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Role of Feeding in the Treatment of Dogs with Pancreatic Degenerative Atrophy

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Westermarck, E., M. Wiberg and J. Junttila: Role of feeding in the treatment of dogs with pancreatic degenerative atrophy. Acta vet. scand. 1990, 31, 325–331. – Fourteen dogs with pancreatic degenerative atrophy (PDA) were fed their original diets or a special diet for 2 periods of 4 weeks to compare the severety of clinical signs in relation to different types of diet. During the first period, the dogs were given ordinary food, and in the second period, the dogs were given only the special diet that consisted of a commercial moderate-fat, low-fiber, highly-digestible food. In addition, equal amounts of pancreatic enzymes were added into the food during both periods. The owners were given a questionnaire covering 9 typical signs of PDA. They were asked to assess the severity of signs daily for the 2 periods using a scale provided with the questionnaire.

The general well-being of the dogs was significantly ($p < 0.05$) better during the period when the dogs were fed a special diet. Of the individual clinical signs associated with PDA the severity of flatulence, borborygmi, volume of faeces and frequency of defecation were significantly ($p < 0.05$) decreased on the special diet. There were no significant differences in appetite, drinking, colour and consistency of the faeces or in coprophagy between the 2 feeding periods.

The costs of the special diet were almost double compared to the ordinary diets.

dog; pancreatic degenerative atrophy; special diet; maldigestion; clinical signs; economy.

Introduction

In dogs with pancreatic degenerative atrophy (PDA), the exocrine part of the pancreas excretes hardly any digestive enzymes. As a result, most food is not digested and the dogs exhibit signs accordingly. Typically, the dogs eat large amounts of food but lose weight. Their feaces are usually grey or yellowish, voluminous and of a pulpy or loose consistency. The dogs defecate frequently and often eat their own faeces. Other signs of PDA are borborygmi, flatulence and polydipsia (*Räihä & Westermarck* 1989).

The disease is irreversible and affected dogs need continuous treatment. It is essential to add pancreatic enzymes into their food. Powder has been found to be the most efficacious form of supplementation (*Strombeck* 1979). Pancreatic enzymes can also be given by adding raw, chopped pancreas into the food (*Westermarck* 1987). Gastric acid secretion inhibitors and antacids have also been used in the treatment of PDA because most of the oral pancreatic enzyme supplementation is destroyed by gastric acids. Antibiotics have also been used, because dogs with PDA often have bacterial overgrowth in the small intestine (*Batt & McLean* 1987, *Williams et al.* 1987).

There are few studies on the role of feeding in the treatment of dogs with PDA. *Pidgeon* (1982) concluded in his studies with pancreatic duct-ligated dogs that correct feeding is

the most important single form of treatment. It gave better results than feeding with normal dog food and administration of pancreatic enzymes, a gastric acid secretion inhibitor and an antacid. However, *Pidgeon* later (1987) suggested that his studies might have been flawed because he used antacids that interfered with the enxyme supplementation. *Pidgeon* (1982) fed the dogs with a special commercial moderate-fat, low-fibre, highly-digestible food[1] designed for dogs suffering from gastrointestinal diseases and recommended for dogs with PDA (*Meyer* 1985, *Lewis et al.* 1987). In children with cystic fibrosis, the symptoms of pancreatic insufficiency are controlled with effective pancreatic enzyme supplements and the children do not need any dietary restrictions (*Beverly et al.* 1987).

The objectives of the present study were to investigate alterations in the severity of clinical PDA signs when ordinary diets were changed for a special diet and to compare the costs of the 2 feeding regimes.

Material and methods

The trial included 14 dogs with PDA (9 German Shepherd Dogs, 5 Collies). PDA was diagnosed on the basis of clinical signs combined with results from a soybean stimulation test, in which raw soybeans are added to the food for several days. Faecal protease activity is then measured by radial enzyme diffusion (*Westermarck & Sandholm* 1980). The dogs were 2–4 years old and in good condition, considering their illness. Prior to the trial, the dogs had been treated for PDA at least 6 months by adding pancreatic enzymes into their food. In 7 dogs, the enzymes were given as powder[2], and 7 were given the enzyme in the form of raw porcine pancreas (50 g/meal). The way and amount of enzyme supplementation remained unaltered throughout the study. The

[1] Prescription diet i/d (dry), Hill's, Topeka, Kansas.

