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Blood chemistry of west African dwarf goats naturally infested with sarcoptic mange superinfected with *Trypanosoma brucei* experimentally

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ABSTRACT

Blood biochemistry was monitored in Twelve West African Dwarf goats. Eight naturally infested with mange Sarcoptes scabiei var caprae and later superinfected with Trypanosoma brucei, while the other four served as control. Hyperchlorademia and hyperphosphataemia were observed. No observable change in sodium and potassium concentration. There was a decreased in serum calcium and in the total protein value of the mixed infected WAD goats (M+T).

1. Introduction

Small ruminants (sheep and goats) are group of animals capable of providing valuable animal protein for human consumption. These animals are ubiquitous in villages throughout the Nigerian rain forest and the derived savanna (ILCA, 1987). However, the benefits derived from these animals are far below expectation due largely to low productivity from numerous factors of which the major one is disease (Schilhorn Van Veen, 1973). Parasitic diseases such as trypanosomosis, babesiosis, anaplasmosis, helminthosis and those caused by mites, fleas and lice are equally important.

Mange is a skin condition common in most animals caused by mites of different genera. A seriously affected animal is unattractive, debilitated with loss of hair and destruction of skin. The affected animal looses its economic value in terms of milk, wool and meat production (Fthenakis *et al*., 2000). The impact of mange on hematology and serum biochemistry in goats had been appraised (Adejinmi *et al.*, 2000). Poor managemental and environmental conditions in farm animals encourage the spread of mange among all ages of animals though direct contact in adults or between dam and the young during suckling (Schmmidt, 1949) favours the spread. Sarcoptic mange due to infestation with mites *Sarcoptes scabiei* var *suis* is a significant production limiting disease of pigs (Cargill *et al*., 1979). Increasing small ruminants production is sub-Saharan is greatly determine by the presence of tsetse transmitted trypanosomosis. The scale of the problem, at the local level, is generally related to the intensity of tsetse- trypanosomosis challenge (Snow *et al.,* 1996). It was reported by Anosa *et al.* (1980) that trypanosomosis due to *Trypanosoma brucei* infection is more severe in goats than in sheep. However, the effect of mixed infections such as trypanosomosis, and any other disease of animals on blood biochemistry are yet to be fully investigated. This study was carried out to investigate the effect of mixed infections caused by Sacorptic mange and trypanosomosis on the blood chemistry of West African dwarf goat.

2. Materials and methods

Twenty adult semi intensively managed West African dwarf (WAD) goats purchased from villages close to Ibadan were used for the study. The goats weighed between 13-14Kg. Fourteen of the goats were naturally mange infested with *Sarcoptes scabiei* var *caprae*, while 6 were apparently healthy and uninfested and these served as the control. The goats were housed in a fly-proof of the Faculty of Veterinary Medicine, University of Ibadan. The animals were allowed to acclimatize for several weeks before the commencement of the experiment.

2.1. Feeding

The animals were fed on a combination of Elephant grass, Legumes (mixture of *Cydon olectostachyus* and C*entrosema pubescence*) and cassava peels supplemented with corn bran. Water was given *ad libitum*

Screening of Animals

Faecal samples of all the animals were collected and screened for intestinal parasites; similarly, blood samples were collected and screened for blood parasites. All positive animals were treated against the infection they were positive for. Those positive for helminths were treated with curative dose of levamisol 100 (Pantex, Holland) 5-10mg/kg I.M., while Amprol (Merck, Sharp and Dohme, Germany) 1g/5 litres in drinking water for seven days was given to those positive for *Eimeria* oocysts. A week before the commencement of the experiment, the goats were re-examined. All the animals had history of peste des petit ruminant (PPR). Deep skin scraping from the edge of the lesions (until blood oozes out) were obtained from animals for the identification of the mites as described by Soulsby (1982). The sediment were examined after processing with 10% potassium hydroxide (KOH) solution after boiling and centrifugation of 300 rpm for 2 minutes.

2.2. Pre-infection periods

After acclimatization, all the fourteen infected and control WAD goats were monitored for 2-weeks, with the rectal temperature been taken and blood also collected.

2.3. Experimental infection with trypanosomes

The mange infested goats were infected intravenously with 0.5ml of mouse blood with estimated parasitaemia of $1.2x10^6$ tryps/ml and then observed for about 3weeks.

