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Haematobiochemical Studies on the Haemoparasitized Camels

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ABSTRACT

A total of 100 camels of either sex, different ages, functional classes and maintained at different localities in and around Faisalabad district were investigated for serum biochemical and haematological changes owing to haemoparasitism caused by *Trypanosoma evansi* and *Dipetalonema evansi* over a course of one year. The mean total serum proteins in the normal camels were found to be 7.381 ± 0.048 g/dl; whereas, the corresponding values in haemoparasitized group was 6.831 ± 0.270 g/dl. The haemoparasitic infection had a significant ($P \leq 0.05$) effect on the total serum proteins. The mean ± SE values of serum aspartate aminotransferase (SGOT) in normal and haemoparasitized camels were 51.975 ± 3.717 µ/l and 58.179 ± 6.598 µ/l, respectively. The mean ± SE values of SGPT in normal and haemoparasitized camels respectively were 14.597 ± 1.867 and 18.262 ± 2.748 µ/l. The change in both enzymes was non-significant. The mean values of different haematological parameters viz. Erythrocyte sedimentation rate, haematocrit, haemoglobin, total erythrocytic and total leucocytic counts did not differ significantly between the infected and non-infected camels. A mild eosinophilia (0.53%) was observed in the haemoparasitised camels.

Key Words: *Dipetalonema evansi*; *Trypanosoma evansi*; Dromedary

INTRODUCTION

Camel (*Camelus dromedarius*) is an important multipurpose animal in arid and semi-arid areas of the world. There are about 20 million camels in the world (FAO, 1992). They are kept for a variety of purposes e.g. transportation, racing and as source of human food (Dorman, 1986).

Pakistan is the fourth largest camel raising country in the world with a population of over one million heads (FAO, 1992) and an annual increase of 1.62% (Qureshi, 1986). Because of economic reasons and also due to heightened awareness about the problem of environmental pollution as a nemesis of mechanized means of transport utilizing fossil fuel, camel will remain an important non-mechanized cheaper means of transport in the foreseeable future in many parts of the world (Mason, 1974).

Haemoparasitic diseases like trypanosomiasis and dipetalonemiasis have adverse impact on health, productivity and working capacity of camel. Local studies on haemoparasites in camel with particular relation to haematochemical and biochemical dimensions are limited. *Trypanosoma evansi* is notorious in developing resistance to drugs. *Trypanosoma evansi* infection popularly called 'Surra' is probably the most serious protozoan disease of camel and is widespread throughout camel rearing areas of the world (Higgins *et al*., 1992). This disease adversely affects the growth, reproduction as well as trekking potential of the camel (Ibadullaev & Khalikov, 1972; Boid *et al*., 1985; Lohr *et al*., 1986). Trypanosomiasis in camel is usually chronic but can be acute with 90% mortality, if not treated (Luckins, 1992). Several changes in the haematology and biochemistry of the blood of haemoparasitised camels may take place. However, data on this aspect of the diseased camels is sparse and totally non-existent among the Pakistani camels.

Dipetalonemiasis caused by a filarial worm, *Dipetalonema evansi*, is another haemoparasitic disease frequently diagnosed fortuitously among camels which are presented to veterinary hospitals for the treatment of a variety of other disease conditions (Nagaty, 1947; El-Bihari, 1986). A recently concluded epidemiological study documented 14.5% prevalence of Dipetalonemiasis among trek and slaughter camels (Butt, 1995). Contrary to the generally held view about the non-pathogenic nature of this parasite, the affected camels in that study were emaciated as evidenced by shrinking of the hump. A carefully designed haematological and biochemical study of camels afflicted with these maladies has not been yet conducted in Pakistan.

The present study was, therefore, designed to investigate the haematochemical and biochemical changes in camels suffering from *Trypanosoma evansi* and *Dipetalonema evansi* infections.

MATERIALS AND METHODS

Study populations. A total of 100 camels (*Camelus dromedarius*), infected with *Dipetalonema evansi* and *Trypanosoma evansi* plus non-infected, of all ages and either sex were put into investigations for studying some aspects of hematology (Hb, WBC count, RBC count, ESR, PCV) and biochemistry. These were selected randomly to

represent all functional groups viz. Slaughter, trek animals. All the camels studied were maintained in and around Faisalabad metropolitan.

Blood and serum samples. Blood was collected with and without anticoagulant. Sodium EDTA (2 mg mL^{-1}) was used as an anticoagulant. Jugular venepuncture method was adopted for the collection of blood using a 16 guage, 5 cm long hypodermic needle. About 20 ml of blood was taken directly into two clean dry test tubes; one of which contained sodium EDTA for haematological work. Other tube was left undisturbed for clotting of blood and separation of serum. Centrifugation of the tube for 10 minutes at about 3000 rpm facilitated the separation of clear straw-coloured serum which was stored at –20°C until analysed. Blood smears were prepared from fresh whole blood. The air dried slides were fixed in methanol and stained with Giemsa's stain. Blood films were prepared to examine motile trypanosomes or microfilariae.

