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**INFLUENCE OF SOME DISEASED CONDITIONS
ON BLOOD SERUM LEVELS OF ANTIOXIDANT
VITAMINS AND SOME TRACE ELEMENTS OF
EGYPTIAN BALADY SHEEP
IN ASSIUT GOVERNORATE**
(With 3 Tables)

By

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تأثير بعض الحالات المرضية في الأغنام البلدية المصرية على مستويات
الفيتامينات المضادة للأكسدة وبعض العناصر النادرة في سيرم الدم
بمحافظة أسيوط

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أجريت هذه الدراسة على عدد ١٣٣ من الأغنام البلدية من الجنسين تراوحت أعمارهم ما بين ١ - ٥ سنوات في عدة مزارع بمحافظة أسيوط . قسمت هذه الأغنام تبعاً للفحص الأكلينيكي والمعملي إلى خمسة مجموعات: الأولى: اشتملت على عدد ٢٥ من الأغنام السليمة ظاهرياً واكلينيكيًا ومعملياً واستخدمت كضوابط ، الثانية: اشتملت على عدد ٣٧ من الأغنام التي تعاني من نزلات معوية نتيجة للإصابة بالطفيليات المعوية ، الثالثة: اشتملت على عدد ٢٢ من الأغنام التي تعاني من عسر الهضم ، الرابعة: اشتملت على عدد ١٧ من الأغنام التي تعاني من النزلات الشعبية ، الخامسة: اشتملت على عدد ٣٢ من الأغنام التي تعاني من أمراض جلدية مختلفة (تساقط الصوف). هذا وقد استخدمت هذه الحيوانات أساساً لدراسة تأثير هذه الأمراض المختلفة على مستويات الفيتامينات المضادة للأكسدة (فيتامين أ، البيتا كاروتين ، فيتامين هـ ، فيتامين ج) وبعض العناصر النادرة (الحديد ، النحاس، الزنك، الكوبالت، المنجنيز، الموليبدينوم) في سيرم الدم. بالإضافة إلى دراسة الأعراض الأكلينيكية المصاحبة لكل مرض على حده وقد أظهرت النتائج: (١) حدوث انخفاض معنوي جداً في مستويات فيتامين "أ" و البيتاكاروتين في مصل دم الأغنام في المجموعات المرضية الثانية المصابة بالنزلات المعوية والثالثة المصابة بعسر الهضم والرابعة المصابة بالنزلات الشعبية والخامسة المصابة بالأمراض الجلدية وتساقط الصوف بمقارنتها بمثيلاتها في المجموعة الأولى (المجموعة الضابطة). (٢) أما بالنسبة لفيتامين هـ فكان هناك نقص

معنوي جدا في سيرم دم الأغنام في المجموعة الرابعة المصابة بالنزلات الشعبية والخامسة المصابة بالأمراض الجلدية وتساقط الصوف وكان النقص معنوي في مستوى فيتامين هـ في مصل دم أغنام المجموعة الثانية المصابة بالنزلات المعوية (3) ولم تسفر التحليلات عن وجود اختلاف في مستوى فيتامين هـ في مصل دم أغنام المجموعة الثالثة المصابة بعسر الهضم، كما حدث انخفاض معنوي جدا في مستويات فيتامين ج في جميع المجموعات المرضية ماعدا المصابة بعسر الهضم (المجموعة الثالثة) فلم يكن هناك اختلافات معنوية. أما عن التحليلات البيوكيميائية بالنسبة للعناصر النادرة فقد أوضحت النتائج وجود انخفاض معنوي جدا في مستويات الحديد، النحاس، الزنك، الكوبالت، المنجنيز في سيرم دم جميع المجموعات المرضية ماعدا المجموعة الرابعة والتي تعاني من النزلات الشعبية فكان النقص معنوي في مستويات هذه العناصر، وعلى النقيض من ذلك فوجد هناك ارتفاع معنوي في مستوى عنصر الموليبدينوم في سيرم دم أغنام جميع المجموعات المرضية ماعدا المجموعة الثانية المصابة بالنزلات المعوية فكان هناك نقص معنوي جدا في مستوى عنصر الموليبدينوم وذلك بمقارنتهم بمثيلاتهم في الأغنام السليمة (المجموعة الضابطة). مما سبق نستنتج أن الأمراض التي تصيب الأغنام متمثلة في أمراض الجهاز الهضمي (نزلات معوية نتيجة للإصابة بالطفيليات المعوية والمعدية وعسر الهضم) وكذا أمراض الجهاز التنفسي (نزلات شعبية) وأمراض جلدية وتساقط الصوف ذات تأثير واضح على مستويات الفيتامينات المضادة للأكسدة (فيتامين أ، البيتا كاروتين، فيتامين هـ، فيتامين ج) وكذلك مستويات العناصر النادرة شاملة الحديد، النحاس، الزنك، الكوبالت، المنجنيز والموليبدينوم في سيرم دم الأغنام الأمر الذي يوضح بجلاء أن مثل هذه الأمراض ذات تأثير مدمر على صحة الأغنام وذلك يوجب بالضرورة إضافة هذه الفيتامينات والعناصر النادرة إلى الخطوط العلاجية التقليدية لمثل هذه الحالات المرضية حتى يمكن الشفاء العاجل والعودة إلى الحالة الصحية الكاملة للحيوان.

