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Exocrine Pancreatic Insufficiency-like Syndrome in Giraffe

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ABSTRACT: Studies were conducted on four giraffe (*Giraffa camelopardalis*) with diarrhea and three clinically healthy ones. The feces from both healthy and sick animals were examined to determine amylase, lipase and trypsin activity. In the feces of the giraffe with diarrhea a significant decrease of amylase and lipase activity was noted. The trypsin activity remained unchanged. Pancreatic exocrine insufficiency-like syndrome was diagnosed on the basis of laboratory investigations and histopathological examinations. The administration of pancreatic enzyme supplements (Pancreatin; Polfa, Poland) had a noticeable effect on the normalization of clinical state and laboratory data of the giraffe with diarrhea. Determination of amylase and lipase activity in the feces may be helpful in determination of the condition of the pancreas in the course of chronic diarrhea in giraffe.

Key words: Giraffe, *Giraffa camelopardalis*, chronic diarrhea, pancreas, feces, amylase, lipase, trypsin.

Chronic diarrhea in non-domestic animals is always an important and dangerous problem. There are no reports on diarrhea or pancreatic diseases in giraffe (*Giraffa camelopardalis*). Some studies on the role of the liver and pancreas in the pathogenesis of chronic diarrhea were performed in young domestic ruminants (Lechowski et al., 1986, 1988). However, the methods used in diagnosis of pancreatic function in these animals may not be acceptable in wild mammals because of their very dangerous side effects concerning the necessity of physical or pharmacological restraint for sampling (Fowler, 1978).

The present investigation is a diagnostic trial for pancreatic exocrine insufficiency-like syndrome in giraffe using the amylase, lipase and trypsin activity determination in the feces.

As material for the study the feces from four giraffe aged from 4 to 6 yr with symptoms of chronic diarrhea for about 2 mo were collected. Three clinically healthy giraffe of the some age comprised the control group. Sick animals defecated about six to seven times per day. The feces were of pulp-like consistency, shiny, from grey to greenish in color and gaseous. Apetite and water intake were normal. The animals were examined clinically every day. The results are shown in Table 1. It should be stressed that apart from the number of rumen movements the basic parameters of the overall state of health of the animals in both groups did not differ significantly. All animals were fed a balanced diet in dosage shown in Table 2. Giraffe were housed in the Warsaw Zoo (Warsaw, Poland).

Prior to enzymatic examination of the feces, the giraffe were treated several times by diet modification by withdrawing vegetables and fodder concentrate (cereal) from their diet for a period of 3 to 5 days, and by substituting with herbs (oak bark, oak leaves, berries). All animals were regularly dewormed four times yearly with Mebendazol (Polfa, Poland). Parasitologic examinations using the flotation test and microbiological determination of bacterial growth were performed at the Veterinary Faculty of Agricultural University (Warsaw, Poland). Results of bacteriological examinations showed only a few colonies of non-hemolytic *Escherichia coli*. Taking the above into consideration a sulphonamide drug was used for 10 days (Sulfatyf; Polfa, Poland) in the dosage of 50 mg/kg body weight. Since this treatment was unsuccessful, we decided to determine the activity of pancreatic enzymes (amylase, lipase and trypsin) in both healthy and sick animals.

The determination of enzyme activity was performed in fresh feces immediately after defecation. The extraction of en-

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TABLE 1. The results of clinical examination of clinically healthy and diarrheic giraffe.

Parameter	Healthy	With diarrhea
Temperature (C)	38.0 ± 0.1	38.1 ± 0.1
Heart rate/min	88.0 ± 10	90.0 ± 10
Rumen rate/min	1–2	2–4
Respiration rate/min	20–30	20–30
Soft defecation/day	none	6–7
Total defecation/day	10–12	10–12

zymes was done using an extraction buffer with pH appropriate for amylase (7.4), lipase (7.4) and trypsin (8.0), in the amount of 20 ml of liquid to 1 g of fecal mass. After 6 hr of extraction at 6 C the sample material was centrifuged for 20 min at 5,000 rpm. The activity of enzymes in the supernatant fluids was determined spectrophotometrically using Lipostrat test for lipase (Labordiagnostica Gödecke, Berlin, Pastfach 5169, 7800 Freibarg, Germany),

TABLE 2. Dietary compounds in daily feeding ratio of healthy and diarrheic giraffe.

