

## Relationship Between Some Trace Elements, Antioxidants And Internal Parasitic Infestation Of Sheep At Kaliobia Governorate

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### ABSTRACT

The present study was designed to investigate the effect of internal parasites on the level of some trace elements (iron, copper & zinc) as well as the oxidative status of affected sheep manifested by the changes of the levels of some chain breaking antioxidant (vitamin C&E). Ninety six sheep of different ages and sex belonging to some private farms in Kaliobia Governorate were used in this study. Fecal samples were collected from all examined sheep for parasitological examination. Results revealed that the prevalence rate of trematodes in examined sheep was 42.8%, the most prevalent were *Fasciola* Spp. 28.5% and *Paramphistomum* Spp. 14.3%. While infestation rate of nematods *Trichuris* Spp was, 33.4%. *Eimeria* Spp. 14.3% and *Moniezia* spp 9.5%. Blood samples were collected from infested sheep beside control non infested group for serum separation and determination of the level of iron, copper and zinc as well as antioxidant vitamin C & E and AST and ALT enzymes. The obtained results revealed significant decrease in serum level of iron, copper & zinc as well as reduction in serum level vitamins C&E with a marked increase in some liver enzymes (AST and ALT) in all parasitic infected sheep compared with healthy ones.

So parasitic infection in sheep may interfere with the oxidative status and increase oxidative stress of their bodies with the subsequent adverse effect on sheep health. In addition, gastrointestinal parasites cause major alteration in the level of serum trace elements and marked liver damage.

### INTRODUCTION

The problem of internal parasites infecting sheep still constitutes one of the major economic and health problems. In general parasitic infection interferes with nutrient availability to the host through both reduction of feed intake and / or reduction of efficient absorption of required nutrients.

The most important economic losses resulted from parasitic infection are retardation of growth, emaciation, remarkable decrease in efficiency, as well as low production of meat, wool and milk reproductive failure, and sudden death (1- 3).

The status of trace element in the body is the mirror of health, growth and reproductive ability (4). In a number of studies it has been demonstrated that the amount of reactive oxygen radicals which cause lipid peroxidation are increased causing cell and tissue damage of hosts infested with different species of parasites (5).

The generation of reactive oxygen species (ROS) such as superoxide anion; hydrogen peroxide, hydroxyl radical and singlet oxygen; in biological systems is dependent on oxygen consumption and can cause cellular damage by lipid peroxidation (6). Oxidative stress and enhanced lipid peroxidation have been associated with several models of liver injury (7). Products of lipid Peroxidation formed in various biochemical reactions are normally scavenged by antioxidants. Antioxidant defenses are widely distributed and include both enzymatic and non enzymatic systems, vitamin C, vitamin E, B-carotene are among the non enzymatic factors that function as antioxidant (8-10). In many studies generally antioxidant vitamins such as E& C and A protect the cell from damage against free oxygen radicals generated as a results of parasitism (10-13). Vitamin C status of ruminants is related to their health and disease as it plays an important role as antioxidant and also has a wide variety of biological function for growth and development of important constituents in the formation of

connective tissue (10,12) . It has also been suggested to be of value in alleviating both physiological and pathological stress (14,15) .The aim of this work was to study the effect of internal parasitism on the concentration of blood serum iron, copper ,zinc and antioxidant vitamins C&E.

## MATERIALS AND METHODS

### 1-Animals

A total 96 sheep of various ages and sex in different localities belonging to some private farms in kaleubia province were examined. These animals suffered from diarrhea ,emaciation and loss of appetite . Fecal examination was carried out to detect any parasitic infection .

### 2-Faecal samples

Rectal fecal samples were collected from all animals in clean plastic bags and subjected to parasitological examination in the same day of collection. Macroscopical examination was carried out to detect gross parasite, blood or mucous, odour and consistency. Microscopical examination using concentration flotation and

concentration sedimentation techniques was performed (16). Identification of parasite eggs and oocysts was carried out depending on microscopic morphology of eggs (17) modified Mc master technique was used for fecal egg count (18).

### 3- Blood collection

Blood samples were collected from jugular vein without anticoagulant for serum separation from 42 naturally infected sheep as well as 10 clinically healthy and parasitic free sheep which used as control. The collected serum samples were stored at -20<sup>0</sup>C until biochemical analysis was carried out. Serum copper and zinc concentration using atomic absorption spectrophotometer (19). Serum iron (20). Vitamin C (L. ascorbic acid) (21) , vitamin E (tocopherol) (22). Aspartate aminotransferase and Alanine aminotransferase (23) were determined .

