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Biochemical Alterations in *Trypanosoma evansi* Infected Cattle

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A B S T R A C T

The study was performed to unmask the biochemical alterations occurred in blood and serum of *Trypanosoma evansi* infected cattle. A total number of 50 infected and 50 non-infected blood and serum samples were collected from Anand and Mahisagar districts. Animals were bled from the jugular vein and blood samples were collected in 10 ml serum clot activator tube to study biochemical parameters. The mean values of total serum protein, albumin, A:G ratio, was significantly reduced in infected cattle indicating hyperproteinaemia, hypoalbuminemia. The average level of globulin, aspartate aminotransferase (AST), alanine aminotransferase (ALT) was significantly increased indicating hyperglobulinaemia and muscle damages.

Introduction

Trypanosoma evansi, a blood protozoan parasite, causes a serious disease known as 'surra' in domestic and wild animals. It is transmitted mechanically by *Tabanus* spp. fly as the main vector. Geographically, it is the most widely distributed pathogenic trypanosome in Africa, South and Central America and Asia (Luckins, 1988, Pathak and Khanna, 1995).*Trypanosoma evansi*, is a major threat to the health and productivity of farm animals throughout the tropics and subtropics countries (Silva *et al.,* 1999). Present study was conducted to study the biochemical changes in cattle affected with natural infection with *T.evansi.*

Materials and Methods

Ethical approval

Institutional Animal Ethics Committee of Veterinary College, Anand Agriculture University has accorded permission for the collection of blood from the cattle for the study.

Study area and sample collection

The Plan of work primarily included evaluation of alterations occurred in serum of cattle suspected for *Trypanosoma evansi.* The samples were collected from Anand and Mahisagar districts of Gujarat with the help of field veterinarians. Serum samples from

50infected as well as 50 non-infected cattle were collected during the clinico-diagnostic approach of animals. Animals were bled from the jugular vein into serum clot activator vacutainer tubes for the estimation of various biochemical parameters.

Processing of collected samples:

Biochemical studies of the serum samples collected from cattle were done by using Semi-automatic Analyzer NOVA-2021 manufactured by, Analytical Technologies Ltd. at the Department of Animal Physiology and Biochemistry, College of Veterinary Science and Animal Husbandry, AAU, Anand.

Parameter studied

The biochemical parameters *viz*. total protein (TP), albumin, globulin, A:G ratio, aspartate aminotransferase (AST/ SGOT), alanine aminotransferase (ALT/ SGPT) were studied during the study.

Statistical analysis

Data analysis was done as per standard method described by Snedecor andCochran.

Results and Discussion

A total number of 50 infected and 50 non-infected serum samples were collected and studied. The biochemical profile such as Total protein, Albumin, Globulin, A:G ratio, Aspartate Aminotransferase (AST/ SGOT), Alanine Aminotransferase (ALT/ SGPT) levels of infected and non-infected cattle and buffaloes and the results are presented in Table 1.

Total serum protein

The mean values of total serum protein was significantly reduced (P<0.01) from 8.11 ± 0.11 to 7.55 ± 0.10 g/dl in non-infected and infected cattle, respectively.

Total albumin

The average level of albumin was recorded significantly reduced (P<0.01) from 3.29 ± 0.08 to 2.16 ± 0.04 g/dl in non-infected and infected cattle, respectively.

Total globulin

The average level of globulin was recorded significantly increased (P<0.01) from 4.81 ± 0.09 to 5.38 ± 0.09 g/dl in non-infected and infected cattle, respectively.

A:G ratio

The average A:G ratio was reduced significantly (P<0.01) from 0.69 ± 0.02 to 0.43 ± 0.01 in non-infected and infected cattle, respectively.

Aspartate aminotransferase (AST/ SGOT)

The result indicated that there is a significant increase (P<0.01) in mean values of aspartate aminotransferase (AST) 118.53 ± 4.44 to 184.63 ± 5.12 IU/L in non-infected and infected cattle, respectively.

