

R. O. A. Arowolo ¹ | **Assessing hepatic dysfunction in**
 E. O. Elhassan ² | **rabbits experimentally infected with**
 B. O. Amure ² | ***Trypanosoma brucei***

AROWOLO (R. O. A.), ELHASSAN (E. O.), AMURE (B. O.). Bilan du dysfonctionnement hépatique chez des lapins expérimentalement infectés avec *Trypanosoma brucei*. *Revue Elev. Méd. vét. Pays trop.*, 1988, 41 (3) : 277-281.

Des sérums de lapins Néo-Zélandais infectés avec des *Trypanosoma brucei* 8/18 ont été recueillis et les niveaux de phosphatase alcaline, de bilirubine, de cholestérol et de cholinestérase biochimiquement déterminés pour évaluer l'état fonctionnel du foie. Les résultats ont montré que les sérums des lapins infectés avaient des niveaux élevés de phosphatase alcaline, de bilirubine et de cholestérol et un niveau de cholinestérase faible. Ces valeurs indiquaient un niveau de fonctionnement insuffisant du foie dans la trypanosomose. Un traitement à l'acéturate de diminazène a amélioré l'insuffisance hépatique. *Mots clés* : Lapin - Trypanosomose - *Trypanosoma brucei* - Infection expérimentale - Sérum - Biochimie - Foie - Acéturate de diminazène - Trypanocide.

INTRODUCTION

The major clinical features of African human trypanosomiasis are fever, anaemia, lymphatic enlargement, hepatosplenomegaly and neurological disturbances (3, 11, 14). The disease in animals resembles that of man except that central nervous signs are rare (9, 13). The hepatosplenomegaly seen in *Trypanosoma rhodesiense* infection has been primarily due to an increased red blood cell destruction (11). In cattle on the other hand, the observed swollen and mottled liver in *T. brucei*, *T. vivax* and *T. congolense* infections has been attributed to anaemia, traumatic and cytotoxic effects of the parasite (10). In the early infection in man JENKINS and ROBERTSON (6) reported an enlarged liver coupled with an increased level of serum bilirubin (SB) with rare manifestation of clinical jaundice. There is very little information in the literature on biochemical evaluation of liver dysfunction in trypanosomiasis. Using known laboratory tests for assessing liver function, in this paper the degree of liver dysfunction in animal trypanosomiasis is reported by measuring serum levels for alkaline phosphatase, bilirubin, cholesterol and cholinesterases.

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MATERIALS AND METHODS

Fifteen inbred male New Zealand rabbits weighing between 1.3 and 1.9 kg were used. They were housed in rabbit cages and supplied with feeds (Pfizer Nig. Ltd) and water *ad libitum*. Prebasal serum biochemical analysis for serum alkaline phosphatase (SAP), serum bilirubin (SB), serum cholesterol (SC) and serum cholinesterase (SCH) was done for two weeks prior to infection. Ten rabbits were inoculated intraperitoneally with 1.05×10^5 *T. b. brucei* per rabbit from a donor rat. The remaining five rabbits served as uninfected controls. The *T. b. brucei* strain used in this study has been previously described (1). Blood was checked daily for four weeks and thereafter three times weekly at low power ($\times 25$) objective of light microscope. Animals were weighed and sera collected weekly for assessment of SAP, SB, SC and SCH. SAP (King-Armstrong Units (KAU)/100 ml) was determined as described by KING and ARMSTRONG (8), SB (mg/100 ml) by the method of BIGGS, CAREY and MORRISON (2), SC (g/100 ml) by the method of ZLATTIS, ZAK and BOYLE (15) and SCH (i.u./ml) by the method of BIGGS, CAREY and MORRISON (2). Five of the infected rabbits were treated with diminazene aceturate (3.5 mg/kg body weight) (Hoescht, W. Germany) intramuscularly on the 23rd day post infection (d.p.i.). At death or slaughter livers of the infected-diminazene treated, infected non-treated and control groups were removed, weighed and calculated as percentages of total body weights.