SUMMARY

A total number of 133 Egyptian Balady sheep of both sexes, their ages varied from 1 – 5 years old belonged to some private farms at Assiut Governorate were involved in this investigation. On the basis of clinical and laboratory examinations, sheep were classified into five groups. The first group constituted 25 clinically and laboratory healthy and served as control. The second group constituted 37 sheep suffering from parasitic enteritis. The third group constituted 22 sheep suffering from indigestion. The fourth group constituted 17 sheep suffering from bronchopneumonia and the fifth group constituted 32 sheep suffering from skin lesions (alopecia). Laboratory examinations and biochemical analysis revealed highly significant decrease in blood serum levels of vitamin A and Beta-carotene in all diseased sheep when compared with control one. Vitamin E levels showed highly significant decrease in sheep suffered from bronchopneumonia and skin lesions (alopecia) and

showed significant variations in the levels of vitamin E in blood serum of sheep suffered from indigestion. Meanwhile vitamin C levels revealed highly significant decrease in all diseased sheep except those suffered from indigestion which showed insignificant changes. Regarding the analysis of trace elements, the obtained results showed highly significant decrease in blood serum levels of iron, copper, zinc, cobalt and manganese in all diseased sheep except those suffered from bronchopneumonia revealed significant decrease in the levels of these elements when compared with control one. On the contrast, there was highly significant increase in the molybdenum levels in blood serum of all diseased sheep except those suffered from parasitic enteritis which revealed highly significant decrease. From the present study, it was concluded that the diseased conditions in sheep leads to reduction in both studied vitamins and trace elements. We must put in consideration the addition of such vitamins and trace elements during the course of traditional treatment of such diseases to overcome this reduction and to repair the healthy status of the animals.

Key words: Diseases of sheep – anti oxidant vitamins – trace elements – Assiut.

INTRODUCTION

The role played by sheep in agricultural production in the rural and urban areas is of great economic importance (Martin, 1983). Economic losses in sheep feed lot have been currently documented, however, the effects of environmental condition, age, sex, seasons and diseased incidence as well as nutrition and management expertise were considered the major factors that influenced the achievement of optimum production (Martin, 1983 and Radostits *et al.*, 1995).

It seems from these current literatures (Beisel *et al.*, 1974; Underwood, 1977; Hidirolou, 1979; Nockels, 1979; Rai, 1980; Georgievskii, 1982; Mills, 1983; Chow, 1985; Panuch and Delafuents, 1985; Bendich, 1987; Chew, 1987 and Tengerdy, 1990) that it deals with feed supplementation of trace elements and antioxidant vitamins more than monitoring their concentration in various clinical and subclinical diseases of sheep affecting digestive or respiratory systems as well as skin. Because of this lack concerning these points it is thought to throw some lights upon these conditions which may be of help to veterinarians in the field in their line of treatment.

