The Iraqi J. Vet. Med. 14 (1990)

EFFECT OF TRYPANOSOMA EVANSI INFECTION ON TRACE ELEMENTS METABOLISM IN RABBITS.

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SUMMARY

This study was carried out to show the effect of Trypanosoma evansi on trace elements metabolism in local breed rabbits fed on either milk or standard diets. the dose of Trypanosoma evansi infection was $2x10^6$ per rabbit. It found that Trypanosoma infection lead to increase in the concentration of copper in both serum and liver, but it lead to decrease the iron serum concentration. The effect of infection on serum copper was greater in rabbits fed milk diets. On the other hand, it has been found that the infection caused an increase in serum iron in those rabbits fed on standard diet.

Although, Trypanosoma infection had no significant effect on plasma zinc, it lead to increase liver zinc concentration in rabbits fed on either dietary treatments. Its effect was greater in those fed on milk diet.

INTRODUCTION

Trace elements metabolism in the host may change in association with various diseases. Depressed serum iron values are characteristic of the most parasitic diseases (1). Increased plasma copper concentration and its carrier protein ceruloplasmin are typical in most parasitic infection. An increase in serum copper has been shown in rats infected with trypanosomiasis (2).

Decreased plasma zinc is shown to be a characteristic response during most of infectious diseases. Lower plasma zince values have been observed during parasitic infection. The lower serum iron and zinc are mediated by leucocyte endogenous, after its release from phagocytic cells (3).

The present work aimed to find out alterations in serum Trypanosoma evansi infection in rabbits offered two different diets. Milk powder was used due to its deficiency in some trace elements (4).

MATERIALS AND METHODS

Rabbits: Twenty adult female rabbits (local breed) were used. They were caged individually and divided into four equal groups. Groups one and two were kept on milk diet, and groups three and four were kept on standard diet. after fifteen days, adaptation period, the rabbits in groups one and three were inoculated with the parasites.

Parasites: Trypanosoma evansi was obtained from the College of Veterinary Medicine. Baghdad University. The parasites were inoculated into rats to obtain infective dose. The infected blood was collected on day 7 post-infection from heart of a rat, and was inoculated intraperitoneally (I.P.) into rabbits. The dose of infection was $2x10^6$/rabbit

Diets: Normal diet, suplied by TEKPEN TICARET A.S. Milk diet. NIDO full cream powered milk was used (soupad 92411 coubevoic cedex, France).

Analysis of milk and standard diets are shown in Table 1.

Blood samples: Blood samples were obtained from ear of each rabbit on days 10, 20 and 30 post-infection.
Analytical methods: Iron, zinc and copper concentrations in serum and liver were estimated by atomic absorption spectrophotometer (PYE UNIC AM SP9). Serum iron, zinc and copper concentrations were estimated by diluting serum with double distilled water. Wet ashing was used for estimation of liver iron, zinc and coper concentrations (1).

Statistical analysis: The results obtained for the groups were subjected to analysis of variance to show the

Table 1: The constituents of normal and milk diets.

A. Normal diet:	
Crude protein	15%
Crude fiber	6%
Ether extract	2%
Calcium	1%
Phosphorus	0.6%
Moisture	13%
Vitamin A 12500 I.U./kg.	12500 I.U./kg
Vitamin D3	3000 I.U./kg
Vitamin E	15 I.U./kg
Trace elements (manganese, zinc, iodine, copper, cobalt and iron)	
B. Milk diet:	
Fat	28%
Protein	25.7%
Lactose	37.4%
Minerals (ash)	5.7%
Lecithin	0.2%
Moisture	3.0%
Vitamin D3	1500 I.D.
Vitamin D3	322 I.D.

significant effect of infection on mineral concentration and the effect of diet-infection interaction.

RESULTS

Serum copper:

Although the serum copper concentration did not differ significantly between rabbit fed on either milk or standard diet on day 10 post-infection, but on days 20 and 30 post-infection, serum cooper concentration was decreased in rabbits fed on milk diet compared with those fed on standard diet ($P<0.01$) (Table 2).

Infection lead to increase serum copper concentration rabbits fed on either dietary treatments. The effect on infection was greter in rabbits kept on milk diet than those on standard diet, giving a significant interaction between diet and infection ($P<0.05$, $P<0.01$ and $P<0.01$)

Serum Iron:

Serum iron value did not vary significantly ($P<0.05$) between rabbits fed on either milk or standard diet. (Table 3). During Trypanosoma infection, the serum iron concentration declined in both groups of rabbits fed milk and standard diets. Infection lead to greater decline in serum iron value in rabbits fed on milk diet, giving a significant interaction between diet and infection on days 20 and 30 post-infection ($P<0.05$ and $P<0.01$)

Serum zinc:

The serum zinc value did not differ between rabbits fed on either milk or standard diet. Infection had no sifgnificant effect on serum zinc concentration in rabbits kept on either dietary treatments (Table 4).

Liver copper, iron and zinc:

The liver copper concentration was lower in rabbits fed on milk diet than those fed on standard diet.

Table 2: Copper concentration in serum of rabbits on days 10, 20 and 30 post-infection.

Mean values + S.D. (mg/ml).

Group No.	Treatment	Days Post-infection 10 days	20 days	30 days
1	Milk diet. infected	0.59 b + 0.16	0.69 a + 0.12	0.74 a + 0.18
2	Milk diet. control	0.49 b + 0.06	1.32 c + 0.12	0.31 v + 0.08
3	Standard diet control	0.45 b + 0.15	0.44 c + 0.10	0.57 ab + 0.14
Significant effect of				
	Diet	N.S.	<0.01	<0.01w
	Infection	<0.01	<0.01	<0.01
Interaction diet and Infection		<0.05	<0.01	<0.01

Table 3: Iron concentration in serum of rabbits on days 10, 20 and 30 post-infection.