### 4-Ration analysis

The ration was digested (24) for determination of zinc, iron and copper contents.

**Table 1 Ration analysis for some minerals contents .**

Elements	Zinc (ppm)	Copper (ppm)	Iron (ppm)
Requirement	20 - 23	7 - 11	30 - 50
Maximum Tolerance level	750	25	500
Concentration in ration	25	10	36

### 5-Statistical analysis

Statistical analysis of the obtained data was done by means of soft ware computer program (25).

## RESULTS

The prevalence of different gastrointestinal parasites in examined sheep was illustrated in Table 2 where it was cleared that the prevalence rate of nematode infection was the highest followed by *Fasciola* Sp

,*Paramphistomum* Sp. , *Eimeria* Sp., and *Moniezia* Sp respectively. Dealing with ration analysis there was no difference between the concentration of trace element zinc, copper and iron compared with requirement of animals (Table 1). Concerning the concentrations of serum trace elements (zinc ,iron ,copper ) and antioxidant vitamin C ,E of control and infested sheep were summarized in Table 3 and 4 and the changes in AST and ALT. were showed in (Table 5) .

Table 2. Prevalence of worm and protozoal parasites of sheep by fecal examination.

No .of animals examined	No . of infected animals	%	Nematode		Trematode				Cestode		Protozoa	
			Trichuris Spp.		Paramphistomum Spp.		Fasciola Spp.		Monezia Spp.		Eimeria Spp.	
			No	%	No.	%	No	%	No	%	No	%
96	42	43.75	14	33.3	6	14.3	12	28.5	4	9.5	6	14.3

Table 3. Mean values of iron, copper and zinc ug/dl in control and infested sheep with internal parasites

Some trace elements Ug/dl	control N=10	Infested sheep N=10
Iron	100.59 ± 2.35	78.20 ± 2.69*
Copper	92.52 ± 2.52	48.60 ± 2.43*
Zinc	93.82 ± 2.73	57.39 ± 3.83*

\* = significant at  $p \leq 0.001$ 

Table 4. Activities of non enzymatic antioxidants (vitamin E and vitamin C mg/dl ) in control and infested sheep with internal parasites.

Group	Vitamin C (mg\dl)	Vitamin E (mg\dl)
Control sheep	4.81 ± 0.47	0.17 ± 0.11
Infested sheep	3.31 ± 0.31*	0.11 ± 0.01*

\* = significant at  $p \leq 0.001$ 

Table 5. AST and ALT (U/L) in serum of control and infested sheep with internal parasites.

Parameters	Control sheeps N=10	Infested sheeps N=10
AST (U/L)	63.18 ± 1.56	129.96 ± 3.22*
ALT (U/L)	35.19 ± 1.55	96.23 ± 2.5*

