African Journal of Biomedical Research, Vol. 8 (2005); 63 - 65
ISSN 1119 – 5096 © Ibadan Biomedical Communications Group
Available online at http://www.bioline.org.br/md

Short Report

Serum Electrolyte Changes In West African Dwarf (WAD) Sheep with Single or Concurrent *(Babesia ovis and Trypanosome congolense)* Infections

TELLA, M.A
Department of Veterinary Surgery and Reproduction, University of Ibadan, Ibadan, Nigeria.

Received: May, 2004
Accepted in final form: December, 2004

Abstract
Electrolyte play significant roles in inter – compartment water balance. Serum samples from protozoa infected West African Dwarf (WAD) sheep were analyzed for electrolyte levels; Na^{+}, K^{+}, Ca^{2+}, HCO^{3-}, Cl^{-} and PO^{4-}. Intermittent changes in the levels of these electrolytes were observed in single or concurrent *T. congolense* or *B. ovis* infected WAD sheep. In animals infected with B. ovis, the effect was chronic while in animals (group II) infected with *T. congolense* effect was acute. Intermittent changes were observed in single infectious but absent in concurrent infection. The intermittent changes observed in single infections were similar but it is of low amplitude of variation in *B. ovis* infected sheep. The observed values in *T. congolense* infected ones. There were significant changes in the levels of Na^{+}, K^{+}, Ca^{2+}, HCO^{3-}, Cl^{-} and PO^{4-} ($P< 0.05$) in both infections except that Ca^{2+} remains unchanged in single infections. The implication of this finding is discussed.

KEY WORDS:
West African Dwarf (WAD) Sheep, Babesia ovis, Trypanosome congolense, infection,

INTRODUCTION

Buffer systems, monosodium phosphate and disodium phosphate play important role in acid – base balance or imbalance (Calson, 1989). Data on serum electrolyte levels have been presented in T. congolense infected ruminants (Esumoso, 1977; Anosa, 1988). Ogunsanmi (1994) presented data on serum electrolyte in *T. congolense* infected (WAD) sheep. Ristic and Lewis (1977) presented data on *B. ovis* infected sheep. There have not been adequate data in concurrent *T congolense* and B. ovis infection, while data in single *B. ovis* infected sheep is also scanty. Data on serum electrolyte changes in single or concurrent protozoa infection is required for comparative studies and to provide basic information for clinical research use in these protozoa infections in WAD sheep. With this, the apparent scanty knowledge in this respect shall be bridged. This study is therefore designed to study the changes in both single or concurrent protozoa infections compared with normal electrolyte values.

MATERIALS AND METHODS

Thirty six (36) West African dwarf sheep ages 2 to 3 years; average weight of 15.3kg were randomly purchased at a local market in Ibadan, Oyo State for this investigation. The sheep were dewormed with ferbendazole (Panacur®, Hoechst Germany) against intestinal parasites. They were washed with Auntol® Bayer Germany (Cumaphos) against external parasites. The animals were kept in screened pens and fed with guinea grass (*Panicum fluvicola* species) and clinically stabilized for 5 weeks before the commencement of single or concurrent infections. The animals were checked for blood protozoa and shown to be free of blood protozoa by routine parasitological techniques before the experiment commenced.

The animals were divided into four groups (4). The second group received Babesia ovis, the third group received T. congolense, the fourth group both *B. ovis* and *T. congolense* in single dose (concurrent infection). The first group consisted of six (6) animals and they were kept as uninfected control.

Blood Collection

Blood samples were taken at 5 days interval until the experiment was terminated on the (45) day. Seven (7ml) milliliters of brachial venous blood was collected from each animal; 5ml into plain universal bottle and allowed to clot. The

decanted sera were stored at – 5ºC and used for electrolyte analysis. Two (2ml) of the blood was collected into Bijou bottle containing ethylene – diamine tetracetic acid (EDTA). For routine parasitological examinations. These procedures were also carried out for both single and concurrent infections.

Parasite Administration

Administration of *T. congolense* in single infection. Measured volume of blood containing Trypanosoma congolense was diluted with equal volume of normal saline and checked under the light microscope to access the level of parasitaemia. Each of the animals in group III received 0.23 millilitre of the solution, equivalent of 0.2 x 105 trypanosomes per animal by intraperitoneal route.

Administration of Babesia ovis

0.5 millilittre of blood containing Bbabesia ovis was diluted with 0.5 millilitre of normal saline. Each of the animals in group were given 0.25 millilitre of the mixture by subcutaneous route.

Concurrent infection (Babesia and T. congolense mixture)

Equal volume of the preparations made for single infection were mixed together for in concurrent infection. 0.23 x 105 T. congolense 0.25 millilitre of B.ovis. the prepared mixture was administered through the intraperitoneal route to each of the animals in group (IV).

Serum electrolyte measurement

Serum electrolytes; sodium and potassium ions weremeasured using flane photometer (Coruing Model 400 Corning Scientific Limited England). The calcium levels were determined as described by Toro and Ackerman (1975) Bicarbonate (HCO3-) was measured by the titrimetric method as described also by Toro and Ackerman (1975). Serum chloride was determined using a modification of Schales and Schales as described, Ogunsanmi, 1997).

Statistical Analysis

The data obtained were subjected to analysis of variance (ANOVA) SAS (1989) and compared using Duncan's multiple range Test (Duncan, 1955).

RESULTS

Table 1 shows the electrolyte values obtained in single infections. Using analysis of variance and Duncan's multiple range tests, there are significant differences in the pre infected and post infection va;ies ($P<0.05$) for both single or concurrent infections. (*T. congoleuse* and *B Ovis*). The levels of Na^+, K^+, HCO_3^- and PO_4^{2-} Increased signi;icantly on day 5 post infection (PI), while Ca^{2+} values remain unchanged in single infections and in *B. Ovis* infected animals PO_4^{2-}, Cl^- and Ca^{+2} also remain unchanged in both infections.

