Assessment of Serum Electrolytes of Rabbits Infected with Cowdria ruminantium (Jaji Stock)

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Abstract

Ten adult rabbits with an average weight of 425gm were experimentally infected intraperiotioneally with cryopreserved Jaji stock of *Cowdria ruminantium* (Cr. 40). Changes in temperature pattern, serum electrolytes, death or other signs were assessed.

Increase in weight was noticed, but none of the rabbits showed any alteration in temperature pattern, serum electrolytes, death or other signs. The brain squash smear was negative for the parasite.

Two savanna brown adult female goats were used as control and infected with prepared stabilate from pooled blood, liver, spleen, and brain of the rabbits, but there was no significant body temperature rise. The goats were later challenged with the jaji stock of *Cowdria ruminantium* Cr. 40 and they showed elevated body temperature rise.

Keywords: *Cowdria ruminantium* (Jaji stock) Rabbit, Serum, electrolytes and body temperature assessments.

Introduction

Heartwater (Cowdriosis) is a tick – borne diseases of ruminants caused by a rickettsial organism *Cowdria ruminantium* (Cowdry, 1925; Barro *et. al.* 1984). The disease has reduced productivity of livesock in Africa and occurs in sub-saharan Africa (Synge, 1978; Uilenberg, 1983), and Nigeria (Isoun *et. al.* 1974; Illemobade, 1977). The organism often seen in groups, occurs as granules in the capillary endothelial cells of the brain, liver, kidney etc. This disease constitutes a restraining factor for introduction of highly producing exotic stock to Nigeria (Uilenberg, 1987). The clinical signs of the disease are not pathognomonic and the course of the disease can be peracute making early treatment and the diagnosis difficult. This study was carried out to determine changes in serum electrolytes based on infectivity for rabbits with *C. ruminantium*, as this may be a means of storing the organism in a situation where conventional storage facilities like liquid nitrogen and deep freezers are not available.

Materials And Methods

The stabilate used was stabilate Cr. 40, a stock of *Cowdria ruminantium* from Jaji. The stock was snap-frozen in 2ml vials with 10% dimethyl-suphoxide

(DMSO) as cryoprotectant and stored in liquid nitrogen.

Experiment I

Ten adult rabbits were pre-conditioned for 3 weeks before the experimental infection, during this period, daily temperature, body weight and serum electrolytes were analysed.
Ten rabbits were experimentally infected intraperitoneally with 2ml of cryopreserved Jaji stock of *C. ruminantium* Cr. 40. The rabbits were observed daily, morning and evening temperatures and body weight taken.

On 7th and 18th day post infection, pooled blood sample was collected and serum electrolytes evaluated. On that 18th day, the rabbits were slaughtered and blood, liver and spleen were collected into sample bottles kept on ice, homogenised and 10% dimethyl sulphoxide (DMSO) was added and then stored in liquid nitrogen and labelled as stabilate Cr. 99.

Experiment II

Two adult female savanna brown goats sourced locally from a market in Zaria tagged Nos. 252A and 252B were used. The goats were preconditioned for two weeks as well. No endo and ecto-parasites were observed. The animals were kept in tick – proof pens and their body temperature were monitored.

A week later goats 252A and 252B were experimentally infected with stabilate Cr. 99 which was first thawed after removal from the liquid nitrogen. 3.0ml of it was slowly injected intravenenously using left jugular vein. They were then monitored for 28 days by daily monitoring of rectal temperature twice a day, early in the morning and late in the evening.

Experiment III

Infection of goats 252A and 252B with Cr. 40. A week after the end of the 28th day, the two goats 252A and 252B were re-challenged using similar route i.e. left jugular vein, with stabilate Cr. 40 *Cowdria ruminantium* (Jaji stock) and the animals were monitored for another 28 days.

Results

Table 1 and Figure 1(a) show the mean daily temperature of rabbits while Table and 1 Figure 1(b) show the mean daily body weight of rabbits.

There was no change in the mean daily temperature of rabbits and the body weight increased to 428.5gm from preinfection value of 425g.

Table 2 and Figures 2(a-f) show the serum electrolytes of rabbits. The electrolytes were within normal values.

The mean temperatures of goats when infected with Cr. 99 and 40 respectively are shown in Table 3 and Figure 3.