2.4. Collection of blood

Blood samples were collected from the external jugular vein of both the experimental and control goats after aseptically prepared the site for biochemical study using plain vacutainer system (Becton, Dickson) with a 20G needle and 5mls syringe. The site of collection was aseptically prepared by shaving clean and scrubbed with disinfectant (Diluted Savlon).

The blood collected was kept in a plastic wooden rack, it was allowed to clot and serum separated by centrifugation at 2000rpm for 10 minutes using MSE centrifuge. The serum samples were kept at -20^{0}C until used, which was not more than 36 hours.

2.5. Soures of trypanomes

Trypanosoma brucei strain T_{14} was obtained from Nigerian Institute for Trypanosomosis Research (NITR),Vom, Nigeria. The stabilate which was originally isolated from sheep in Binchin Bassa in 1995, stored in liquid nitrogen. Out-bred mice were obtained from the Parasitology Unit, NITR, Vom to transport the *T. brucei* to Ibadan.

2.6. Biochemical estimation

The values of the following parameter were determined by method indcated. Serum calcium (Ca^{2+}) was measured by cresolphtalein complexone micro method (Toro and Ackerman, 1975), serum inorganic phosphate (Gomori, 1942), bicarbonate (HCO_3^-) and serum chloride value (Cl^-) (Schales and Schales, 1941). Urea (Harrison, 1947), serum creatine (Bonser and Tansky 1945), while Biuret method was used for total protein (Reinhold, 1953). Albumin values were estimated by bromocresol green method as described by Doumas *et al.,* 1971.

2.7. Statistical analysis

Data were subjected to student ''t'' test using the statistical analysis stem (SAS) Computer programme.

3. Results

The scrapping showed *Sarcoptes scabiei* var *caprae* because of the possession of terminal suckers and scales on the dorsum. The changes in serum biochemical parameters of goats naturally infested with mange (M) and superinfested with *T. brucei* (M + T) are shown in Table 1. There was no significant variation in the sodium level of mange infested goats and when superinfested with *T. brucei*. Slight fluctuation in the mean value of the chloride concentration of the mange infested goats, with the lowest being 114. 67 $\pm$ 1.53 MEq/l on day 7 was observed, following superinfection with *T. brucei*, the values increase to 118.5 + 10.61ME/ql Table 1. The mean serum bicarbonate level in the mange infested goats was 20.33$\pm$ 0.58 MEq/l at the commencement of experiment following superinfection with *T. brucei*, this value increased progressively to 25.50 $\pm$ 0.75MEq/l Table 1. No observable change was noticed in the mean serum values of calcium in the mange infested goats and when superinfected with *T. brucei* except at the end of experiment when it increased to 6.85$\pm$2.75Eq/1 from-infection mean serum phosphate value was observed in both mange infested goats and when superinfected with *T. brucei*. The mean total protein levels of mange infested goats fluctuated between 6.94 -7.00g/dl. On superinfection with *T. brucei*, the level decreased progressively to 6.50 $\pm$ 0.42g/dl.

4. Discussion

The results presented above demonstrated a significant biochemical changes exhibited in mixed infections of mange and trypanosomosis (*T. brucei*). The hyperchlorademia observed in this study was due to dehydration which resulted from continuous loss of fluid from the braided skin of mange infested goats.

The drop in calcium and rise in phosphate values obtained agree with the findings of Fiennes *et al,* (1946) in *T. congolense* infected cattle and Goodwin and Guy (1973) in rabbit infected with *T. brucei*. The observed hypocalcaemia and hyperphosphataemia may be attributed to deficiency of parathyroid hormone (PTH) probably due damage to parathyroid gland (Capen and Rosol, 1989). The hyperphoshaphataemia may also be due to hemolysis (Baron, 1984). Contrary to the report by Goodwin and Guy (1973) who reported a decrease in the serum bicarbonate levels, an increased in the serum biochemistry was noticed in this study. This may be attributed to the generation of bicarbonate ions by the kidney (Carlson, 1989). Decreased in the mean serum total protein level in mange infested goats was observed and even further decreased when it was superinfected with *T. brucei*, this differs from the findings of Anosa and Isoun (1976) that observed increased in total protein values in *T. vivax* infected sheep and Tabel *et al.* (1980) also reported normal protein values in calves infected with *T. congolense*. The decrease observed in this study, may be due partly to the mange infestation which brings about continuous seepage of sucking of fluid from infested goats. This also contradicts Stromberg and Gullot (1987) who noted a

Table 1
Changes in biochemical parameters of mange infested West African dwarf goats and later superinfected with *Trypanosoma brucei.*