Alanine aminotransferase (ALT/ SGPT)

The mean values of alanine aminotransferase (ALT) was significant increase (P<0.01) from 44.68 ± 2.06 to 69.57 ± 1.43 IU/L in non-infected and infected cattle, respectively.

Similar results were observed by Katunguka-Rwakishaya *et al.,* (1992) who recorded significant decrease in albumin concentrations in infected animals from 3.7 g/dl to 3.2 g/dl, while globulin concentration showed a moderate increase from 2.7 g/dl to 3.2 g/dl. Kadima *et al.,* (2000) who reported serum

biochemical values of *Trypanosoma vivax* infected cattle and observed increased serum aspartate amino transferase (AST) on higher side with increased parasitaemia on day 4 to 6 p.i., Singh *et al.,* (2000) documented biochemical profile of a white tigress suffering from Trypanosomosis and revealed decreased level of total protein (7.9 g/dl) and albumin (3.1 g/dl) while increased globulin (4.8 g/dl) levels.

Ahmad *et al.,* (2004) had undergone the study of biochemical parameters of haemoparasitized (*Trypanosoma evansi)* camels. They reported decreased value of serum proteins from 7.381 ± 0.048 g/dl to 6.831 ± 0.270 g/dl. The haemoparasitic infection had a significant ($P \leq 0.05$) effect on the total serum proteins which completely support present findings. The mean ± SE values of serum Asparatate amino transferase was increased in the infected camels (58.179 ± 6.598 U/l) compared to normal camels (51.975 ± 3.717 U/l).The mean ± SE values of Alanine aminotransferase was also increased in infected camels (18.262 ± 2.748 U/l) compared to normal camels (14.597 ± 1.867 U/I). Cadioli*et al.,* (2006) studied biochemical changes in experimental *Trypanosoma evansi* infected donkeys. Serum albumin concentration decreased gradually concomitantly to an increase in globulin levels in infected animals, but no significant differences were seen in total protein mean values of both groups which were not correlated with present study. So these all above findings support our present study results.

The increase in AST could not have been only due to tissue damage alone but also as a result of destruction of trypanosomes by host defence system thus resulting in release of trypanosomal AST. The increase in AST in the later part of infection could be a result of tissue breakdown (necrosis and inflammation) in host particularly liver, muscle and kidney.

Hilali*et al.,* (2006) worked on biochemical changes in water buffalo calves (*Bubalus bubalis*) infected with *Trypanosoma evansi*. The mean albumin values (3.1 g/dl) were not changed all over the experimental period and increase in the globulin values (7.9 g/dl) and albumin/globulin ratio decreased ($P < 0.001$ to <0.0001) with these changes. Gunaseelan *et al.,* (2009) reported haemato-biochemical changes in a case of canine trypanosomiasis. A six year old male nondescript dog was presented to the Veterinary Teaching Hospital of Madras Veterinary College with a history of diarrhoea and emaciation. On physical examination the dog had a body temperature of 104°F, pulse rate 98 per minute, respiratory rate 23 per minute, loss of body weight, lacrimation, nasal discharge and the conjunctival mucous membrane was pale with bilateral corneal opacity. The blood smear stained with Leishman - Giemsa stain revealed microcytic hypochromic anaemic changes and as many as 15-20 trypanosomes per field. Serum biochemistry showed SGPT 4.83 IU/ l, total protein 6.27g/dl, albumin 1.88 g/dl and glucose 33.99 mg/dl which correlates our findings.