There was an elevation of body temperature of the goats above normal at day 12 postinfection with Cr. 40, in which the value recorded was an average of 40.30 ± 0.35C. Whereas at day 12 post infection with Cr. 99 the body temperature was within normal value.

TABLE 1: The mean daily temperatures (T°C) and the mean daily body weight in gram (gm), of Rabbits.

Day	Temperature °C		Body Weight (GM)	
	Pre-Infection	Post Infection	Pre-Infection	Post-Infection
1	39.80 ± 1.19	39.70 ± 1.75	425 ± 0.65	426 ± 0.12
2	39.90 ± 0.10	40.10 ± 0.95	425 ± 0.14	426 ± 0.15
3	40.00 ± 0.10	40.10 ± 0.28	425.5 ± 0.20	427 ± 0.21
4	39.00 ± 0.30	39.00 ± 1.52	425.5 ± 0.10	427 ± 0.11
5	40.00 ± 0.30	40.00 ± 0.75	426 ± 0.40	427 ± 0.18
6	39.90 ± 0.22	39.90 ± 0.51	427 ± 1.25	427.5 ± 0.25
7	39.80 ± 0.25	39.90 ± 0.10	426.5 ± 0.20	427.5 ± 0.16
8	39.80 ± 0.12	39.80 ± 2.10	426.5 ± 0.12	428 ± 0.70
9	39.80 ± 1.20	39.80 ± 0.38	426 ± 0.17	429 ± 0.17
10	37.70 ± 1.00	39.80 ± 2.05	426.0 ± 0.10	428.5 ± 2.20

Mean ± standard error (n = 10)

TABLE 2: The Pre and Post infection electrolytes values of Rabbits

Parameters	Pre-Infection	7th day Post Infection	14 day post infection
Sodium m Eq/l	137.5 ± 1.19	137.5 ± 1.20	137.5 ± 1.20
Potassium m Eq/l	3.70 ± 0.25	3.70 ± 0.25	3.70 ± 0.25
Calcium mg/dl	8.45 ± 0.15	8.45 ± 0.15	8.46 ± 0.15
Chloride m Eq/I	103.2 ± 0.10	103.3 ± 0.12	103.4 ± 0.20
Phosphate mg/dl	3.75 ± 0.10	3.80 ± 0.10	3.80 ± 0.12
Total Protein g/dl	5.70 ± 0.14	5.72 ± 0.13	5.70 ± 0.15

Mean ± standard error (n = 10)

TABLE 3: The mean temperature of goats taken twice daily in every 3 days.

Days	Temperature (°C)	
	Infection with Cr. 99	Infection with Cr. 40
0	38.50 ± 0.15	38.60 ± 0.20
3	38.50 ± 0.20	38.50 ± 1.25
6	39.00 ± 1.25	39.00 ± 1.00
9	39.00 ± 1.30	39.50 ± 0.50
12	38.50 ± 0.45	40.30 ± 0.35
15	38.50 ± 0.30	40.00 ± 0.25
18	38.00 ± 0.25	39.50 ± 0.30
21	38.00 ± 0.10	39.00 ± 0.25
24	38.50 ± 0.25	38.50 ± 0.30
27	38.60 ± 0.30	38.50 ± 0.25

Mean ± standard error (n=2)

Discussion

The rabbits did not show any clinical signs and alteration in serum electrolytes, this could mean that they were not susceptible to *Cowdria ruminantium* or susceptible to the sisolate of *C. ruminantium* used. Various routes have been used to inject laboratory animals with *C. ruminantium*. Intraperitoneal route has been successfully used, Du Plesis and Kumm (1971). However, Alexander (1931) prefers intravenous administration, which was found to be more effective.

Liver, spleen, brain and blood, are some of the organs that the organism resides and can be detected either by staining of the smears made from them or injection of homogenised materials into susceptible animals. The non-reaction of the infected crushed tissues from rabbits showed that the organism was not effective. Infection with a known virulence *Cowdria ruminantium* stabilate was to determine the virulence of the organism (stabilate) as well as the susceptibility of the animals. Among the clinical signs exhibited by the two challenged goats were pyrexia, this agrees with the observation by Neits and Alexander (1945) and nervous signs, Ilemobade (1977). It may be necessary to find out therefore, the susceptibility of this stock in rabbits using the intravenous route.

