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SERUM BIOCHEMISTRY OF CAMEIS (*CAMELUS DROMEDARIUS*) EXPERIMENTALLY INFECTED WITH *SARCOCYSTIS CAMELI*

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SUMMARY

Inoculation of two camel calves with low dose (25 x 10^4) and high dose (75x10^4) of *Sarcocystis cameli* sporocysts obtained from dogs, produced increase activity of aspartate aminotransferase, creatine phospokinase, lactate dehydrogenase, fructose 1,6 diphosphate aldolase and glucose-6-phosphate dehydrogenase and decrease in total protein and glucose compared to values of uninfected control. Where, the concentrations of triglycerides, phospholipids, total cholesterol and alanine aminotransferase showed no marked changes.

Key words: Camel, *Sarcocystis,* serum biochemistry.

INTRODUCTION

Sarcocystis is one of the most prevalent protozoon parasite of the skeletal and cardiac muscles of mammals, birds and reptiles.

Sarcocystis cameli is a common parasite of camels (*Camelus dromedarius*) in Saudi Arabia (Hussein, 1991 and Fatani et al. 1996) and different countries of the Middle East, where camels are raised. The parasite causes svere clinical signs include anorexia , inappetence, marked loss of weight and dehydration (Fatani et al. 1996). The aim of the present investigation was conducted to study the serum biochemistry in camel calves experimentally inoculated with *S. cameli* obtained from dogs.

MATERIAL AND METHODS

Two coccidia free (6-8 weeks of age) conventionally reared dogs dogs were fed each 500 gm of *Sarcocystis cameli* infected musculature of camel. The dogs were raised on milk and bread to preclude infection with any coccidian parasite. Faecal samples of each dog were examined daily; until the 7th day post excretion of *S.cameli* sporocysts when the two dogs were euthanatised . The sporocysts were

obtained from the dog's intestine according to the method described by Dubey et al. (1989). They were suspended in sterile distilled water containing 1000 I.U. penicillin, 100 ug streptomycin and 500 units mycostatin per ml. The number of sporocysts per ml was counted as using haematocytometer.

Three camel calves obtained immediately after birth from a local camel breeding farm in Al-Ahsa area, Saudi Arabia were housed indoors with their dams in the absence of carnivores for 6 months period. The calves were divided into two groups, Group I and Group II. The two camels of Group I (C_1 and C_2) were inoculated with $25x10^4$ and $75x10^4$ sporocysts through the rumen respectively, while the third camel (C_3) was kept as healthy uninfected control. Serum biochemistry of all these camels were studied at weekly intervals for a period of 4 weeks post-inoculation.

Blood samples were allowed to clot. Serum was separated and stored at-20°C until analyzed for activities of aspartate amino transferase (AST), alanine aminotransferase (ALT) by the method of Retiman and Frankel (1957). Creatine phosphokinase (CK) by the method of Hughes (1962). Lactic dehydrogenase (LD), fructose 1,6-diphosphate and aldolase (FDA) and glucose-6-phosphate dehydrogenase (G6PD) were assayed by the method of King (1965). The glucose content was estimated. by the method of Dubowski (1962) and the concentration of total cholesterol, phospholipids and triglyceride in serum were determined by the method of Zlatkis et al (1969) and serum total protein concentration by biuret method.

Mean values for infected and control camels were compared statistically by the paired (t) test. Values of $P<0.05$ were considered to be significnat deviation from the null hypothesis.

RESULTS

The results of inoculation of *Sarcosystis cameli* sporocysts into camel calves (C_1 , C_2) on serum biochemistry are shown in Table 1. The infection produced significantly ($P<0.001$) increased activity of AST (177%), CK (138%), LD (33%), FDA (88%) and G6PD (71%) compared to values of uninfected control (C_3). Conversely, a significant ($P<0.01$) decrease in total protein (35%) and glucose (33%) occurred in infected calves (C_1 , C_2) compared to uninfected control (C_3). The concentrations of triglycerides, phospholipids, total cholesterl as ALT in infected calves (C_1 , C_2) showed no marked changes during the experimental period. The higher dose of the inoculum produced higher effects than the lower dose though not significantly different ($P>0.1$).

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Table (1): Mean (± SD) peripheral concentrations of some constituents and enzymes in serum of experimentally inoculated camels with *Sarcocystis cameli*.