[2] Viokase V, A. H. Robins.

Table 1. Data on dogs with PDA in the feeding trial, enzyme supplementation used, and costs and contents of the diets. Foods included in ordinary diets are given in their order of importance. GSD = German Shepherd Dog.

Number	Breed	Enzyme supplement	Ordinary food period		Special diet period	
			Main contents	Price FIM	Amount kg	Price FIM
1.	GSD	Pancreas	Dry food	141	11.7	468
2.	GSD	Pancreas	Dry food, scalloped liver	148	11.8	472
3.	GSD	Pancreas	Canned food, rice	180	14.4	576
4.	GSD	Pancreas	Dry food, ground meat, bread	214	8.9	356
5.	GSD	Pancreas	Porridge, rice, dry food	186	11.1	444
6.	GSD	Pancreas	Dry food, porridge, ground meat	178	10.1	404
7.	Collie	Pancreas	Dry food	84	3.9	156
8.	GSD	Viokase	Dry food	200	12.6	504
9.	GSD	Viokase	Ground meat, rice, meat, egg	314	10.1	404
10.	Collie	Viokase	Dry food, porridge, cottage cheese	232	5.8	232
11.	Collie	Viokase	Dry food, coconut oil	168	3.0	120
12.	Collie	Viokase	Scalloped liver, dry food, fish	350	9.0	360
13.	Collie	Viokase	Dry food, ground meat, sausage	220	7.2	286
14.	GSD	Viokase	Dry food, sausage, macaroni	330	13.5	540

dogs received no other medication during the trial, but antibiotics had been used, particularly during the initial stage of their illness.

The trial was divided in two 4 weeks periods. During the first period, the dogs were given their ordinary food twice a day. Thereafter, they were gradually accustomed to the special diet during 1 week. During the second period, the dogs were given only the special food, twice a day.

The ordinary diet differed from dog to dog and usually consisted of both commercial dog food and home-made food (Table 1).

Table 2. Typical signs of PDA, assessed daily by the owners. Signs were scored in such a way that the higher the score, the more typical the symptom of PDA.

Appetite	*Consistency of faeces*
0 = very poor	0 = hard
1 = poor	1 = normal
2 = normal	2 = loose, watery
3 = good	3 = pulpy, mal-digested
4 = very good	
5 = excessive	
Drinking	*Colour of faeces*
0 = less than normal	0 = darker than normal
1 = normal	1 = normal
2 = more than normal	2 = grey or yellowish
Defecation frequency/day	*Coprophagia*
0 = once	0 = no
1 = twice	1 = yes
2 = 3 times	
3 = ≥ 4 times	
Volume of faeces	*Flatulence*
0 = normal	0 = no
1 = copious	1 = some
2 = very copious	2 = frequent
Borborygmi	
0 = no	
1 = some	
2 = frequent	

The owners were allowed to plan the feeding of their dogs themselves. The special diet consisted of a commercial dry food[3] designed for dogs suffering from intestinal diseases.

The owners were given a questionnaire covering 9 typical signs of PDA. They were asked to assess the severity of signs daily for the 2 periods using a scale provided with the questionnaire (Table 2). The signs were scored in such a way that 0 represented the sign most atypical of PDA. The higher the number, the more typical of PDA the sign became. There were 2 to 5 alternatives for each sign.

The dogs were weighed weekly. The aim was to keep their body weights unchanged throughout the trial.

At the end of the trial, the owners calculated the monthly costs of ordinary feeding and the special diet.

Statistical analysis

Mean scores for each PDA sign were calculated for all dog and diet combinations. A new variable was established by totalling the daily scores for each dog. This was designated the PDA index. Daily PDA index scores were averaged over the 2 periods and all dogs. As a result, 10 continuous variables for every dog were obtained. The original 9 variables (Table 2) described the severity of individual PDA signs and the PDA index estimated general well-being during each period.

