CEs) are a common cause of morbidity in dogs. CEs are diagnosed in dogs with chronic gastrointestinal clinical signs (>3 weeks), inflammatory changes on intestinal biopsies and where no other underlying cause is determined based on a thorough, standardised diagnostic work-up. Based on response to therapy, CEs are subclassified into food-responsive, antibiotic-responsive or steroid-responsive enteropathies. A significant proportion of dogs with a CE are food-responsive; however, there are limited peer-reviewed publications describing the clinical efficacy of the commercially available diets used to treat CE.

Methods In this study, the authors evaluated the response of 15 dogs with a CE to a commercially available dietetic food (Hill’s Prescription Diet i/d Sensitive Canine Dry). The dogs underwent a standard diagnostic evaluation and did not receive concurrent anthelmintic, antibiotic, glucocorticoid or gastroprotectant therapies. The clinical efficacy of the dietary treatment was assessed by comparing the Canine Inflammatory Bowel Disease Activity Index (CIBDAI) before and a median of 13 days after dietary therapy.

Results The authors found that the CIBDAI significantly decreased following the introduction of the dietetic food (median CIBDAI score pretreatment 9, post-treatment 2; P<0.0005).

Conclusion This study demonstrates that this dietetic food can be used to successfully manage CE in dogs.

Introduction

Chronic enteropathies (CEs) are an important and debilitating group of diseases in dogs. The underlying mechanisms of disease development are largely unknown, although the inflammatory changes are considered to be caused by a dysfunction in the interaction between the mucosal immune system, the intestinal microbiota and dietary components.1–5 When diagnosing CE, it is important to rule out other potential non-gastrointestinal causes of the clinical signs as well as to histologically demonstrate intestinal inflammation.

There are many potential causes of chronic gastrointestinal clinical signs, and a standardised work-up including complete blood count, serum biochemistry, faecal analysis and endoscopy with intestinal biopsies is needed before a formal diagnosis of a CE can be made.6 Based on response to treatment, CE can be divided into food-responsive, antibiotic-responsive and steroid-responsive enteropathies.7–9 Since dietary therapy was first implemented in the management of inflammatory intestinal disease in dogs, it has become well established that dietetic food, defined in this paper as a food which is used as the principal treatment for a specific condition, is an important treatment modality for CE, and a significant proportion of dogs with a CE will respond to dietetic food alone.10–16

The Canine Inflammatory Bowel Disease Activity Index (CIBDAI) can be used to objectively assess the severity of clinical signs, and thus response to treatment, in dogs with a CE.8 13 17–20 Importantly, this index allows the authors of this study to evaluate the severity of clinical signs before and after the initiation of CE therapies.

Although many studies show the efficacy of dietetic food in the treatment of CE, not all dogs with diet-responsive CE will respond to a particular food. For this reason, there is a continual need to expand the range

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of effective dietary therapies to treat CE. No studies to date have evaluated egg-based sources of protein food in the treatment of CE. The aim of this prospective cohort study was to determine the efficacy of exclusively feeding a new select ingredient dietetic food as a treatment for canine CE. Here, the authors present 15 dogs diagnosed with a CE by exclusion of other diseases and demonstration of inflammatory changes on intestinal biopsies. The authors report the efficacy of this therapeutic approach by comparing CIBDAI scores before and after the introduction of the dietetic food.

**Materials and methods**

Dogs presenting for investigation of chronic gastrointestinal clinical signs between January 2015 and May 2018 to an academic referral hospital were considered for inclusion in the study. Chronic gastrointestinal clinical signs could include diarrhoea, vomiting, hyporexia, weight loss, pica, borborygmi and abdominal pain, and had to be present for more than three weeks in order to be eligible for inclusion in the trial.

The CIBDAI score was calculated as previously described from evaluation of attitude/activity, appetite, vomiting, stool consistency, stool frequency and degree of weight loss. Briefly, each of the six parameters was given a score of 0–3, where 0 is normal, 1 is mild change, 2 represents moderate change and 3 represents severe change. The individual scores are summed to yield a total score. A CIBDAI score is classified as clinically insignificant disease when 0–3, mild CE when 4–5, moderate CE when 6–8, and severe CE when 9 and above.