Compound	Female	Male
Crushed oats	1.5 kg	2.0 kg
Crushed barley	0.5 kg	0.5 kg
Crushed wheat	0.5 kg	0.5 kg
Crushed corn	0.5 kg	0.5 kg
Apples	1.5 kg	2.0 kg
Carrots	3.0 kg	3.0 kg
Leeks	0.2 kg	0.3 kg
Celery	0.2 kg	0.3 kg
Onion	0.1 kg	0.1 kg
Alfalfa	10–14 kg	10–14 kg
Branches of deciduous trees	5 tufts	5 tufts
Decoct from *Semen lini*	2 liters	2 liters
Vitamin and mineral supplement[a]	+	+

[a] Polfasol AD_3E; Polfa, Poland; 50,000 IU vitamin A, 25,000 IU vitamin D_3, 20 mg vitamin E, vehiculum ad 1.0 g dosage of 10 g/animal/day. Polfasol B compound; Polfa, Poland; 800 mg B_1, 3 g B_2, 300 mg B_6, 8 mg B_{12}, 1.5 g K, 50.0 g C, 15.0 g nicotinamidum, 5.0 g calcium panthotenicum, vehiculum ad 1,000 g, dosage of 7.5 g/animal/day. Polfamix 0; Polfa, Poland; 500,000 IU vitamin A; 50,000 IU vitamin D_3, 1,000 IU vitamin E, 134.0 g calcium; 71.0 g phosphorum, 62.5 g magnesium, 500 mg ferrum, 125.0 mg cuprum, 15.0 mg cobaltum, 7.5 mg jodum, 2.5 g manganum, 2.25 g zincum, 3.75 g selenum, 60.0 g sodum, 50.0 g sulphuricum, vehiculum ad 1.0 kg; dosage of 40 g/animal/day.

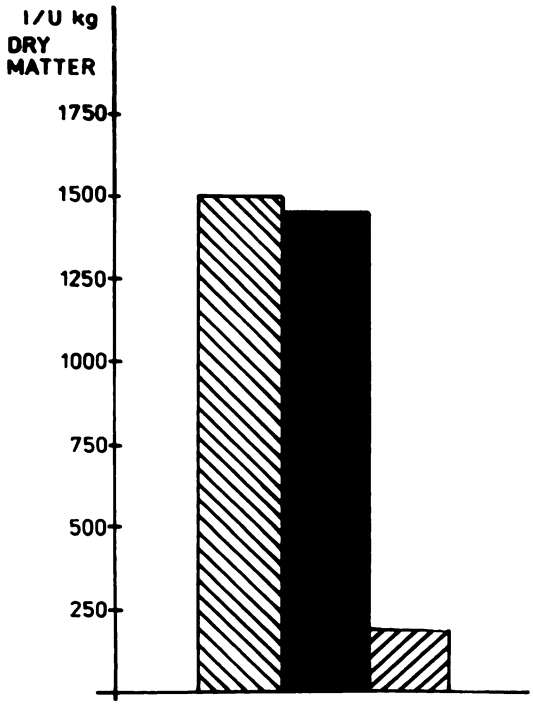


FIGURE 1. The activity of amylase, lipase and trypsin in the feces of clinically healthy giraffe; ▧ amylase, ■ lipase, ▨ trypsin.

Spofa test for α amylase (Slouako-fama Hlonec, Czechoslovakia), and the trypsin test (Boehringer-Mannheim Gmlitt, Diagnostica, 6800 Mannheim 31, Germany). Simultaneously the activity of trypsin was examined in gelatin tube test.

