

# The Signs of Pancreatic Degenerative Atrophy in Dogs and the Role of External Factors in the Etiology of the Disease

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**Riih , M. and E. Westermarck:** The signs of pancreatic degenerative atrophy in dogs and the role of external factors in the etiology of the disease. *Acta vet. scand.* 1989, 30, 447-452. - A questionnaire was sent to 109 owners of German Shepherds suffering from pancreatic degenerative atrophy (PDA) and to 186 owners of German Shepherds with no known history of PDA. Owners were asked questions about their dogs adolescence, e.g. rate of growth, diseases and training. Detailed questions about feeding, intestinal and skin problems were also asked. In the questionnaire for PDA - dogs questions were divided into two parts: before and after the onset of PDA signs.

Based on this study no specific early signs of PDA or causative factors could be found. The role of stress as a triggering factor could not, however, be totally excluded. The frequency of typical signs of PDA was outlined and also some signs not previously reported as typical PDA-signs were noted.

exocrine pancreas; German Shepherd; digestion.

## Introduction

Pancreatic degenerative atrophy (PDA) is a disease that occurs especially in German Shepherds (*Freudiger* 1976). It has been stated that PDA is inherited as an autosomal recessive trait in this breed (*Westermarck* 1980). In many inherited diseases there occurs an interaction between host-associated and environmental factors. The former include breed, sex and age. The latter include diet, housing, husbandry and exposure to toxic and infectious agents (*Thrusfield* 1988). The role of the environmental factors in the etiology of PDA has not been studied before. Recent studies show that PDA is an atrophic disease (*Pfister et al.* 1980). Factors that are involved in causing or triggering this atrophying process and the rate of which it proceeds remain yet unknown. Clinical signs of PDA appear generally when the dogs are young adults (*S teri* 1975). The occurrence

of possible signs of PDA during the adolescence has not been studied before.

Clinical signs of PDA such as increased appetite, weight loss and loose stools are well known (*Hill* 1978) but there are no previous reports on the frequency of these signs.

The objectives of this study are:

- to show if dogs that developed PDA had signs suggestive of PDA already during their adolescence;
- to show if any external circumstances during adolescence or just before the onset of PDA-signs are involved in directly causing or triggering PDA;
- to list the frequency of the most common signs of PDA and also to look for signs not previously noted as typical PDA-signs.

## Materials and methods

A questionnaire was sent to 109 owners of

German Shepherds with PDA (returned by 76 = 70%) and to 186 randomly selected owners of German Shepherds with no known history of PDA (returned by 134 = 72%). The diagnosis of PDA was based on clinical signs combined with a soybean stimulation test (Westermarck & Sandholm 1980). Eleven PDA-dogs were alive during the study. Necropsy had been performed on 45 of the dogs that had subcommed or had been euthanized and the diagnosis of PDA was confirmed in every case.

The PDA-group consisted of 38 males and 38 females and the control group of 70 males and 63 females. The average age of the dogs in the control group was  $4.1 \pm 2.1$  years (SEM).

In both questionnaires owners were asked questions about their dogs living conditions during adolescence e.g. rate of growth, feeding regimes and training. Also detailed questions about diseases, especially intestinal and skin problems, were asked.

The questionnaire for owners of PDA-dogs

Table 1. Data from adolescence prior to the onset of PDA-signs.

Questions	Response	
	Control dogs (%)	Dogs that developed PDA (%)
1.1 <i>Rate of growth</i>		
Slower than normal	9	7
Normal	81	73
Faster than normal	10	20
1.2 <i>Diseases during adolescence</i>		
No major diseases	70	68
Occasional diseases	25	21
Frequent diseases	5	11
1.3 <i>Food-induced diarrhoea</i>		
Yes	40	33
No	60	67
1.3.1 <i>Foodstuffs that induced diarrhoea</i>		
Cartilages and bones	26	30
Commercial dog foods	33	30
Fat	7	13
Milk	17	9
Inner organs	6	4
Whole meat	7	4
Several foodstuffs	4	9
1.4 <i>Composition of food</i>		
Home made	42	48
Dry dog food	41	30
Semi moist dog food	13	14
Canned dog food	4	8
1.4.1 <i>Composition of home made food</i>		
Meat	37	36
Fish	16	15
Cereals	47	49
1.5 <i>Training of the dog</i>		
Normal obedience	67	58
Police dog	1	3
Security dog	3	5
Other training	16	11
No training	13	23

was divided into two parts: conditions before and after the onset of PDA-signs.