RESULTS

The normal serum levels for bilirubin, cholesterol, alkaline phosphatase and cholinesterase in the rabbits used in this study were 0.30 ± 0.0 mg/100 ml, 44.48 ± 2.08 g/100 ml ; 9.60 ± 0.68 (KAU/100 ml) and 4.28 ± 0.08 i.u./ml respectively. Infected rabbits started showing parasitaemia as from the third day post infection (d.p.i.). The parasitaemia was scanty (1-2 parasites per microscope field) and intermittent. Clinical signs became apparent on the 23rd d.p.i., and they were characterised by droopy ears, milky white exu-

TABLE I Serum levels of alkaline phosphatase (SAP), bilirubin (SB), cholesterol (SC) and cholinesterases (SCH) in rabbits infected with *Trypanosoma brucei*

Animal groupings	Preinfection values				Postinfection values (8th week)			
	SAP (KAU/100 ml)	SB (mg/100 ml)	SC (g/100 ml)	SCH (i.u./ml)	SAP KAU/100 ml)	SB (mg/100 ml)	SC (g/100 ml)	SCH (i.u./ml)
Infected rabbits	9.78 (0.71)	0.32 (0.02)	49.72 (2.33)	4.6 (0.09)	12.90 (1.90)	0.45 (0.02)	98.8 (8.51)	3.47 (0.31)
Infected rabbits treated with diminazene	10.10 (0.25)	0.31 (0.02)	46.50 (4.28)	4.12 (0.11)	11.18 (0.88)	0.36 (0.05)	60.5 (16.79)	3.8 (0.28)
Controls (non infected, non treated rabbits)	9.6 (0.71)	0.31 (0.02)	44.48 (2.05)	4.28 (0.08)	9.7 (0.75)	0.31 (0.01)	44.64 (2.71)	4.28 (0.15)

The figures in parentheses () are the standard deviation of means.

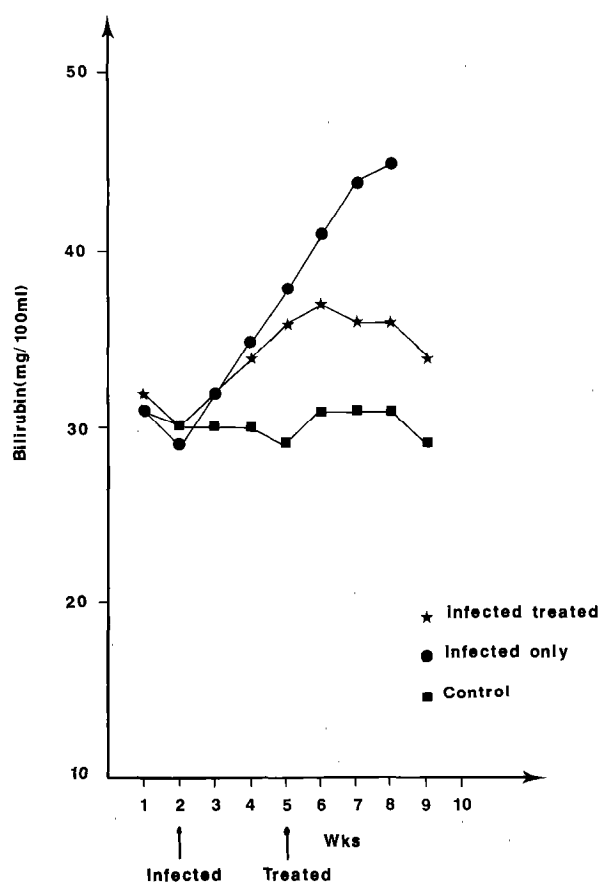


Fig. 1: Graph of serum bilirubin (mg/100 ml) in infected treated, infected non treated and control rabbits.

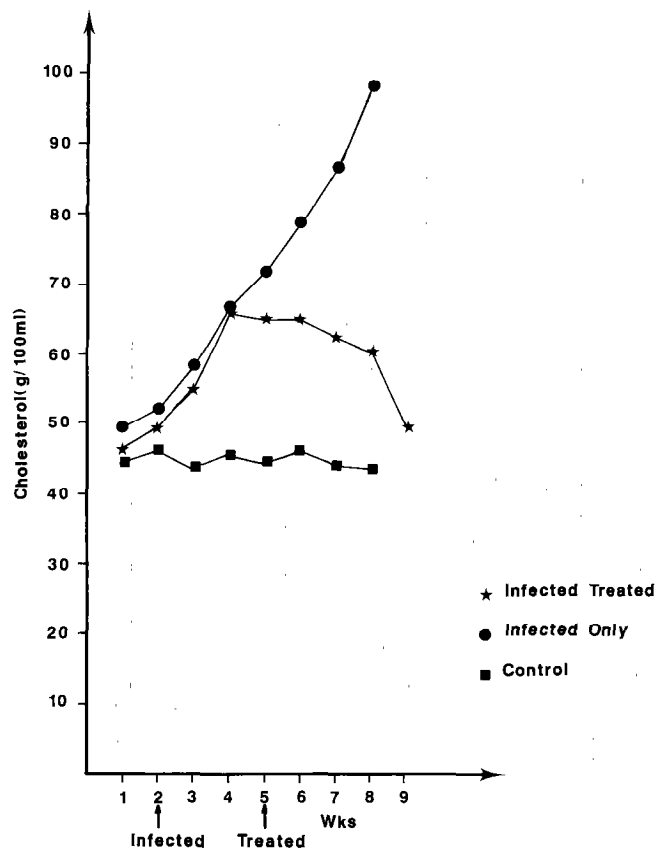


Fig. 2: Graph of serum cholesterol (mg/100 ml) in infected treated, infected non treated and control rabbits.