The activity of the enzymes was standardized to 1 kg of fecal mass and compared with the values obtained in clinically healthy animals. The activity of pancreatic enzymes in the feces of both healthy and sick animals is presented in Figures 1 and 2. Attention is drawn to a significant decrease of amylase and lipase activity in the feces of the sick animals in comparison to those in the control group. The activity of trypsin remained unchanged.

After the fecal samples were collected the animals were treated with pancreatic enzyme supplements (Pancreatin; Polfa, Poland; one tablet contains 24 IU of trypsin, 12 IU of amylase, and 5 IU of lipase; 30 tablets per animal) and the fecal tests were repeated 7 and 10 days after the first

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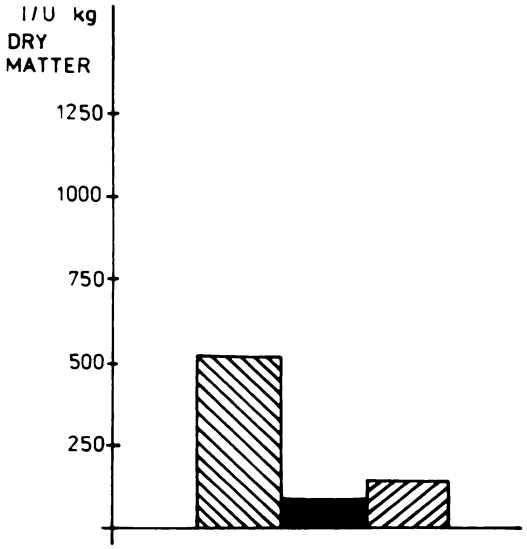


FIGURE 2. The activity of amylase, lipase and trypsin in the feces of giraffe with chronic diarrhea; ▧ amylase, ■ lipase, ▨ trypsin.

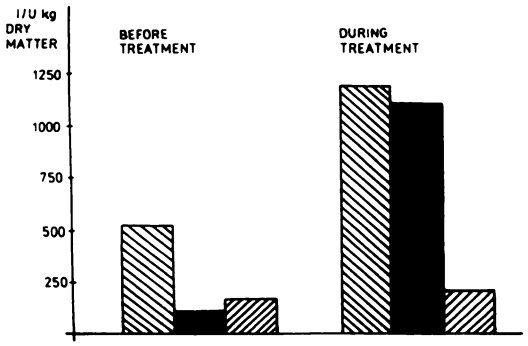


FIGURE 3. The changes of amylase, lipase and trypsin activity in the feces of giraffe with chronic diarrhea before and during treatment with pancreatic enzyme supplements; ▧ amylase, ■ lipase, ▨ trypsin.

enzymatic examination. The influence of the administered pancreatic preparations on the activity of the tested enzymes in the feces is shown in Figure 3. It should be stressed that in addition to the normalization of laboratory indicators of pancreatic function, a clinical improvement was noted by a return to normal of defecation both in quality and quantity.

During the illness two giraffe with diarrhea died as a result of acute rumen distension. Histopathological examinations of their pancreases (hematoxylin-eosine stain) indicated marked atrophy of pancreatic acinar cells and infiltration of macrophages and lymphocytes. These changes are similar to those observed in exocrine pancreatic insufficiency in other animal species (Ettinger, 1983).

Our results suggest that a pancreatic exocrine insufficiency-like syndrome exists in giraffe and can cause dyspepsia. It seems that the enzymatic examination in giraffe's feces may be helpful to determine the probable cause of chronic diarrhea. We believe that pancreatic disorders may play an important role in the pathogenesis of chronic diarrhea in giraffe as they do in other species (Rimaila-Pärnänen and Westermarck, 1982). However, for a more precise diagnosis and for establishing reference values for enzyme activity, further investigations on a greater number of animals are needed.

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