Statistical analysis of the material was performed by using a chi square test.

### Results and discussion

It is quite widely accepted that PDA is an atrophying disease (Säteri 1975), but it is not known at what age the atrophying process starts in the pancreas. It has also been reported that PDA is a hypoplastic disease (Holroyd 1968). If this is the case or if the atrophying process starts at a very early age, affected dogs should exhibit signs of pancreatic dysfunction during their adolescence. In this study we found that the growth rate of most dogs, both in the PDA-group and the control group, was normal (Table 1.1). In both groups a third of the dogs suffered from diarrhoea induced by various foods (Table 1.3). Dogs that later in life developed PDA suffered from fat-induced diarrhoea more often than control dogs. This could be considered as a first sign of PDA, but the

difference between the two groups was not statistically significant (Table 1.3.1).

Data in Table 3 shows that appetite, body condition, body weight, water consumption, frequency of vomiting, flatulence, tenderness of the abdomen and matters connected with defecation (consistency, colour, amount of feces) did not differ significantly between the PDA-dogs, prior to onset of PDA-signs, and the control group. However, dogs that later in life developed PDA, defecated significantly more often before the onset of PDA-signs than control dogs. In both groups dogs exhibited coprophagia of their own or other dogs feces. As a general remark it can be noted that more than one tenth of the control dogs exhibited coprophagia in some form. According to this study, no early signs suggestive of PDA could be seen in dogs that later developed PDA.

External conditions and events in the life of the dogs that later developed PDA were very similar to those of the control dogs (Table 1). The different training patterns showed

Table 2. Data from the time of onset of PDA-signs.

Questions	Response %
2.1 <i>Age of the dog at the onset of signs (years)</i>	
< 1	12
1-2	28
2-4	53
> 4	7
2.2 <i>Changes in the dogs life immediately prior to the onset of signs</i>	
New owner	5
Boarding away from home	1
Increased training	5
New family member	3
Change in the diet	3
Other reasons	20
No changes	63
2.3 <i>Other diseases immediately prior to the onset of signs</i>	
Severe diarrhoea	25
Severe vomiting	3
Tenderness of the abdomen	0
Other diseases	8
No diseases	64

no significant differences between the two groups. Most dogs were ordinary household pets (Table 1.5). Differences in the composition of food were very small (Table 1.4). These results indicate that PDA most likely is not a result from erroneous feeding or a deficiency disease. This study is however, not sufficient to detect a deficiency of some micronutrient as a causative factor of PDA. After all it is known that pancreatic atrophy in chickens can be experimentally induced by selenium deficiency (Thompson & Scott 1970). These results suggest that external

factors are very unlikely to be causative factors in the ethiology of PDA.

In this study most dogs (93%) exhibited signs of PDA before the age of 4 years (Table 2.1). Special attention was given to the time immediately prior to the onset of PDA-signs. It is known that the onset of some diseases (e.g. autoimmune diseases) are preceded by a stress factor or some other disease (Garman & Werner 1986). Our results show that almost one third of the dogs that developed PDA had noticeable changes in their living conditions immediately prior to

Table 3. Summary of major signs in PDA-dogs compared with control dogs.