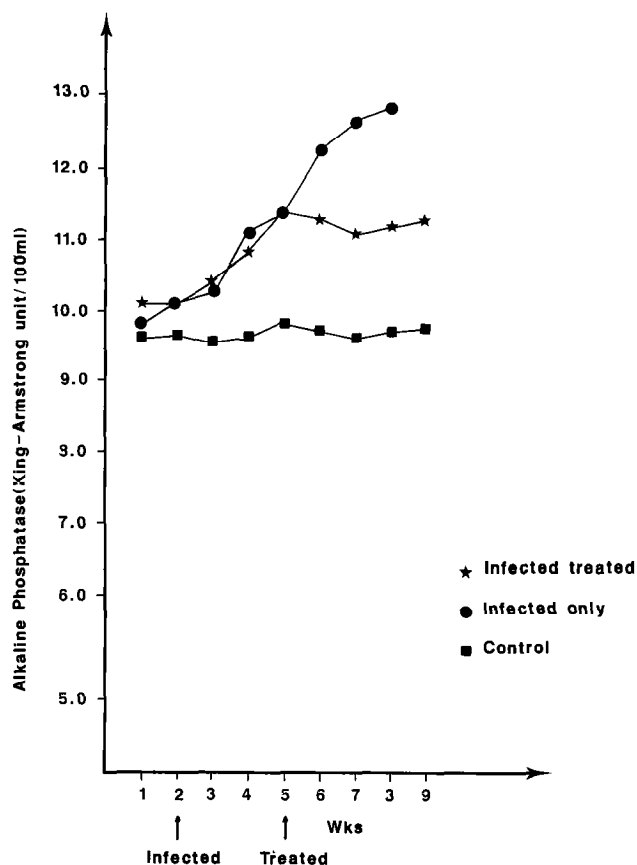


Fig. 3 : Graph of serum alkaline phosphatase in infected treated, infected non treated and control rabbits.

date from external nares and eyes, weakness, dullness, enlarged testes, emaciation and loss of hair. Two infected rabbits exhibited oscillatory movements of the head before death. All infected non-treated rabbits died of the infection between the 35th and 49th d.p.i. The infected rabbits showed aparasitaemia 24 hours after diminazene treatment on the 23rd d.p.i. and remained so till the end of the study. In spite of the aparasitaemia, two rabbits died in this group on the 42nd d.p.i. There were no deaths in the controls. All rabbits, with the exception of the controls showed a decrease in total body weight. Mean total body weight (kg) in the infected treated group fell by 34.9 p. 100 and by 39 p. 100 in the infected non-treated; but increased by 9 p. 100 in the controls. Live-weights were higher in the infected non-treated than in the infected treated and controls. The mean liver weights (g) were 31.76 ± 2.43 , 39 ± 4.44 and 31.95 ± 4.77 in the infected treated, infected non-treated and the controls respectively.

There was a marked rise in the SAP, SB and SC values and a marked decrease in SCH in the infected rabbits.

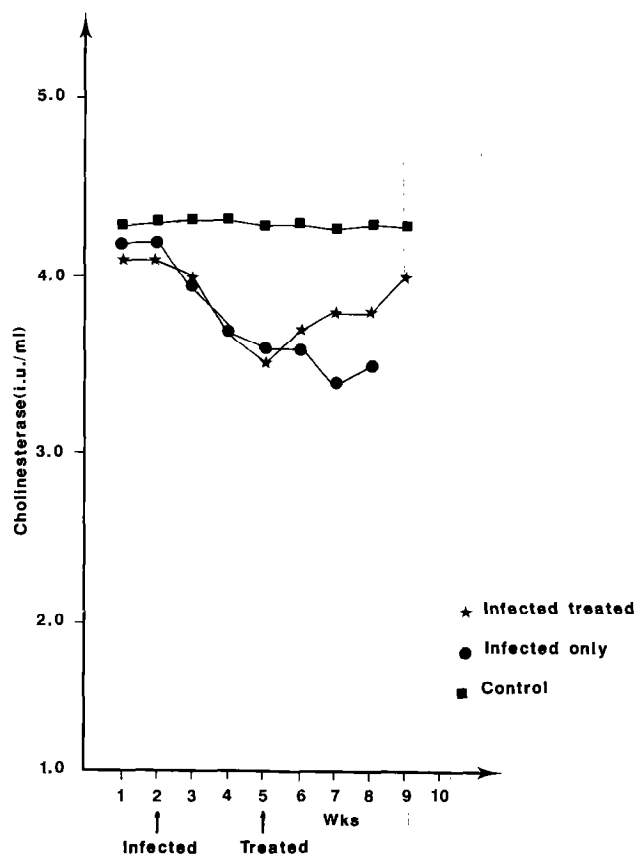


Fig. 4 : Graph of serum cholinesterase (i.u./ml) in infected treated, infected non treated and control rabbits.