Haematology. The haematological parameters investigated included ESR, packed cell volume, red blood cell count, total leukocytic count and differential leukocytic count following the methods described by Benjamin (1978). Haemoglobin concentration in blood samples was estimated by Sahli's method as described by Coles (1980).

Blood biochemistry. The biochemical parameters included in the study were: total proteins (Biuret method; Merckotest-33271), Asparatate aminotransferase (using kit GOT IFCC Modified Liquid-UV-test), Alanine aminotransferase (using kit GPT IFCC Modified-Liquid-UV-test), Alkaline phosphatase (using kit alkaline phosphatase optimum Humazym, Enzymatic colorimetric test).

RESULTS AND DISCUSSION

Total serum proteins. The mean of total serum proteins in the normal camels (n=74) was found to be 7.381 ± 0.048 g/dl; whereas, the corresponding value in haemoparasitized group (n=26) was 6.831 ± 0.270 g/dl. The haemoparasitic infection had a significant ($P \leq 0.05$) effect on the total serum proteins. The mean total protein value in normal healthy camels in the present study was within the range reported by Sabir *et al.* (1991) and Fowler (1986). The comparison of the results of serum protein levels led to the conclusion that sera of camels with haemoparasites have a lower mean total serum proteins than in non-infected camels. Similar results have been reported by Safwat and Abadin (1982). The change in protein value probably corresponds to the degenerative changes in the haemoparasitized organs. Contrary to the findings of the present study, Jatkar *et al*. (1973) and Boid *et al*. (1980) reported higher serum protein values in trypanosomiasis-infected camels than in the non-infected ones.

Table I. Comparative mean ± SE of some of the haematological parameters in 74 healthy and 24 haemoparasitized dromedaries (Camelus dromedarius)

Parameter	Healthy camels Mean ± SE	Diseased camels Mean ± SE
Erythrocyte sedimentation rate (mm/h)	2.446 ± 0.142	2.731 ± 0.162
Packed cell volume (%)	27.662 ± 0.507	26.423 ± 0.726
Haemoglobin (g/dl)	9.686 ± 0.276	9.056 ± 0.161
Red blood cell count ($10^6/mm^3$)	6.934 ± 0.217	6.85 ± 0.320
Total leukocytic count ($10^3/mm^3$)	11.970 ± 0.461	10.618 ± 0.484
Lymphocytes (%)	50.203 ± 1.087	49.115 ± 2.071
Neutrophils (%)	46.581 ± 1.053	49.654 ± 2.466
Monocytes	3.351 ± 0.095	3.731 ± 0.204
Eosinophils (%)	0.42	0.53
Basophils (%)	0	0.00 ± 0.00

Asparatate amino transferase. The mean ± SE values of serum Asparatate amino transferase in the sera of normal (n=74) and haemoparasitized (n=26) camels were 51.975 ± 3.717 U/l and 58.179 ± 6.598 U/l, respectively. The haemoparasitism had non-significant effect on Asparatate amino transferase. Dwivedi *et al*. (1977) found that in infected dogs, SGOT did not change. The results of the present study are favourably compared with those of Safwat and Zein (1982). Boid *et al.* (1980) studied the changes in the levels of some serum enzymes in Sudanese camels infected with *Trypanosoma evansi*. They reported increase in the level of SGOT above pre-infection level which corresponded with the present study.

Alanine aminotransferase. The mean ± SE values of Alanine aminotransferase in normal (n=74) and haemoparasitized (n=26) camels were 14.597 ± 1.867 and 18.262 ± 2.748 U/l, respectively. The effect of haemoparasitism on this is non-significant. These findings are comparable with those of Dwivedi *et al*. (1977) who reported that in infected dogs, there was a slight temporary rise in serum alanine aminotransferase between the 6th and 13th day of infection. Boid *et al.* (1980) found an increase in the level of SGPT above pre-infection level in Sudanese camel which is in agreement with the present study.

Alkaline phosphatase. The mean ± SE values of Alkaline phosphatase were 59.651 ± 7.265 IU/l in normal camel (n=74) serum and 55.078 ± 12.290 IU/l in haemoparasitized (n=26) ones. Statistically, the change between normal and parasitized camels was non-significant. In a similar study, Boid *et al.* (1980) recorded non-significantly lower value of serum Alkaline phosphatase in infected group of camel during the period of patent parasitaemia in trypanosomiasis. These findings are consistent with the present study.

Haematology. The results of various haematological parameters have been summarized in Table I.

The pattern of ESR results was, although, similar to that reported by Jatkar and Mohan (1971), but values were quite different as they reported 0.9 mm/hour in normal and 3.48 mm/hour in camels with *Trypanosoma evansi.* The differences in values could be attributed to differences in techniques, breed, nutrition and environmental conditions (Salaheldin, 1979). The higher ESR value in infected animals may be due to the anaemia. It may also be due to auto-agglutination that is observed in this disease during

infection (Jatkar & Mohan, 1971). The increase in ESR has been observed in many other diseases where auto-agglutination of red blood cells takes place as in malaria and tuberculosis (Hagan & Bruner, 1961).