The significances of differences in average mean scores for each PDA sign during the 2 feeding periods were assessed using the Student's t-test, as were the differences in PDA indices between the feeding periods and the different forms of enzyme supplementation.

[3] Prescription diet i/d (dry), Hill's, Topeka, Kansas.

Results

Comparison of the severity of typical PDA signs in these 14 dogs on ordinary diets and on the special diet showed that clinical signs (as reflected in the PDA index) were significantly reduced ($p < 0.05$) on the special diet. Daily fluctuations in signs also decreased on the special diet (Fig. 1).

In 8 dogs, the severity of the clinical signs typical of PDA decreased significantly. In 4 dogs, the signs were alleviated only to some extent. In 2 dogs, the signs became slightly more severe on the special diet (Fig. 2).

Comparison of differences between scores for clinical PDA signs during the 2 feeding periods revealed that the occurrence of flatulence and borborygmi, volume of faeces and frequency of defecation decreased significantly ($p < 0.05$) on the special diet. There were no significant differences in appetite, drinking, colour and consistency of the faeces, and coprophagy between the 2 feeding periods (Fig. 3). Using correlation analysis, none of the signs were found to correlate positively with each other.

Half of the dogs received the enzyme supplement in the form of powder, and half received it in the form of raw pancreas mixed into their food. There were no significant differences in the severity of clinical signs between the 2 groups on their ordinary diets or on the special diet.

The difference between feeding costs with the ordinary diets and special diet was considerable. The average cost of the ordinary diets per dog was FIM 211 per period and FIM 380 for the special diet, respectively. Differences between the costs were particularly great regarding home-made food (Table 1). For 1 dog, the ordinary diet was more expensive. For another, the ordinary diet was as expensive as the special diet.

The price of the enzyme supplement added to the food was, on average, FIM 212 per period using the powder form and FIM 42 using raw pancreas. The cheapest form of

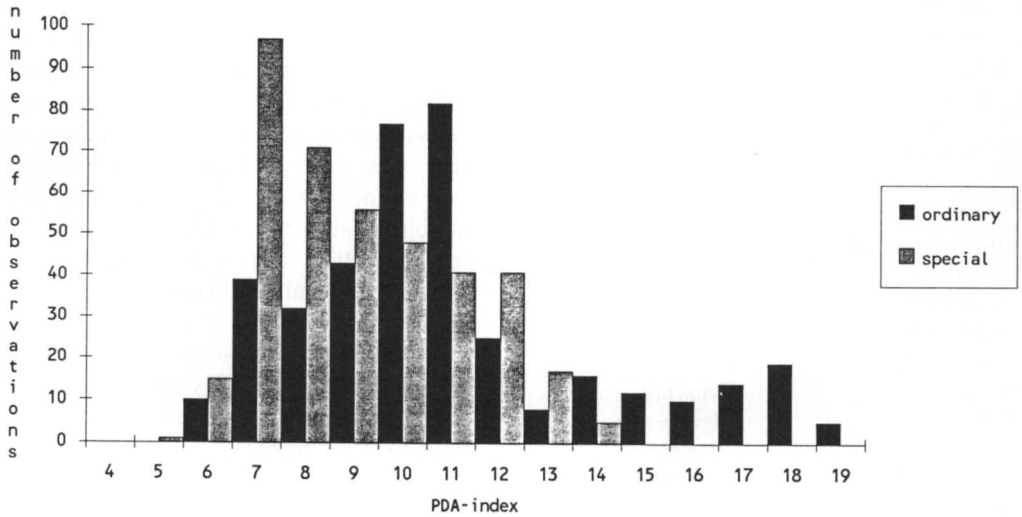

Figure 1. Distributions of daily PDA indices on ordinary diets and on the special diet. The PDA index is the sum of the scores for each sign. The PDA index increases as signs typical of PDA become more severe. The figure shows that the signs were alleviated and their daily fluctuations reduced on the special diet.