These values in the controls remained slightly the same throughout the duration of the experiment (Fig. 1, 2, 3, 4). The increasing rise in the levels of SAP, SB and SC and the downward trend in the levels of SCH were brought to a halt following diminazene treatment (Fig. 1, 2, 3, 4). At the 8th week post infection, SAP, SB and SC levels in the diminazene treated rabbits were 11.18 ± 0.88 KAu/100 ml, 0.36 ± 0.05 mg/100 ml and 60.5 ± 16.79 g/100 ml respectively and SCH (i.u./ml) was 3.8 ± 0.28 . At this time the values in the infected non-treated rabbits were 12.90 ± 1.90 KAu/100 ml, 0.45 ± 0.02 mg/100 ml, 98.80 ± 8.51 g/100 ml and 3.47 ± 0.31 i.u./ml for SAP, SB, SC and SCH respectively (Table I).

DISCUSSION

In this study *T. b. brucei* (8/18) produced a chronic infection lasting over eight weeks in rabbits. The clinical features of the infection are similar to those

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previously described for sheep and rabbits (4, 5), except that the neurological symptom of oscillatory movement of the head reported here is a new finding in the rabbit. In the present study the disease is also characterised by a rise in serum levels of alkaline phosphatase, bilirubin and cholesterol and a decrease in serum cholinesterase (Fig. 1, 2, 3, 4). An elevated serum bilirubin or alkaline phosphatase is an indication of obstructive jaundice; a high serum cholesterol is an indication of impairment in liver lipid metabolism while a decrease in serum cholinesterases is an indication of impaired synthesis by liver cells (7).

These values tend to indicate that trypanosomiasis has affected the secretory, excretory and metabolic functions of the liver. The result of this study has also shown that the drug diminazene aceturate clears the

parasitaemia, abolishes the clinical symptoms, and also improves the depressed functions of the liver. The death of two diminazene treated rabbits could be due to inability of the drug to kill all extravascular trypanosomes (e.g. in the brain and the tissues).

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AROWOLO (R. O. A.), ELHASSAN (E. O.), AMURE (B. O.). Assessing hepatic dysfunction in rabbits experimentally infected with *Trypanosoma brucei*. *Revue Elev. Méd. vét. Pays trop.*, 1988, **41** (3) : 277-281.

Blood sera of New Zealand rabbits infected with *Trypanosoma brucei* 8/18 were collected, and the levels of alkaline phosphatase, bilirubin, cholesterol, and cholinesterases biochemically determined to assess the functional state of the liver. Results showed that the infected rabbits had high serum levels of alkaline phosphatase, bilirubin and cholesterol and a low level of cholinesterase. The values indicated a state of depressed liver function in trypanosomiasis. Treatment with diminazene aceturate improved the depressed hepatic function. *Key words* : Rabbit - Trypanosomiasis - *Trypanosoma brucei* - Experimental infection - Serum - Biochemistry - Liver - Diminazene aceturate - Tripanocicide.

AROWOLO (R. O. A.), ELHASSAN (E. O.), AMURE (B. O.). Evaluación del mal funcionamiento hepático en conejos experimentalmente infectados con *Trypanosoma brucei*. *Revue Elev. Méd. vét. Pays trop.*, 1988, **41** (3) : 277-281.

Se tomaron sueros de conejos neo-celandeses infectados con *Trypanosoma brucei* 8/18 y se determinaron bioquímicamente los niveles de fosfatasa alcalina, de bilirubina, de colesteroína y de colinesterasa para conocer el estado funcional del hígado. Los resultados mostraron que los sueros de los conejos infectados tenían niveles elevados de fosfatasa alcalina, de bilirubina y de colesteroína y un nivel reducido de colinesterasa; lo que indicaba un nivel de funcionamiento insuficiente del hígado durante la tripanosomosis. Un tratamiento con aceturato de diminazeno mejoró el funcionamiento hepático. *Palabras claves* : Conejo - Tripanosomosis - *Trypanosoma brucei* - Infección experimental - Suero - Bioquímica - Hígado - Aceturato de diminazeno - Tripanocida.

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