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SERUM- γ -GLUTAMYLTRANSPEPTIDASE
(γ -GT) AND ASPARTATE-AMINOTRANSFERASE
(AspAT) ACTIVITIES IN ADULT CATTLE
WITH CHRONIC *Fasciola*
HEPATICA INFECTION

By

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SIMESSEN, MOGENS G. and PETER NANSEN: *Serum- γ -glutamyl-transpeptidase (γ -GT) and aspartate-aminotransferase (AspAT) activities in adult cattle with chronic *Fasciola hepatica* infection. Acta vet. scand. 1974, 15, 239—243. — Sera from adult cattle with fluke-infected and normal livers were analyzed for γ -GT and AspAT activities. The analyses revealed no significant increases in either γ -GT or AspAT values of the animals with fascioliasis as compared with the non-infected animals. The advanced chronic stage of the infection characterized by hepatic fibrosis, limited injury of parenchyma and low fluke burdens may explain the lack of enzymatic increase.*

γ -GT; AspAT; *Fasciola hepatica*; cattle.

It has been shown that the serum γ -GT activity exhibits a marked increase 30—60 days after experimental infection of calves with metacercariae of *Fasciola hepatica* (Simesen *et al.* 1973). The calves were inoculated with 3 doses of each 400 metacercariae at monthly intervals. Activities up to 20 times pre-infection levels were seen. With a decrease which appeared from 5 to 8 months after the first experimental infection the γ -GT activities were still significantly above normal levels at slaughter 9 months after the first infection i.e. approx. 3 times the pre-infection values. Levels of aspartate-aminotransferase were also increased but to a much smaller degree.

The present study was undertaken to define the enzyme activities in older animals with a chronic infection acquired under natural conditions.

MATERIALS AND METHODS

The material comprised 2 series of blood samples taken at random at a slaughter-house in an area where fluke infection is quite common. Blood was drawn before the animals were slaughtered. The average age of the slaughtered animals was more than 3½ years. The first series was taken in the spring (March 15, 1972), the second in the autumn (October 5, 1972). Serum samples were analyzed for the content of γ -glutamyltranspeptidase (γ -GT)* (Szasz 1969) and aspartate-aminotransferase (AspAT)** (previous nomenclature: Serum glutamic-oxaloacetic-transaminase (SGOT)) (Morgenstern *et al.* 1966). The fluke burdens were estimated by opening the bile ducts and counting the number of visible flukes. Additional flukes were recovered by slicing the livers and squeezing the sections between the fingers. Gross pathology was noted, including the presence and extent of bile duct calcification.

RESULTS

As shown in Table 1 25 out of 99 animals examined in the spring sampling were fluke-infected. The average γ -GT values for 24 fluke-infected animals were 21.9 ± 11.3 compared with an average value of 18.6 ± 7.7 in 51 animals with fluke-free livers. The corresponding average AspAT values for the 25 animals with fluke-infected livers were 42.8 ± 7.4 and 44.6 ± 7.1 for 51 animals with livers containing no flukes.

In the autumn sampling only 9 out of 52 animals were found to be fluke-infected. The average γ -GT value for the 9 infected animals was 27.7 ± 12.1 and the average value for the 32 fluke-free animals was 25.9 ± 7.2 . The 9 fluke-infected animals showed an AspAT value of 42.7 ± 9.1 compared with 41.5 ± 9.1 in 33 non-infected animals. As for both enzymes there was no signif-

* EC 2.3.2.1.

** EC 2.6.1.1.

Table 1. Serum enzymes in animals with parasitized and non-parasitized livers.

Date of sampling		Number of animals with			
		parasitized livers		non-parasitized livers	
		AspAT, i.u.	γ -GT, i.u.	AspAT, i.u.	γ -GT, i.u.
Mar. 15, 1972	m. \pm s n	42.8 \pm 7.4 25	21.9 \pm 11.3 24	44.6 \pm 7.1 51	18.6 \pm 7.7 51
Oct. 5, 1972	m. \pm s n	42.7 \pm 9.1 9	27.7 \pm 12.1 9	41.5 \pm 9.1 33	25.9 \pm 7.2 32

icant difference between fluke-infected animals and animals with non-parasitized livers.