	Control dogs (%)	PDA-dogs prior to the onset of signs (%)	PDA-dogs after the onset of signs (%)
Good appetite	53	53	40
Abnormally increased appetite	3	7	53 <sup>xxx</sup>
Lean body or cachexia	26	33	90 <sup>xxx</sup>
Defecation more than 3 times/day	x 4	14	90 <sup>xxx</sup>
Large amounts of feces	15	22	95 <sup>xxx</sup>
Poorly digested feces	1	1	61 <sup>xxx</sup>
Grey or yellowish feces	13	18	99 <sup>xxx</sup>
Diarrhoea several times/week	1	3	77 <sup>xxx</sup>
Frequent defecation indoors	1	4	56 <sup>xxx</sup>
Occasional coprophagia of other dogs feces	14	12	29 <sup>x</sup>
Occasional coprophagia of own feces	12	22	61 <sup>xxx</sup>
Frequent flatulence	22	25	88 <sup>xxx</sup>
Occasional tenderness of the abdomen	3	1	28 <sup>xxx</sup>
Polydipsia	3	8	51 <sup>xxx</sup>
Frequent vomiting	14	5	38 <sup>xxx</sup>
Monthly skin problems	10	8	14
Temperament			
- nervous or aggressive	6	7	31 <sup>xxx</sup>
- apathetic	0	0	11 <sup>xxx</sup>

Stars on the left side of the columns represent statistical differences between control dogs and PDA-dogs prior to the onset of signs.

Stars on the right side of the columns represent statistical differences between control dogs and PDA-dogs after the onset of signs.

x : p < 0.05

xx : p < 0.01

xxx: p < 0.001

the onset of PDA-signs (Table 2.2). Also almost one third suffered from some other disease. A fourth of the dogs had suffered from severe diarrhoea before signs of PDA occurred (Table 2.3). It is difficult to estimate whether diarrhoea provoked PDA or whether severe diarrhoea already was a sign of PDA. Although no specific triggering factors could be found, the role of stress in one form or another can not be excluded.

After the onset of PDA-signs PDA-dogs differed significantly from control dogs (Table 3). Their appetite increased. More than half of the PDA-dogs constantly wanted food. There was a clear increase in water consumption, which has not been reported before to be a typical sign for PDA. The frequency of defecation and the amount of feces also increased significantly among the PDA-dogs. In two thirds of the PDA cases feces became poorly digested and in all cases the colour of the dogs feces turned grey or yellowish. After the onset of signs there was an increase in diarrhoea, defecating indoors, flatulence and coprophagia, especially of their own poorly digested feces. Vomiting also increased markedly, a sign that has not been considered typical of PDA. After the onset of signs tenderness of the abdomen increased somewhat. This probably is due to increased amounts of gas in the intestines. The nature of some dogs changed after the onset of signs; some became apathetic and some became nervous and aggressive. The general discomfort caused by severe intestinal problems could be the reason for behavioral changes in PDA-dogs.

In previous reports it has been stated that dry skin and skin problems generally are typical for PDA-dogs (Freudiger 1979, Johnson 1980). In this study detailed questions about skin problems were asked in the questionnaires. Information about frequency, type of skin problem e.g. pruritus, sca-

ling, abnormal hair loss and condition of the skin itself e.g. dry or oily skin was sought (data not shown). Surprisingly, PDA-dogs did not have skin problems more often than control dogs and the nature of the problems were much the same in both groups.

The results of this study outline the signs of PDA more precisely than in earlier studies, but a reliable diagnosis of PDA is confirmed only by combining various laboratory tests with clinical signs and a detailed history.

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#### **Sammanfattning**

*Symptom vid degenerative atrofi i bukspottskorteln hos hund och yttre factorers roll i sjukdomens etiologi.*

Ett frågeformular skickades till 109 agare av

schaferhundar med atrofi i bukspottkörteln (PDA) och till 186 agare av kliniskt friska schäferhundar. Frågorna gällde bl.a. hundens uppväxtperiod, tillväxthastighet, sjukdomar och skolning. Detaljerade frågor ställdes angående utfodring, tarmproblem samt hudproblem. Två grupper av frågor ingick i frågeformularen för PDA-hundar: före och efter symptomens början. På basen av denna undersökning kunde inga specifika symptom på begynnande PDA eller faktorer som skulle orsaka sjukdomen påvisas. Stressens roll som utlösande faktor kunde dock inte helt uteslutas. Vi redogjorde för frekvensen av typiska symptom för PDA och noterade en del symptom som ännu inte rapporterats som kännsaker för PDA.

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