Dogs were included if inflammation was present on intestinal biopsies in the absence of an underlying cause. Dogs were excluded if they had received corticosteroids or antibiotics in the three weeks before presentation, if they had hypoalbuminaemia (<25 g/l) or if they had already been exposed to the dietetic food before referral.

To evaluate for underlying disease, a thorough work-up was performed, including faecal analysis (flotation, *Giardia* ELISA, culture), haematology and serum biochemistry, in addition to abdominal ultrasonography and endoscopy with intestinal biopsies (minimum of eight biopsies in each area). Only dogs with the final diagnosis of CE based on histopathology of mucosal biopsies were included.

For dogs whose owners consented to enrol in the trial, dietary management with Hill’s Prescription Diet i/d Sensitive Canine Dry was initiated as a monotherapy. It was emphasised that this diet had to be given exclusively. This food contains egg (source of animal protein), maize gluten meal (source of plant protein) and carbohydrates (brewers’ rice, barley and oats) (table 1).

| Table 1 Analytical constituents and composition of Hill’s Prescription Diet i/d Canine Sensitive Dry |
|---------------------------------------------------------------|
|                  | As fed        | Dry matter | Per 100 kcal ME |
|------------------|---------------|------------|-----------------|
| Protein          | 24.3%         | 26.4%      | 6.2 g           |
| Fat              | 20.4%         | 22.2%      | 5.2 g           |
| Carbohydrate (NFE) | 38.9%     | 42.3%      | 9.9 g           |
| Fibre (crude)    | 1.9%          | 2.1%       | 0.49 g          |
| Moisture         | 8%            |            | 2.03 g          |
| Calcium          | 1.01%         | 1.1%       | 25.6 mg         |
| Phosphorus       | 0.8%          | 0.87%      | 20.3 mg         |
| Sodium           | 0.41%         | 0.45%      | 10.4 mg         |
| Potassium        | 0.86%         | 0.93%      | 21.7 mg         |
| Magnesium        | 0.09%         | 0.1%       | 24 mg           |
| Omega-3 fatty acids | 0.27%      | 0.3%       | 69 mg           |
| Omega-6 fatty acids | 3.58%      | 3.89%      | 907 mg          |
| Taurine          | 930 mg/kg     | 1011 mg/kg | 24 mg           |
| Vitamin A        | 9590 iu/kg    | 10424 iu/kg| 243 iu          |
| Vitamin D        | 1198 iu/kg    | 1302 iu/kg | 30 iu           |
| Vitamin E        | 600 mg/kg     | 652 mg/kg  | 15 mg           |
| Vitamin C        | 100 mg/kg     | 109 mg/kg  | 2.53 mg         |
| Beta-carotene    | 1.5 mg/kg     | 1.6 mg/kg  | 0.04 mg         |

The amount of food recommended for each dog was based on feeding as per the manufacturer’s instructions for bodyweight, taking into account body condition. The amount fed was adjusted at re-evaluations, based on the patient’s weight change and perceived requirements. Folate and/or cobalamin were the only supplements allowed alongside the diet change. To be considered eligible for inclusion in the trial, no other medications or supplements were allowed.

Re-evaluation included physical examination and completion of the CIBDAI score and was recommended after 14 days. CIBDAI, weights and body condition score (BCS)

**Results**

**Signalment**

Fifteen client-owned dogs, ten male (seven neutered males and three entire males) and five female (three neutered females and two entire females), were included in the trial. Their median age was four years and two months (range six months to 12 years and five months). The breeds included in the study were four crossbreeds, two Labrador Retrievers, two West Highland White Terriers, and one of each of French Bulldog, Border Collie, Cocker Spaniel, Cavalier King Charles Spaniel, Pointer, Rottweiler and Belgian Malinois.
Clinical findings
Clinical signs had been present from three weeks to the entire lifetime of the animal with a median duration of six months, and the most common clinical abnormality was diarrhoea. Primary presenting complaints included vomiting (n=9), small intestinal diarrhoea (n=6), mixed small and large intestinal diarrhoea (n=5), and large intestinal diarrhoea (n=2). One dog presented with vomiting as the only clinical sign. The median BCS did not significantly change following treatment (pretreatment 4, post-treatment 4.5, P=0.13). The median weight significantly increased following treatment (pretreatment 17 kg, post-treatment 17.2 kg, P=0.004). The weight increased in 13 of the 15 dogs post-treatment with the dietetic food. The dogs had received a variety of commercial diets, but none of the dogs had been exposed to the Hill’s Prescription Diet i/d Sensitive Canine Dry food before enrolment in this study. There were no reported issues with palatability of the food. No clinically relevant abnormalities were detected on haematology, serum biochemistry and abdominal ultrasonography, which could not be attributed to CE. Basal cortisol concentration was measured at the discretion of the attending clinician, and in the 13 cases where it was tested it was found to exclude hypoadrenocorticism (>$55 \text{ nmol/l or }>2 \text{ µg/dl})^2.$