Constituents	Uninfected control	Entroxin Production							
		Week 1		Week 2		Week 3		Week 4	
		LD	HD	LD	HD	LD	HD	LD	HD
Total protein (g/l)	56±2.3	640±2.1**	39.6±2.1**	39.6±2.1**	36.6±1.4*	33±2*	34±1.6*	37±1.5*	33±2.1*
Glucose (m mol/l)	4.3±0.2	4.3±0.2	4.3±0.2	3.6±0.2**	3.2±0.2**	2.9±0.2**	2.8±0.2**	2.8±0.2**	2.6±0.15**
Triglyceride (m mol/l)	0.37±0.0	0.36±0.03	0.36±0.03	0.36±0.03	0.36±0.03	0.36±0.03	0.38±0.03	0.34±0.03	0.35±0.03
Phospholipids (m mol/l)	0.45±0.04	0.42±0.04	0.42±0.04	0.42±0.04	0.41±0.05	0.43±0.03	0.39±0.04	0.44±0.04	0.45±0.04
Total cholesterol (m mol/l)	2.5±0.31	2.5±0.31	---	2.4±0.32	2.3±0.31	2.2±0.32	1.9±0.32	---	2.0±0.31
Enzyme activity (U/L)									
Aspartate aminotransferase	1.81±2.1	1.81±2.3	22.3±3.1	46±4.1*	56±4.6*	52±4.3*	68±4.5*	51±4.3*	85±4.4*
Alanine aminotransferase	5.1±0.6	5.2±0.6	---	6.3±0.5	6.1±0.6	6.2±0.6	---	6.0±0.5	6.3±0.5
Creatine kinase	42.2±4.6	45.3±4.2	80.3±7.4*	90.6±8.1*	110±8.6*	105±8*	115±8*	96.3±7.3*	---
Lactate dehydrogenase	395.6±16.3	403±17	424±17.3	502±16**	---	525±16**	560±18**	496±15**	530±17**
Fructose 1,6-diphosphate aladase	3.6±0.21	3.9±0.2	4.1±0.2	6.8±0.3**	7.4±0.3**	6.7±0.25**	7.9±0.31**	7.3±0.4**	7.6±0.3**
Glucose-6-phosphate dehydrogenase	4.2±0.3	4.6±0.32	---	6.8±0.25**	7.8±0.32**	7.3±0.33**	8.2±0.32**	7.8±0.33**	8.1±0.35**

LD= Low dose of parasite inoculum; HD=High dose of parasite inoculum; - Denotes constituent not estimated in those samples
* P < 0.001, **= P < 0.05.

DISCUSSION

Significant elevation of activities of AST,LD and CK imply liver and muscle injury infected by the parasite. Similar observation have been demonstrated in calved (Mahrt and Fayer, 1975; Prasse and Fayer, 1981; and Dossouky et al. 1984). Signs of degeneration in the liver of calves and goats infected with sarcocystis (Collins et al., 1980 and Hilali and Nassar 1983) will further substantiate such observation that the liver may be involved. Indeed, the increased activity of CK, a muscle specific enzyme has been elevated in this study suggesting that one of the predilection sites of sarcocystis may be the muscle (Warrag, 1981 and Hussein, 1991). The activity of the enzyme also increased in bovine sarcocystosis (Fayer and Lynch, 1979 and Prasse and Fayer, 1981) muscle trauma, muscle ischaemia, nutritional myopathies (Sreekumar and Nirmalan, 1992 and Aktas et al., 1993) at and after localized intramuscular injection (Lewis and Rhodes, 1978).

The parallel increase in CK, FDA and G6PD activity in serum during *Sarcocystis* infection may be due to efflux of enzymes from parasitized muscle tissue as from repair processes or from parasite derive enzymes (Daugschies et al., 1990). The increase in activity of FDA , D6PD and decrease in glucose concentration, and lacking effects of the parasite on total cholesterol, phospholipids and triglyceride, suggest that muscular glycolysis and energy metabolism but not lipid metabolism, were adversely affected by the parasite (Daugschies et al. 1990 and Prickett et al., 1992). The decrease in total protein, however, may results from anorexia and inappettence shown by the infected animals (Fatani et al. 1996).

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