Acknowledgement

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Fig. 1a: Changes in Mean Temperature (°C) of Rabbits Pre - and Post infection.

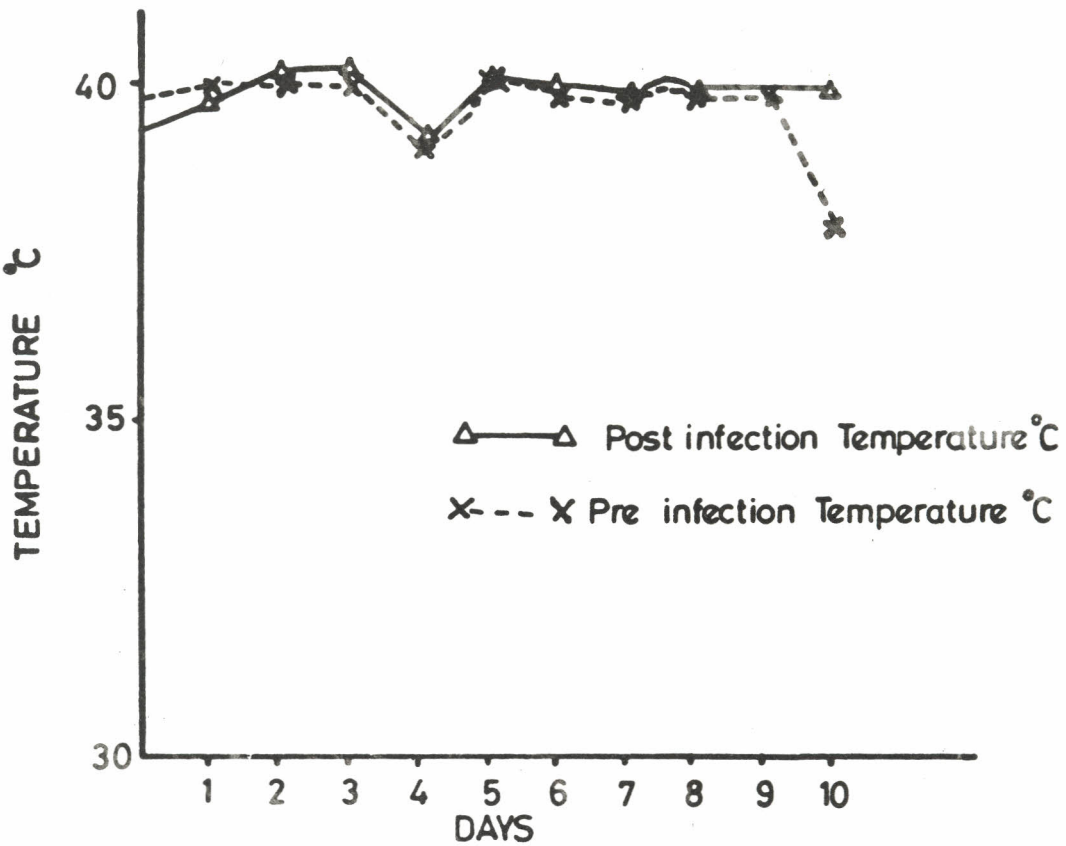
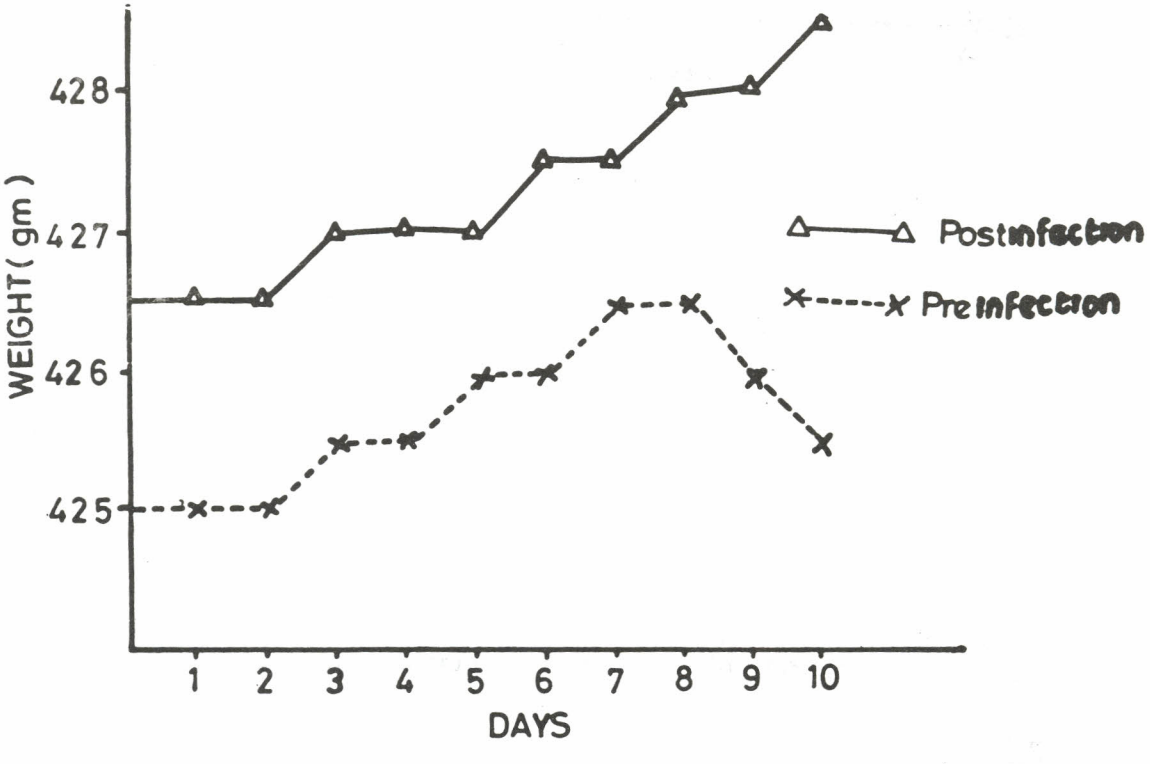