Similarly hyperproteinaemia was also recorded by Kumar *et al.,* (2012) who documented an outbreak of acute *Trypanosoma evansi* infection in crossbred cattle in Punjab, India. Biochemical profile revealed total proteins was on the higher side (8.73 ± 0.27 g/dl. Ref. range: 6.7-7.4 g/dl). The increased levels of total proteins may be due to increase in immunoglobulin in response to antibody production to different antigenic variants of *T. evansi.* Albumin levels found under normal range (3.46 ± 0.43 g/dl, Ref. range: 3.0-3.5 g/dl) while Globulin level was on higher side (5.27 ± 0.43 g/dl) which supports our study.Bal *et al.,* (2014) conducted a study on haemato-biochemical alterations occurred due to *T. evansi* infection

in cattle herd. Biochemical study revealed increased AST (Infected: 110.09 ± 126.9 IU/l, Treated: 64.62 ± 26.07 IU/l), ALT (Infected: 24.90 ± 13.12 IU/l, Treated: 22.3 ± 9.85 IU/l), Total protein (Treated: 7.76 ± 1.41g/dl, Infected: 6.96 ± 1.90 g/dl), Globulin (Infected: 5.25 ± 1.145 g/dl, Treated: 4.26 ± 2.09 g/dl) and decreased Albumin (Infected: 2.51 ± 0.49 g/dl, Treated: 2.7 ± 0.38 g/dl).

Dagnachew *et al.,* (2014) also documented comparative biochemical changes in young Zebu cattle and recorded the similar findings. The increase could be due to elevation in the gamma globulin, which was secreted as immunological response against *T. evansi* (Keniko, 1997).Reddy *et al.,* (2014) screened dogs with inappetence, fever, ocular discharges, dullness and enlarged lymph nodes in one year period of study for the presence of haemoprotozoan - *Trypanosoma evansi* at College Hospital, College of Veterinary Science, Tirupati. The biochemical parameters revealed increased globulin (control: 3.56 ± 0.20 g/dl, infected: 3.88 ± 0.19 g/dl), AST (control: 27.71 ± 2.00 U/l, infected: 68.33 ± 4.23 U/l), ALT (control: 18.71 ± 1.56 U/l, infected: 66.67 ± 6.5 U/l) and decreased total protein (control: 6.81 ± 0.22 g/dl, infected: 6.18 ± 0.15 g/dl), albumin (control: 3.25 ± 0.04 g/dl, infected: 2.47 ± 0.10 g/dl), A:G ratio (control: 0.85 ± 0.11, infected: 0.64 ± 0.05), glucose (control: 120 ± 6.22 mg/dl, infected: 55 ± 3.26 mg/dl) levels, Moolchandani and Sareen (2016) studied blood biochemical study in trypanosomiasis infected Camel. Blood samples of six healthy and six trypanosomiasis infected camels (*Camelus dromedarious*) were collected and further analysed for total protein, albumin and globulin. Mean total protein, and albumin were found to be significantly ($P<0.05$) decreased in infected animals. The decreased total protein (control: 7.11 mg/dl, infected: 6.63 mg/dl) and albumin (control: 2.73 mg/dl, infected: 2.54 mg/dl) levels are suggestive of hypoproteinemia and hypoalbuminemia during the course of parasitaemia.

These all mentioned scientific research work were in accordance with present findings of increased AST, ALT, globulin and decreased globulin, total protein and A:G ratio.

Table 1. Biochemical values in *Trypanosoma evansi* infected cattle of Anand and Mahisagar districts (Gujarat)(Mean±SE)

Sr. No.	Parameters	Infected (n=50)	Non-infected (n=50)	P value	Stat. Sign.
1	Total protein (g/dl)	7.55 ± 0.10	8.11 ± 0.11	0.00	**
2	Albumin (g/dl)	2.16 ± 0.04	3.29 ± 0.08	0.00	**
3	Globulin (g/dl)	5.38 ± 0.09	4.81 ± 0.09	0.00	**
4	A:G ratio	0.43± 0.01	0.69 ± 0.02	0.00	**
5	Aspartate aminotransferase (AST/ SGOT) IU/L	184.63 ± 5.12	118.53 ± 4.44	0.00	**
6	Alanine aminotransferase (ALT/ SGPT) IU/L	69.57 ± 1.43	44.68 ± 2.06	0.00	**

('*'=P<0.05, ''= P=<0.01)**

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Conflict of Interest

All authors declare no conflict of interest.

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