The values of TLC were lower than the previously recorded means of 18.00 ± 0.80 and 13.00 ± 0.52 by Nadim and Soliman (1967), and 17.18 and 23.73 by Jatkar and Mohan (1971) in healthy and sick animals. Leukopaenia has been reported in horses infected with *Trypanosoma evansi* (Ng & Vanselow, 1978). Pigoury *et al.* (1938) found leukocytosis in trypanosomiasis of horses at the early stages followed by leukopaenia before death. Differences in white blood cell counts obtained in the present study and those of the previous studies could be due to variations in the handling of the samples (Salaheldin *et al*., 1979). Generally, the white blood cell count in the camel is the highest of all the domestic animals (Dukes, 1955). In the present study, the difference in TLC of normal and infected camels was significantly different ($P \leq 0.05$).

The values of RBC counts and their differences were lower than that reported means of 9.20 ± 0.31 and 7.50 ± 0.40 million mm^{-3} in normal and infected camels, respectively (Nadim & Soliman, 1967), 9.83 in normal and 4.52 million mm^3 in infected camels (Jatkar & Mohan, 1971). This could be attributed to differences in techniques, breed, nutrition and environmental conditions (Salaheldin *et al*., 1979).

The lower haemoglobin values found in infected animals in the present study are in line with those reported previously (Jatkar & Mohan, 1971; Nadim & Soliman, 1967). The mean value of haemoglobin in infected camels decreased considerably. The haemoglobin values in normal camels in the present study agree with those reported by Salaheldin *et al*. (1979) and Lakhotia *et al*. (1964) in Sudanese and Indian camels, respectively but these are lower than those reported by Banerjee *et al*. (1962) and Soliman and Shaker (1967).

The results of mean values of haematocrit in normal and infected camels were 27.662 ± 0.726% and 26.423 ± 0.726%, respectively. Jatkar and Mohan (1971) reported HCt values of 28.94 and 21.90 per cent, respectively for normal and *Trypanosoma evansi* infected camels. Mahmoud and Gray (1980) mentioned that in areas endemic for *Trypanosoma evansi*, lower Hcts in camels were considered indicative of *Trypanosoma evansi* infection. Raisinghani *et al*. (1981) recorded reduction in HCt of 66.20 per cent in camels infected with *Trypanosoma evansi*. Since *Trypanosoma evansi* infection in camel may last for many years, the differences in the duration of the disease at which they entered into the present study and those in the previous studies may account for part in least for differences in PCV values observed in the present study and those reported previously.

Lymphocytes were by far the most frequent of the white blood cells. The mean values in normal and infected camels of the present study were: 50.203 ± 1.087% and 49.115 ± 2.071%, respectively. These means compared favourably with the results (62.98 ± 0.72% and 40.05 ± 2.70%) reported by Nadim and Soliman (1967). It is evident that infected camels exhibited considerable drop in lymphocytes percentage. Anosa (1988) reported lymphopaenia in *Trypanosoma evansi* infection of camels. The lymphopaenia which develops in most infections is presumably due to intense antigenic stimulations which increase the demands for lymphocytes to be transformed into plasma cells (Anosa, 1988). The variations between previous study and the present one could be due to handling of the samples.

The mean values of monocytes in the present study were: 3.351 ± 0.09 and 3.731 ± 2.04% of TLC in normal and infected camels, respectively compared favourably with the results (2.37 ± 0.19% and 3.15 ± 0.20%) reported by Nadim and Soliman (1967). Monocytes increased considerably ($P = 0.0617$) in infected camels. Monocytes were a consistent finding in trypanosomiasis and had been reported in *Trypanosoma evansi* infection of camels (Anosa, 1988).

The neutrophils constituted 46.581 ± 1.053% in normal camels and 49.654 ± 2.466% of TLC in infected camels in the present study. These findings are in agreement with the observations recorded by Nadim and Soliman (1967) who found out that neutrophils increased in infected camels. Neutrophilia was present in camels infected with *Trypanosoma evansi* (Anosa, 1988).

The grand mean eosinophilic count recorded in normal and infected camels in the present study were 0.42 and 0.53%, respectively. These values are lower than the previous obtained values of 2.16 and 3.80%, respectively (Nadim & Soliman, 1967). The present study, however, revealed that there was eosinophilia in infected camel. In this respect, this study is in agreement with the results (eosinophilia) reported by Anosa (1988).

Basophils were zero (0) percent in the present study. This was similar to (0-3%) reported by Higgins and Kock (1984). Basophils are seldom present in the blood of mammals and are seldom mentioned in the haematological studies of trypanosome infected animals and man (Anosa, 1988).

CONCLUSIONS

The haemoparasitic infection had a significant ($P \leq 0.05$) effect on the total serum proteins. The change in enzymes (SGPT and SGOT) in haemoparasitized and non-haemoparasitized animals was non-significant. The mean values of different haematological parameters e.g. erythrocyte sedimentation rate, haematocrit, haemoglobin, total erythrocytic and leucocytic count did not differ significantly between the infected and non-infected camels. A mild eosinophilia (0.53%) was observed in haemoparasitized camels. More sincere efforts are required

to uncover the mystery of haemoparasites in dromedary (*Camelus dromedarius*).

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