The number of flukes found in the spring sampling varied from few up to 33. Five livers contained more than 25 flukes, 19 contained less than 25. In the autumn sampling 9 livers contained flukes. The parasite burdens were all below 25 flukes.

Gross pathological examination of the livers of both samplings revealed a rather uniform picture. There was a marked overall fibrosis which was most pronounced in the left lobe. Major bile ducts were visible at the visceral surface of the left lobe, and distention and fibrosis of the major ducts were apparent on section of the livers. In some livers there was a marked bile duct calcification, in others calcified plates extruded directly into the lumen. All together, the pathological lesions did not correspond to the low parasite burdens registered. Apparently, the majority of a previous parasite burden has been eliminated at some time before this chronic advanced stage of the infection has been reached.

DISCUSSION

The results of the present analysis revealed no significant increases in either γ -GT or AspAT values. This may be seen in view of the advanced chronic stage of the infections. Although there was an overall fibrosis of the livers, the pathological processes were rather inactive. Thus, traumatic lesions involving hepatic parenchyma and bile duct epithelia were very limited. In previous experimental infection of calves γ -GT activities exhibited a very pronounced increase (Simesen *et al.* 1973). At slaughter 9 months

after the start of the experiment significantly elevated levels still persisted. At this stage fluke burdens were larger and the pathological lesions much more pronounced than those observed in the present material.

The enzyme analyses of the present study have been performed on serum samples obtained at random occasions at 1 large abattoir. A more comprehensive parasitological study in progress (*Nansen et al.*) indicates that the present material is roughly representative of adult cattle slaughtered at Danish abattoirs, since the majority of examined animals may have grazed at least 2 and usually several seasons before slaughter. Two explanations may be given as to the above mentioned finding of livers with advanced chronic changes, i.e. low parasite burdens and limited traumatic lesions of the parenchyma. Firstly, much evidence has recently accumulated to suggest that cattle may acquire a considerable resistance to reinfection (*Doyle 1972*). This will explain a decreasing number of established parasites following successive grazing seasons. Secondly, in Denmark young animals are often grazing permanently wet lowland areas with snail habitats. When the animals become members of the milking herd they will usually graze cultured fluke-free land. Therefore, lesions and parasites found at slaughter will usually result from their first 1 or 2 grazing seasons. The relative role of the 2 explanations is difficult to assess.

Apparently, advanced chronic bile duct changes associated with the presence of a low parasite burden will not induce a significant rise in serum γ -GT activity. This enzyme test may therefore be of limited diagnostic value in older animals. Since previous studies on experimental infection of calves (*Simesen et al. 1973*) have revealed markedly raised γ -GT levels up to 9 months after infection, experiments should be designed to follow the serum pattern of this enzyme in young animals exposed to a natural infection during their first 1 or 2 grazing seasons.

REFERENCES

- Doyle, J. J.*: Evidence of an acquired resistance in calves to a single experimental infection with *Fasciola hepatica*. *Res. vet. Sci.* 1972, 13, 456—459.
- Morgenstern, S., M. Oklander, J. Auerbach, J. Kaufman & B. Klein*: Automated determination of serum glutamic oxaloacetic transaminase. *Clin. Chem.* 1966, 2, 95—111.

- Nansen, P., N. Midtgaard & R. J. Jørgensen: To be published.
- Simesen, M. G., K. Nielsen & P. Nansen: Serum enzymes in bovine fascioliasis. Studies on serum γ -glutamyl transpeptidase (γ GT) and serum glutamic oxaloacetic acid transaminase (SGOT) activities during the course of an experimental infection. Res. vet. Sci. 1973, 14, 32—37.
- Szasz, G.: A kinetic photometric method for serum γ -glutamyl transpeptidase. Clin. Chem. 1969, 15, 124.

SAMMENDRAG

γ -GT og AspAT aktivitet hos voksent kvæg med naturlig Fasciola hepatica infektion.

Serum γ -GT og AspAT er blevet undersøgt hos voksent kvæg med og uden ikteinfektion. Der kunne ikke påvises signifikant forøget enzymaktivitet hos de inficerede dyr sammenlignet med de iktefrie dyr. Dette forhold må antagelig ses i lys af infektionens fremskredne stadium, der er præget af hepatisk fibrosering, begrænsede parenchymskader og lave parasitbyrder.

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