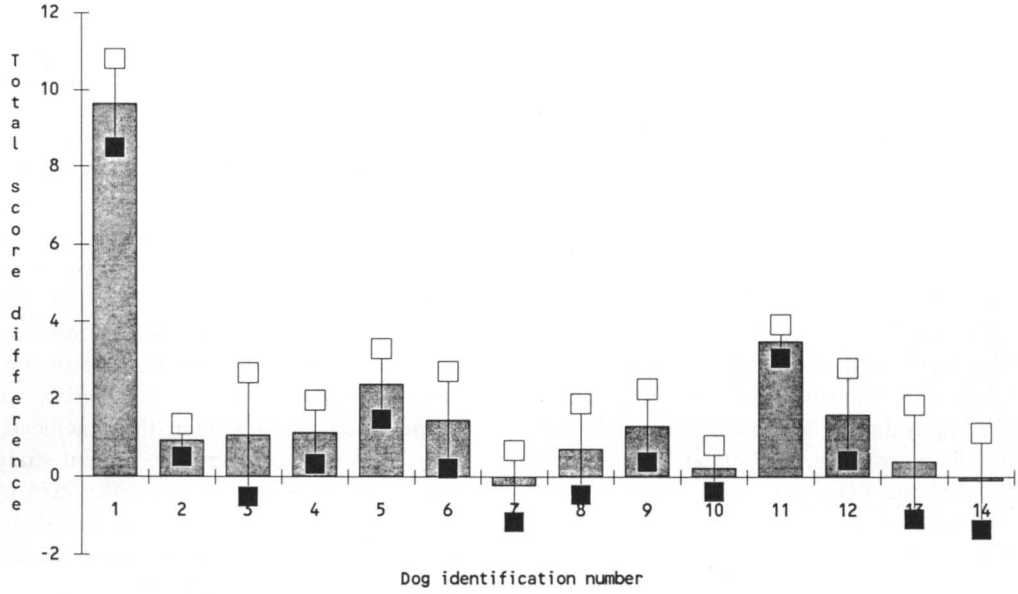

Figure 2. Comparison of sores reflecting the severity of clinical signs in 14 dogs with PDA on ordinary diets and on the special diet. The zero level represents the situation on ordinary diets. The higher the column, the more the score for PDA signs decreased on the special diet. The columns show 95 % confidence intervals.

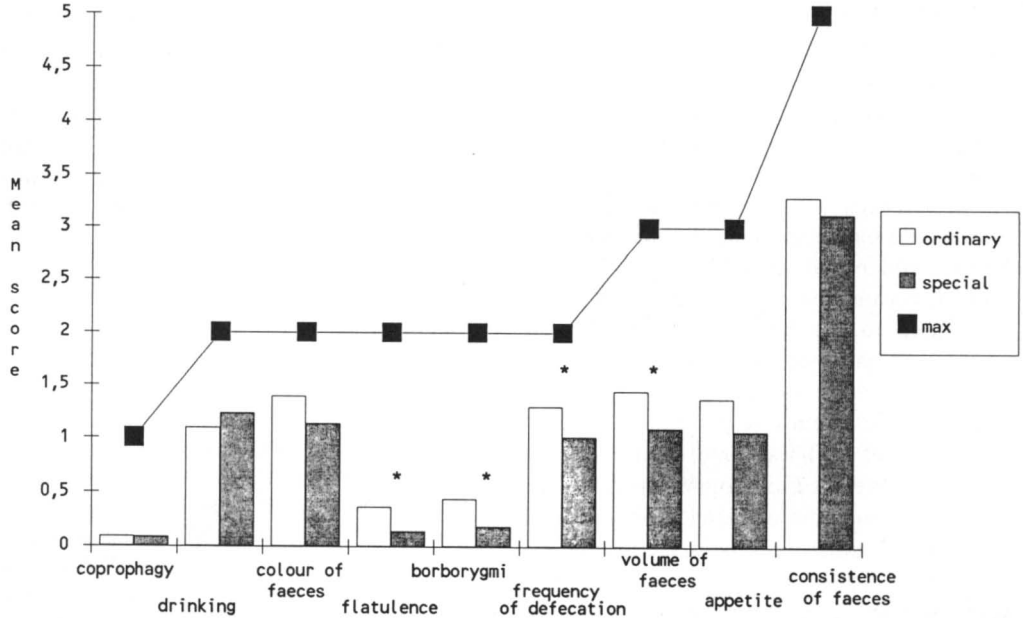

Figure 3. The severity of PDA signs on ordinary diets and on the special diet. The columns increase in height as the score for the sign becomes more typical of PDA. The "max" line is the maximum score for each sign. An asterisk (*) indicates a significant difference ($p < 0.05$) between diets.

treatment, ordinary food plus raw pancreas, costs, on average, FIM 203 per period. The most expensive treatment, the special diet plus enzyme powder, costs FIM 561 per period.