All dogs had serum cobalamin measured and 14 dogs also had serum folate measured. Hypocobalaminemia was present in three dogs, with values of less than 111 pmol/l, 197 pmol/l and 263 pmol/l (reference >275), and low folate in one dog with serum folate of 4.76 µg/l (reference 8.2–13.5). Trypsin-like immunoreactivity was measured in 12 dogs and was found to be normal. All dogs had faecal examinations performed, no parasites were detected, and bacterial culture was negative for potential pathogens in all dogs.

One dog underwent oesophagogastroduodenoscopy only, whereas the remaining 14 dogs had both oesophagogastroduodenoscopy and ileocolonoscopy. Histological evaluation revealed lymphoplasmacytic inflammation in two or more intestinal segments in all dogs, with three dogs also having additional eosinophilic inflammation, one dog having additional neutrophilic inflammation, and one dog having additional eosinophilic and neutrophilic inflammation.

Outcome
The Hill’s Prescription Diet i/d Sensitive Canine Dry food was used as a monotherapy in all included dogs. None of the dogs received any anthelmintics, gastroprotectants, antibiotics or glucocorticoid medication. The only other medication administered was folate in one case and cobalamin in three cases. The median time from start of the diet trial (day of or day after endoscopy) to first re-evaluation was 13 days (range 8–37 days). All dogs that were started on the dietetic food as a monotherapy returned for re-evaluation. The median CIBDAI score before diet trial was 9 (range 5–14), which significantly declined after diet trial to 2 (range 0–7) (P<0.0005) (figure 1). CIBDAI did not increase in any of the dogs. Twelve dogs showed marked improvement, defined as a minimum of a 6-point reduction in CIBDAI score, following treatment with the diet. Of the three dogs that did not show marked improvement, one had the same CIBDAI score of 6 at re-evaluation, and in the other two the CIBDAI score had only decreased by one point (CIBDAI score from 5 to 4 and from 8 to 7). Dogs with a marked reduction in CIBDAI had a significantly higher

![Figure 1](image1.png)

**Figure 1** CIBDAI score before and after dietary therapy of each dog enrolled in the study. CIBDAI, Canine Inflammatory Bowel Disease Activity Index.
CIBDAI score at initial presentation than the dogs with a more limited clinical response (median CIBDAI scores of 9.5 and 6, respectively, P<0.05). In the 11 dogs treated only by the introduction of the dietetic food and that did not receive folic acid or cobalamin supplementation, the median CIBDAI score significantly decreased from a median of 10 to 2 (P<0.001).

Discussion
This study demonstrated that the CIBDAI score in the study population significantly decreased following the diet trial with Hill’s Prescription Diet i/d Sensitive Canine Dry dietetic food, and that all dogs found it to be palatable. This supports the current evidence that dietetic food can effectively manage CE in dogs.

The study population consisted of dogs with ‘uncomplicated’ CE, as no dogs with hypoalbuminaemia were included, and only very few dogs fulfilled other criteria considered to be of negative prognostic value (ie, hypocobalaminemia). Despite the fact that previous studies tend to report that dogs with food-responsive CE are often less severely affected than dogs with steroid-responsive CE, the CIBDAI scores were ≥6 in 14 cases and ≥9 in 10 cases, indicating the presence of severe disease (Allenspach et al).10 Twelve of the 15 dogs had at least a 6-point decrease in CIBDAI at re-evaluation, indicating a marked improvement in clinical signs in most cases.