Table 1:

Serum Electrolyte Values in *T. Congolense* and *Babesia ovis* Infected West African Dwarf Sheep in Single Infections

	0	5	10	15	20	25	30	35	40	45
T. Congolense	137.3	142.2	136.6	136.0	141.0	130.0	141.0	134.0	135.0	136.0
Na^+	±2.8	±0.6	±0.6	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5
B. Ovis	137.3	134.8	137.7	136.6	129.8	140.0	139.9	140.1	130.1	137.9
	±2.8	±0.6	±0.4	±0.7	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5
T. Congolense	5.5	6.2	5.9	5.2	4.6	4.5	6.6	5.7	5.7	5.7
K^+	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.0	±0.1	±0.1
B.Ovis	5.5	6.2	6.3	5.6	4.6	8.6	5.9	5.4	5.1	4.6
	±0.1	±0.1	±0.4	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
T. Congolense	8.7	8.7	8.6	8.6	8.8	8.7	8.7	8.7	8.9	8.6
CaH^+	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
B.Ovis	8.7	8.7	8.6	8.7	8.7	8.6	8.5	8.6	8.5	8.5
	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±01	±0.1	±0.1
T. Congolense	22.3	24.2	23.9	23.3	21.1	20.1	25.0	22.0	24.0	24.0
$HCO3^-$	±0.3	±0.5	±0.4	±0.4	±0.5	±0.5	±0.5	0.5±	±0.5	±0.5
	22.3	24.2	23.9	23.3	21.1	23.9	24.9	25.0	20.0	22.0
	±0.3	±0.5	±0.4	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.4
T. Congolense	4.1	5.3	4.8	4.2	4.0	4.3	4.0	3.9	4.2	4.3
$PO4^-$	±0.6	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	0.1±	±0.1	±0.1
B.Ovis	4.1	4.0	4.8	4.3	4.6	4.6	4.8	5.2	3.6	3.5
	±0.6	0.1	±0.1	±0.1	±0.1	±0.1	0.1	±0.	±0.1	±0.0
T. Congolense	104.0	105.9	104.0	103.0	105.0	96.0	105.0	102.2	102.0	103.0
CL^-	±2.0	0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5
B.Ovis	104.0	103.4	104.3	107.2	98.9	104.8	104.8	105.0	98.7	103.9
	±1.5	0.5	±4.2	±0.5	±0.5	±0.5	±0.5	±0.1	±0.5	±0.4

Table 2
Serum Electrolyte Values in *T. Congolense* and *B. Ovis* Infected Wad Sheep In Concurrent Infection

	5	10	15	20	25	30
Na+	131.0 ±0.5	131.3 ±0.4	132.2 ±0.2	143.0 ±0.2	165.0 ±0.5	167.0 ±0.5
K+	5.4 ±0.1	5.2 ±0.1	5.6 ±0.2	11.0 ±0.2	8.5 ±0.3	4.0 ±1.2
Cl-	100.0 ±0.5	99.6 ±0.6	89.0 ±0.2	125.0 ±0.5	130.0 ±0.4	135.0 ±0.4
HCO_3^-	20.9 ±0.5	21.3 ±0.6	22.3 ±0.3	24.0 ±0.5	27.0 ±0.2	27.0 ±0.3
Ca+	8.8 ±0.1	8.4 ±0.1	6.0 ±0.4	13.0 ±0.4	7.6 ±0.5	8.1 ±0.3
PO4	3.7 ±0.1	3.7 ±0.1	3.7 ±0.1	8.2 ±0.1	7.5 ±0.4	9.1 ±0.5

In concurrent infection, the first 15 days PI show significant increases in electrolyte levels ($P<0.05$). Values obtained for $Na^{+,}$ Cl^-, HCO_3^- and PO_4^{2-} were significantly higher between day 20 and 30 PI and higher than values obtained between day 5 and 15 PI. Potassium (k^+) and Ca+ levels fall below that of the control on day30 PI. Intermittent changes in electrolyte values were obtained in single infections but absent in concurrent infection Table 2.

DISUSSIONS

Previous studies have shown that electrolytes pay central role in gaseous exchange and inter-compartmental water balance (Raffe, 1989). Elevated or low serum electrolyte levels may have resulted in hypo-or hyper functioning of related organ or tissue (Finco,1989). The intermittent change observed in this study is related to low or higher electrolyte levels observation reported by shoemaker (1984).

Significant differences were observed between the normal and post-infection levels of Na^+, HCO_3- and PO_4- in both single and concurrent infections. These values increased significantly on day 5 post infection, except in *B Ovis* infective sheep where sodium levels decreased and PO4 levels remained unchanged. The low level of calcium and chloride are not in agreement with higher values reported in sheep experimentally infected with *T. brucei* (Ogunsanmi *et al* 1994).

The observed hyperkalaemia and low bicarbonate level suggest massive leakages of these electrolytes from cells are tissue. These observations suggests massive cell and tissue damage However, the intermittent increase, low level and subsequent return of these electrolytes to pre-infection levels suggest massive cell and tissue damage at the terminal phase of both single or concurrent infection. Esmnoss, (1977) observed and associated intermittent and multitude of variation to resistance.

In this study, the multitude of variation is observed in single infections where the response is chronic and it is absent in concurrent infection where the response is acute .

It is conceivable that between days 5 and 25 post-infection, electrolyte values are of chinical importance, where as values obtained after 25th day post –infection when most values return to pre-infection values, the clinical History must be critically considered in the presence of parasitaemia or sub-clinical infection.

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