	0-days		7-days		14-days		21-days		28-days		35-days	
	C	M	C	M	C	M	C	M+T	C	M+T	C	M+T
Na^{+}(mEq/l)	146.0	151.67	147.7	151.67	145.6	151.67	146.7	152.75	146.0	152.17	146.0	152.75
	±5.29	±4.16	±2.01	±2.89	±2.52	±1.73	±0.20	±11.08	±5.29	±9.02	±5.29	±5.56
K^{+}(mEq/l)	5.50	5.67	5.36	5.67	5.33	5.67	5.55	5.67	5.10	5.23	5.10	5.50
	±0.23	±0.95	±0.69	±0.92	±0.15	±0.58	±0.25	±0.58	±0.01	±0.38	±0.10	±0.02
Cl^{-} (mEq/l)	89.67	166.33	88.67	114.67	101	11.5	89.0	118	89.67	116.23	99	118.5
	±8.96	±1.53	±2.08	±1.53	±0.96	±1.15	±0.06	±8.89	±2.08	±9.07	±0.71	±10.61
HCO^{-}_{3}(mEq/l)	17.33	20.33	17.50	20	18.33	20.00	19.73	21.67	17.50	22.33	17.20	22.50
	±2.08	±0.58	±1.50	±1.00	±0.49	±1.00	±2.05	±1.53	±1.50	±2.08	±0.25	±0.71
Ca^{2+}(mEq/l)	3.90	6.17	6.97	6.17	6.50	6.17	6.90	6.17	6.50	6.20	6.90	6.85
	±0.40	±0.19	±1.40	±2.03	±2.10	±2,02	±0.10	±2.19	±2.10	±2.25	±0.60	±2.75
PO^{2-}_{4} (mEq/l)	3.90	5.47	4.00	5.40	3.63	5.43	2.97	5.50	3.43	5.53	4.25	5.57
	±0.40	±0.64	±0.10	±0.60	±0.47	±0.60	±0.15	±0.61	±0.60	±0.59	±0.10	±0.71
Urea (mg/dl)	23.47	26.00	23.67	25.00	24.55	24.33	23.10	25.00	24.55	24.67	24.50	26.00
	±4.04	±2.67	±3.30	±2.65	±0.50	±2.31	±0.20	±4.36	±0.50	±3.06	±0.20	±2.83
UREAT (mg/dl)	1.30	0.77	1.10	0.73	0.98	0.77	0.99	0.87	0.98	0.87	1.25	0.85
	±0.50	±0.06	±0.17	±0.15	±0.20	±0.12	±0.70	±0.06	±0.20	±0.06	±0.07	±0.02
Total protein Mg/l	7.25	6.94	7.23	6.97	7.10	7.00	7.00	6.98	7.10	6.56	7.03	6.50
	±0.10	±0.61	±0.21	±0.32	±0.10	±0.42	±0.21	0.90	0.10	0.32	0.42	0.42
ALB(g/dl)	2.70	2.70	3.10	3.10	3.10	3.00	3.10	2.89	3.10	2.93	2.79	2.00
	±0.10	±0.29	±0.10	±0.32	±0.10	±0.20	±0.10	±0.25	0.10	±2.68	±0.25	±0.28
GLOB(g/dl)	4.20	4.15	`4.13	3.48	4.00	4.00	4.13	4.00	4.00	3.57	4.07	4.40
	±0.10	±0.49	±0.21	±0.32	±0.10	±0.53	±0.21	±0.85	±0.10	±0.64	±0.32	±0.14
AG ratio	0.64	0.60	0.75	0.81	0.78	0.78	0.75	0.75	0.75	0.78	0.81	0.47
	±0.03	±0.70	±0.05	±0.11	±0.02	±0.02	±0.15	±0.05	±0.09	±0.02	±0.09	±0.05

C=Means of control goats at 0, 7, 14, 21,28and 35 days of the experiment.
M=Means of mange infested goats at 0, 7, and 14 days.
M+T=Means of mange infested goats, later superinfected with *T.brucei* on days 14.
H-Means ± standard error of means (n=6 for control goats; n= 14 for mange goats).

raised protein concentration in serum from calves infested with *P. ovis*. It is therefore, to be noted that Sarcoptic mange may occur along with any of other disease, be it parasitic, bacteriologic or systemic which may bring about alterations in the normal picture of the blood and its biochemistry, therefore careful blood analysis is necessary to arrive at a conclusion. Sometimes attempt to eliminate one of the diseases might bring complete recovery to the animal.

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