Discussion

The aim of the present study was to determine whether or not the clinical status of dogs with PDA could be improved by feeding them with a special diet designed for dogs with intestinal disorders, rather than feeding ordinary dog food or food prepared by the dog owners. In Finland, it is common to feed the PDA dogs with supplementary pancreas enzymes without much changing the feeding regime. The general opinion is that dog owners usually know what kind of diet is suitable for their dogs.

The study showed clearly that the special diet could significantly reduce some clinical signs of PDA. However, there were considerable differences in the results for the 14 dogs participating in the study. In 6 dogs, the diet did not make much difference.

On the special diet, flatulence,borborygmi, volume of feaces, and defecation frequency were reduced significantly. Positive correlations between signs were surprisingly low. One would have expected, for example, flatulence and borborygmi to be closely correlated, because both signs are supposed to be related to the bacterial growth in the gastrointestinal tract.

The disadvantage of studies of this kind, based on assessment of clinical signs, is that evaluation of at least some signs is fairly subjective. We tried to avoid erroneous evaluations through use of paired comparisons, to eliminate differences between the assessors. Effects of single erroneous evaluations were evened out by calculation of mean scores over a relatively long period.

In the addition of pancreatic enzymes to the food in the present study, half of the dogs received the enzymes in powdered form, half received it in the form of raw pancreas. Differences in clinical signs between these two groups were not statistically significant during either feeding period. In other words, both forms of enzyme supplementation can be considered to be equally effective. In an earlier study (*Westermarck* 1987), it was noted that the addition of raw pancreas into the food of dogs with PDA resulted in considerably higher enzyme concentrations in the proximal jejunum than those achieved using Viokase V powder. The present study centered on discovery of any differences in the severity of PDA signs in relation to diets, so that the effects of enzyme supplementation might have gone unnoticed.

Since PDA occurs primarily in large dogs, feeding costs are of great importance. The costs of the special diet were almost double compared to the ordinary diets. From the economic point of view it is probably best to start the treatment of PDA-dogs by adding pancreatic enzymes into their food and giving a course of antibiotics while keeping the diet unchanged. If the dog's status does not improve sufficiently and PDA signs continue, the special diet should be started. Treatment costs can also be reduced considerably by using pancreas instead of commercial pancreatic enzyme preparations.

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Sammanfattning

Utfodringens betydelse vid behandlingen av hundar med degenerativ atrofi i bukspotskörteln.

I utfodringsförsöket användes 14 hundar med degenerativ atrofi i bukspottskörteln (PDA). Försöket omfattade 2 perioder av 4 veckor vardera. Under den första perioden fick hundarna vanligt hundfoder, under den andra perioden fick hundarna endast en specialdiet i form av ett kommersiellt, lättsmält foder innehållande en moderat fettmängd och lite fiber. Genom hela försöket tillsattes lika mycket pancreasenzymer i fodret. Ett frågeformulär, täckande 9 typiska symptom för PDA, utdelades åt hundägarna. Dessa ombads dagligen uppskatta svårighetsgraden av symptomen under de båda perioderna, med hjälp av en skala som bifogades frågeformuläret.

Svårighetsgraden av typiska symptom för PDA minskade signifikant ($p < 0.05$) med specialdieten. Av de kliniska symptomen minskade väderavgång, borborygmi, avföringsvolym och -frekvens signifikant ($p < 0.05$) med specialdieten. Inga signifikanta skillnader i aptit, vätskeintag, färg och konsistens på avföringen och förekomst av koprofagi kunde påvisas mellan de båda utfodringsperioderna.

Specialdieten var i medeltal 90 % dyrare än det vanliga hundfodret.

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