Mean values + S.D. (mg/ml).

Group No.	Treatment	Days Post-infection 10 days	20 days	30 days
1	Milk diet. infected	0.77 a + 0.21	0.52 b + 0.19	0.62 b + 0.11
2	Milk diet. control	0.92 a + 0.16	1.27 a + 0.26	0.86 a + 0.13
3	Standard diet infected	0.71 a + 0.16	0.81 bc + 0.08	0.67 b + 0.15
4	Standard diet control	1.04 a + 0.19	1.01 ac + 0.14	0.90 a + 0.10
Significant effect of				
Diet		N.S.	N.S.	N.S.
Infection		<0.05	<0.01	<0.01
Interaction diet and infection		N.S.	<0.05	<0.01

Table 4: Zinc concentration in serum of rabbits on days 10, 20 and 30 post-infection.

Mean values + S.D. (mg/ml).

Group No.	Treatment	Days Post-infection 10 days	20 days	30 days
1	Milk diet. infected	0.35 a + 0.07	1.59 a + 0.30	0.87 a + 0.29
2	Milk diet. control	0.52 a + 0.25	1.95 a + 0.31	0.54 a + 0.14
3	Standard diet infected	0.65 a + 0.06	1.28 a + 0.35	0.89 a + 0.38
4	Standard diet control	0.35 a + 0.07	1.86 ac + 0.33	0.50 a + 0.05
Significant effect of				
Diet		N.S.	N.S.	N.S.
Infection		M.S.	M.S.	M.S.
Interaction diet and infection		N.S.	M.S.	M.S.

Trypanosoma infection, lead to increased liver copper concentration in rabbits fed on either dietary treatments ($P<0.001$) Table 5).

Statisfically there was no significant ($P>0.05$) difference in the liver iron value between rabbits fed the milk and the standard diets and no difference observed between infected and uninfected groups of rabbits.

Rabbits fed the milk diet had lower zinc concentration than those fed the standard diet. Infection caused increased liver zinc concentration.

The effect of infection was greater in rabbits fed the milk diet than those fed the standard diet, giving a significant interaction between diet and infection ($P<0.01$).

DISCUSSION

The concentration of trace elements in the serum may change in association with various infectious diseases. It has been reported that serum zinc and iron concentration depressed and serum copper concentration increased during most infection (6).

The alteration of serum copper and iron concentrations in this study are in agreement with those reported by other workers. The higher serum copper concentration in infected rabbits was also reported during the parasitic infections. In rats it was reported during trypanosomiasis (2) and during Babesia muratovi infection (1).

In this study, the liver copper concentration was also increased during Trapanosoma evansi infection. The decline in serum iron during infection is probably due to haemolysis and decreased haemoglobin concentration. The lower serum iron concentration, is in agreement with other workers during other parasitic infections (7 & 8).

Table 5: Liver copper, iron and zinc concentration in serum of rabbits on days 10, 20 and 30 post-infection.

Mean values + S.D. (mg/ml).

Group No.	Treatment	Days Post-infection Copper	Iron	Zinc
1	Milk diet. infected	2.16 + 0.48	213.49 + 33.74	167.16 + 4.25
2	Milk diet. control	1.92 + 0.32	252.63 + 4.76	103.54 + 2.33
3	Standard diet infected	6.72 + 0.73	191.99 a + 2.97	165.92 + 2.59
4	Standard diet control	0.35 a + 0.07	1.86 ac + 0.33	0.50 a + 0.05
Significant effect of				
Diet		<0.01	N.S.	<0.01
Infection		<0.001	M.S.	<0.01
Interaction diet and infection		N.S.	M.S.	<0.01

In this study although serum zinc value did not vary significantly between infected and control rabbits, infection lead to increase deposition of zinc in the liver.

The results of this study suggest that the effect of Trypanosoma evansi on the serum copper concentration was greater in rabbits fed the milk diet but its effect on the serum iron was greater in rabbits fed the standard diet. The effect of parasites was more evident with prolong duration of infection.

Further study is recommended to elucidate the effect of trace elements on the parasitaemia percentage and pathogenicity of Trypanosoma evansi and other protozoan parasites, using different dietary levels of trace elements.

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تأثير طفيلي التريبانوموسا ايفانسي على تمثيل بعض العناصر النادرة في الأرانب

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الخلاصة

اجريت هذه الدراسة لتقييم تأثير التريبانوسوما ايفانسي على تمثيل بعض العناصر النادرة في الأرانب المحلية. غذيت الأرانب على عليقة قياسية ومجموعة اخرى على حليب مجفف ؤ نيدو) وبعد خمسة عشر يوما حقنت الارانب بمليوني طفيلي من الترايبانوسوما ايفانسي ولقد وجد ان الأصابة بالترايبانوسوما ادت الى زيادة في تركيز النحاس في مستوى الحديد في مصل الدم وكما دلت النتائج ان هناك تأثير معنوي على نسبة النحاس في الأرانب المصابة والمغذاة على الحليب المجفف. ومن جهة اخرى فأن تأثير الاصابة كانت معنوية على نسبة الحديد في مصل الدم للأرانب المعاملة تحت العليقة القياسية. وقد تبين ان هناك زيادة في تركيز الخارمين في الكبد نتيجة لتأثير الأصابة بالطفيلي.