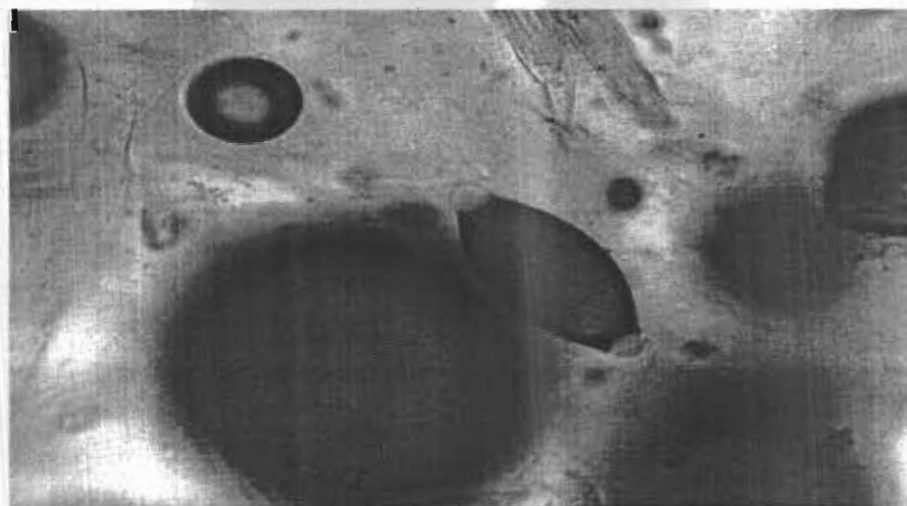
\* = significant at  $p \leq 0.001$



**Fig.1 . Showed Fasciola hepatica egg x 400**



**Fig. 2. Showed Paramphistomum egg x 400**



**Fig. 3. Showed Trichuris egg x 400**

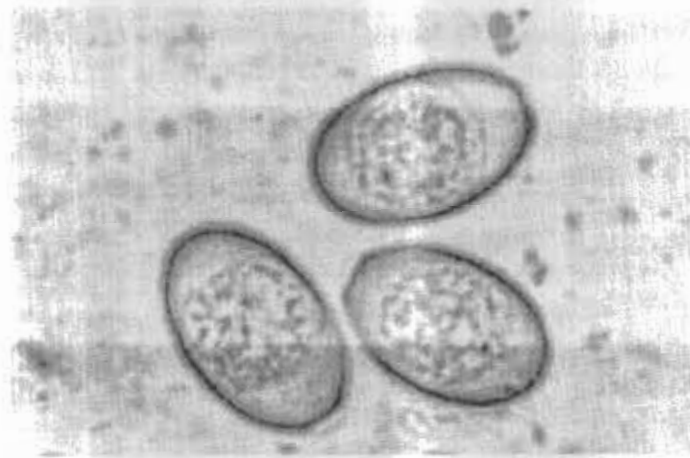


Fig. 4. Showed *Eimeria* oocyst x 400

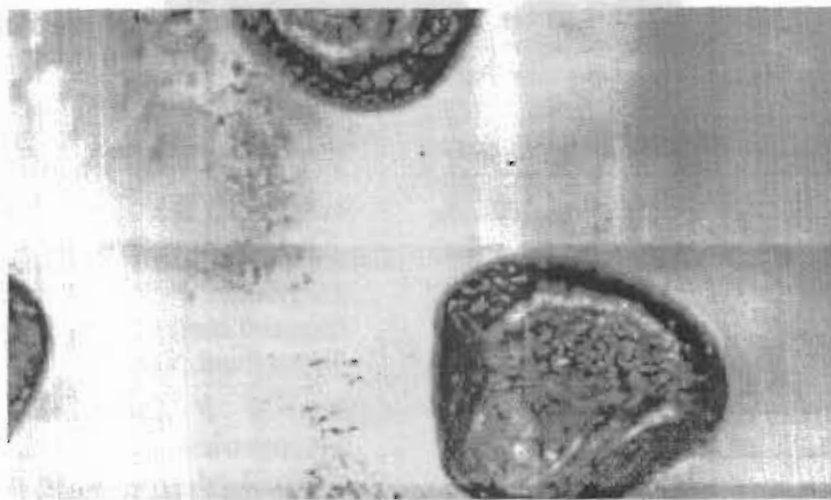


Fig. 5. Showed *Monezia* egg x 400

## DISCUSSION

Parasitic infection particularly in Egypt represents an important cause of direct losses in farm animals include not only the actual mortalities but also severe degree of morbidity resulting in decrease in weight and production. Gastrointestinal parasite are very common in sheep due to their grazing and watering habits (26). So the present study aimed to focus light on the effect of internal parasite on some blood biochemical components in sheep. Dealing with concentration of iron, copper and zinc they were

significantly decrease in infested animals compared with apparently healthy. However ration analysis cleared that the decrease of these element not refer to deficiency in feed. The decrease in serum zinc attributed to the destructive effects of the parasites on the absorptive epithelial cells in gastrointestinal tract (27) on the other hand zinc is transported in plasma bound to albumin (28) so the hypoalbuminemia which is a characteristic feature of internal parasite in ruminants (29) reduce its circulating concentration during internal parasitic infestation.