The two categories of commercial dietetic foods commonly used in the treatment of CE in dogs are hydrolysed protein foods and single-source protein foods.11 Both types of food have shown significant efficacy in dogs with CE.10 11 18 22–25

To the authors’ knowledge, there has only been one study evaluating a hydrolysed protein food compared with a single-source protein food, and this study found no statistically significant difference in improvement in CIBDAI between these foods.17 There have, however, been multiple studies using hydrolysed foods and single-source protein foods successfully in the treatment of CE. In studies using Purina LA salmon and rice, 55.7 per cent (39 of 70), 52.6 per cent (10 of 19), 58.8 per cent (30 of 51), 65.5 per cent (19 of 29) and 38.5 per cent (10 of 26) of dogs were food-responsive.10 18 22–24 When using Purina HA Hypoallergenic, 66.6 per cent (12 of 18, and 4 of 6) of dogs were reported as food-responsive.11 25 Purina LA salmon and rice is no longer on the market. When comparing Hill’s Prescription Diet i/d Sensitive Canine Dry food and Purina HA Hypoallergenic, the latter diet has less protein (21 per cent) and fat (10 per cent) and more carbohydrates (54 per cent) on an as-fed basis.26 It is important to emphasise that diets vary regionally and may change over time, and as such comparisons with historical data can be challenging.

A subset of dogs with suspected CE are simultaneously affected by atopic dermatitis, and dietary therapy can successfully manage these conditions concurrently, as has been demonstrated with both hydrolysed or single-source protein foods.27–29 Of dogs with cutaneous food allergy, 10–15 per cent present with concurrent gastrointestinal clinical signs, although some studies show percentages as high as 65 per cent.28 29 None of the patients in the present study had a history of chronic pruritus.

Demographically, dogs enrolled in this study were similar to other studies in dogs with CE. A wide variation in age has been described previously.8 20 30 There was an over-representation of male dogs in this study, as reported in previous studies, but the relatively small size of the cohort limits the ability to make clear inferences on the greater number of male dogs recruited to the study.13 17 20 The initial CIBDAI score did not influence whether the dogs improved on treatment, which is contrary to a previous report.10

The value of diet trials in dogs with CE is further emphasised by the present study. Treatment trials are necessary to determine what therapy is appropriate in the individual animal, and most dogs with CE will respond to food alone.7 10 12 31 There has been much interest in identifying biomarkers, which may be used in determining treatment and adding prognostic information in dogs with CE. However, there are currently no tests able to replace treatment trials.32–35

This study has several limitations, including a small cohort of dogs, the lack of a control group and the short follow-up time. The authors cannot exclude the possibility that some of the dogs’ clinical signs may have spontaneously improved during the follow-up time period. However, the chronic nature of the clinical signs before dietary intervention suggests this is unlikely. Enrolling dogs that were treated with diet alone could have led to a bias towards milder clinical signs; however, as the median CIBDAI score was 9, this was not the case here. The main reason for the small study population was that the use of a diet as a monotherapy was not acceptable to many owners. The authors report a greater response than that previously reported in other studies. This may be due to different study methodologies, a small cohort of dogs, short follow-up time and a population which was naive to the ingredients used in the diet.

Re-evaluation was recommended within two weeks in an attempt to ensure continuous compliance with feeding a therapeutic diet exclusively and to address any other problems owners might encounter when trying to adhere to a new feeding regimen. In most cases of food-responsive CE, a partial or full clinical response can be observed within a relatively short period of time.36 Additional follow-ups would be desirable, as the long-term efficacy of the diet used cannot be defined by this study. Re-evaluations were recommended 14 days after initiation of the diet trial, and the median time from diagnosis to re-evaluation was 13 days.
In summary, the current study evaluated the short-term efficacy of Hill’s Prescription Diet i/d Sensitive Canine Dry in the management of 15 dogs with CE. The CIBDAI scores significantly decreased following introduction of the dietetic food, confirming the usefulness of dietary intervention in managing CE in dogs. Further studies are needed to compare this particular diet with other highly digestible foods and with hydrolysed protein diets, as well as to evaluate the longer-term efficacy, in order to further help veterinarians make evidence-based decisions about which dietary therapies would most benefit dogs with a CE.

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Competing interests The dog food used in this trial was supplied by Hill’s Pet Nutrition. No employees from Hill’s Pet Nutrition were involved in the design, recruitment, analysis or manuscript preparation. RJM has received consultancy funding from Hill’s Pet Nutrition for providing technical support to an unrelated project.

Ethics approval The University of Edinburgh Veterinary Ethical Review Committee approved this study (76/18).

Data availability statement All data relevant to the study are included in the article.

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