Fig.1b Changes in Mean Weight (gm) of Rabbits Pre - and Post infection



C. ruminantium infected Rabbits

Fig. 2a: Pre - and Post infection values of Sodium (mEq/l)

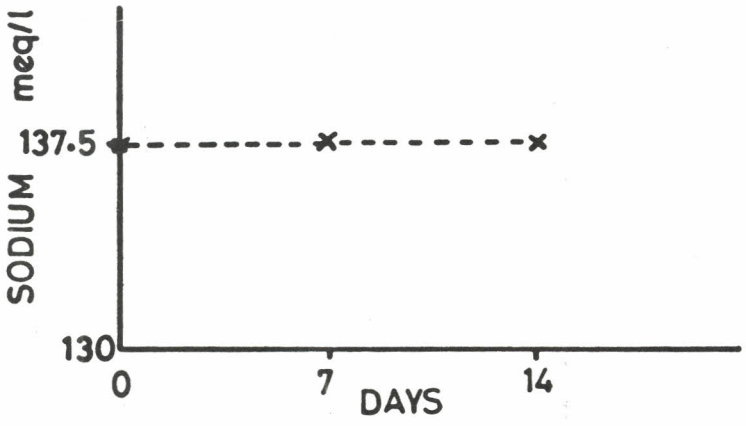


Fig. 2b: Pre - and Post infection values of Potassium (mEq/l)

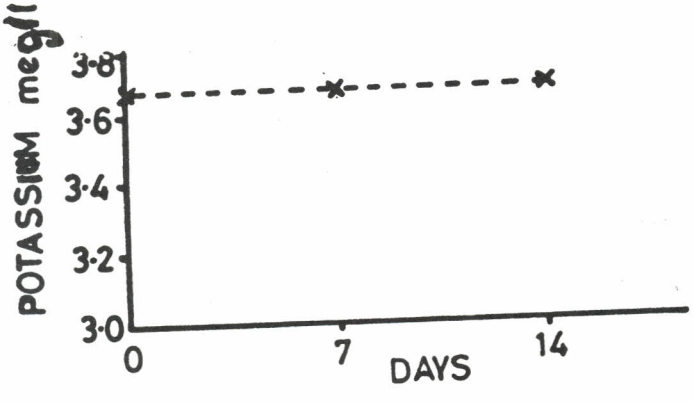


Fig. 2c: Pre - and Post infection values of Calcium (mg/dl)