The decrease serum iron level can result from the direct loss of blood through a rise in rate of degeneration of blood cells, and also through a depression of hematopoiesis from the action of toxic substances produced by parasites (30), also copper level in the serum of sheep infected with internal parasite was significantly lower than control, this could be attributed to the lower absorption of copper in ruminant than in non ruminant (31) where gastrointestinal parasites interfere with copper absorption by increasing the PH of the rumen (32), so the solubility of copper can reduce in the abomasums up to 70% subsequently the uptake of dissolved copper by the liver reduces up to 50% and copper losses from the animals increases (33). Antioxidant systems comprising vitamins have cellular protective action against oxidative stress resulting in cell, organ and tissue damage as a result of parasitic invasion (13, 34,35). Since parasites damage the cell which synthesize the antioxidant agents a decrease in numbers of such cells is natural (36). Eimeria spp causes oxidative degeneration in epithelial lining GI tissue and pulmonary worms like Protostrongylidae spp cause damage the cells of lung tissue (34, 37, 38). Decrease in serum vitamin C concentration causes significant changes in vitamin E gastrointestinal infection agreed with (39-41) which attributed to the assimilation of these vitamins by continuous release of reactive oxygen species (42), the decrease in vitamin level may be attributed to the increase utilization of vitamin C by the tissues and in regeneration of vitamin E as vitamin C has a sparing effect on vitamin E (8,42). Vitamin E protect the cell from oxidative damage by being converted into vitamin E radical and the role of vitamin C is to regenerate oxidized vitamin E (11). Previous studies have shown that low level of tocopherol (chemical active form of vitamin E) represent a significant risk factor of clinical mastitis and other types of infection of affected animals (43). Changes in the antioxidant abilities were accompanied by rising activities of AST and ALT as markers of liver damage. Liver trematodes cause the release of reactive oxygen species producing a damage to the cell

membrane and components and thus leading to cell death (44).

Finally it could be concluded that, additional supplementation of gastrointestinal parasites infected animals with source of vitamins to overcome the oxidative stress and to avoid possible complication of vitamin E and C deficiencies resulted from infection with GI parasites cause alteration in the level of serum trace element. Finally periodical examination of sheep to control and prevent the adverse effect of the parasites is needed.

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### الملخص العربي

## العلاقة بين بعض العناصر النادرة ومضادات الأكسدة والاصابة بالطفيليات الداخلية في الأغنام بمحافظة القليوبية

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أجريت هذه الدراسة بهدف معرفة تأثير الاصابة بالطفيليات الداخلية على مستوى بعض العناصر النادرة ( الحديد , النحاس , الزنك ) علاوة على دراسة تأثير الاصابة بهذه الديدان على ضغوط الاكسدة وذلك بقياس مستوى بعض مضادات الاكسدة المتمثلة في حامض الاسكروبيك وفيتامين هـ . حيث تم استخدام عدد ٩٦ من الاغنام البلدية المحلية من مختلف الاعمار من بعض المزارع الخاصة بمحافظة القليوبية وتم اخذ عينات براز من هذه الحيوانات واجراء الفحوصات الطفيلية اللازمة.

وقد اظهرت النتائج اصابة عدد ١٨ حيوان بالديدان المفطحة بمعدل انتشار ٢٨,٥% اصابة بالفشيولا و ١٤,٣% بارماستوموم وكانت الاصابة بالديدان الاسطوانية ١٤ حيوان بمعدل ٣٣,٤% والديدان الشريطية ( المونيزيا ) ٤ حيوان بمعدل ٩,٥% الكوكسيديا ٦ حيوان بمعدل ١٤,٣% .

تم قياس مستوى عناصر الحديد و النحاس و الزنك في مصل الدم وكذلك قياس مستوى فيتامين ج و فيتامين هـ و بعض انزيمات الكبد و ذلك للاغنام المصابة بالطفيليات الداخلية وكذا لمجموعة اخرى سليمة اكلينيكيًا وخالية من الطفيليات ( مجموعة ضابطة) و قد اظهرت نتائج البحث وجود نقص معنوي في قيم الحديد و النحاس و الزنك كما اظهرت النتائج نقص في مستوى فيتامين هـ و فيتامين ج و كذلك زياده معنوية في بعض انزيمات الكبد مما يدل علي مدي تاثر الكبد في الحيوانات المصابة مقارنة بالمجموعة الضابطة نستخلص من هذه الدراسة ان الاصابة بالطفيليات الداخلية تزيد من ضغوط الاكسدة مما يؤثر على الحالة الصحية للاغنام كما ان لها تأثير سلبي على مستوى العناصر النادرة .ومن هنا تتضح اهمية القضاء على الطفيليات الداخلية وتوصي تلك الدراسة باضافة فيتامين هـ و ج والعناصر النادرة في الحيوانات المصابة لتجنب التأثير السلبي لعوامل المؤكسدة علي صحة و مناعة و انتاجية الحيوان.