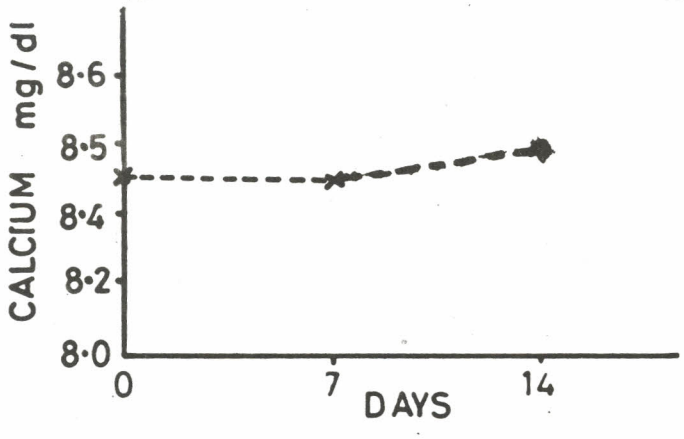


Fig. 2d: Pre - and Post infection values of Chloride (mEq/l)

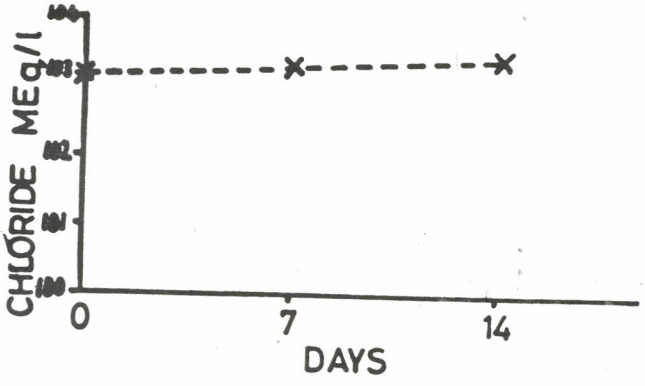


Fig. 2e: Pre - and Post infection values of Phosphate (mg/dl)

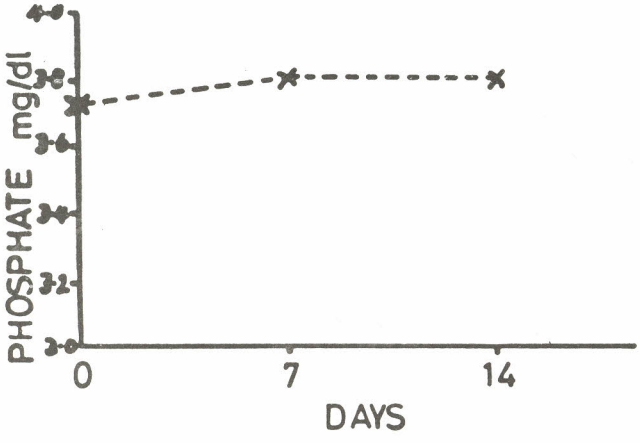


Fig. 2f: Pre - and Post infection values of Total Protein (g/dl)

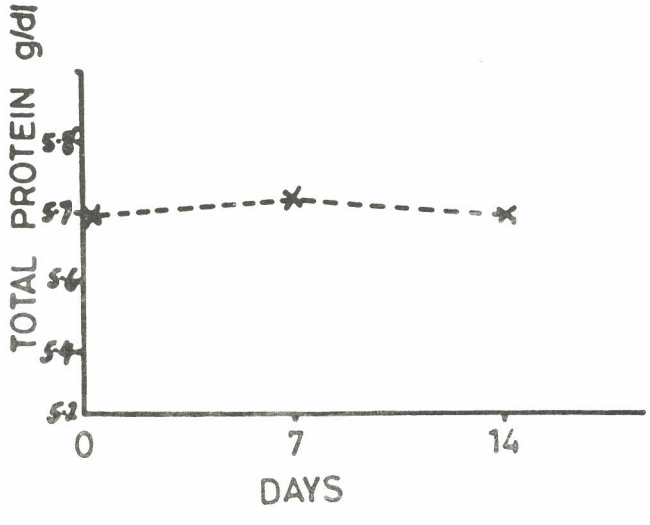


Fig. 3: Mean Temperature of Goats when infected with Cr. 99 and Cr. 40 separately.