MATERIALS and METHODS

Animals:

A total number of 133 Egyptian Balady sheep of both sexes, their ages varied from 1-5 years old belonged to some private sheep farms of Agricultural Co-operation located at Abu-tig City (Assiut Governorate) and small private farms located at many villages of Assiut Governorate namely El-Dewair, El-Berba, El-Etiffy, El-Shanina, and Sidfa constituted the materials of this investigation.

All animals were subjected to careful clinical and laboratory examinations according to the methods described by Coles (1986) and Chauhan, (1995) to ensure their healthy status.

According to the clinical and laboratory findings, the examined sheep were classified into 5 groups

The first group: Constituted 25 clinically healthy sheep and served as control group.

Second group: Constituted 37 sheep which were suffering from parasitic enteritis.

Third group: were 22 sheep which were suffering from indigestion.

Fourth group: Constituted 17 sheep which were suffering from bronchopneumonia.

Fifth group: were 32 sheep suffering from different skin lesions (alopecia).

Samples and adopted methods:

Blood samples were collected from each animals through jugular vein puncture and the obtained clear, non-haemolysed sera were analysed biochemically: Digested blood serum samples for estimation zinc, cobalt and manganese levels using GBC 906 Atomic Absorption Spectrophotometer in Soil Irrigation Department, Faculty of Agriculture, Assiut University. Samples digested using the method of Parkinson and Allen (1975).

Iron and copper were estimated colorimetrically using Digital Ultraviolet Spectrophotometer Model 292 by means of test Kits supplied by Boehringer Mannheim GmbH Diagnostica after the methods described by Trinder, (1956) and Zac (1958) respectively.

Levels of molybdenum were estimated by Sendele method (1944). Vitamin A and Beta-carotene were estimated after the methods of Carr and Price, (1926). Vitamin E were estimated after the method of Hawk, *et al.* (1954).

Blood serum levels of vitamin C were estimated after the method of Lowery, *et al.* (1945).

Blood smear, faecal and skin scraping samples were examined according to the methods described by Coles, (1986).

The obtained data were statistically analysed by Microstat Computer Program (SAS 1986).

RESULTS

The clinical signs and some laboratory findings of both clinically healthy control sheep and those suffered from different diseased conditions are illustrated in Table (1). Blood serum antioxidant vitamins and some trace elements levels in both clinically healthy and diseased sheep are illustrated in Tables (2 and 3).

DISCUSSION

Recently great attention has been directed to study blood parameters in healthy and various diseased conditions of animals. Biochemical analysis of blood serum can provide a remarkable and valuable informations about metabolic profiles. Test results are more important as they may provide absolute evidence regarding physiological alterations resulting from a disease (Coles, 1986; Duncan and Prasse, 1986 and Chauhan, 1995).

Diseases of sheep whatever the cause may constitute the main factors of direct or indirect losses which reduces the productivity or reproductivity of these animals (Martin, 1983 and Radostits, *et al.* 1995).

I- Clinical signs:

Parasitic enteritis: The observed clinical signs in the examined sheep (Table1) coincided with those previously described by Kaneko and Cornelius (1970); Abdel-Aziz, (1979); Tawfic and Dighedy (1980); Wegger, (980); Abdel-All, (1983); Dokka and Abdel-All, (1992); Mandour, and Omima (1994) and Radostits, *et al.* (1995).

Indigestion: The mentioned clinical signs in examined sheep (Table1) coincided with the previously obtained by El-Sebaie, (1974); Martin, (1983); Fouda, (1995) and Radostits, *et al.* (1995).

Bronchopneumonia: Many authors recorded the most important clinical signs of broncho-pneumonia in sheep as that diseased in our results (Table1) coincided with those of [Biberstein, *et al.* (1967); Rahman and Iyer (1979); Jones, *et al.* (1986); Kimberling, (1988); Hafez, *et al.* (1991); Radostits, *et al.* (1995) and Sayed, (1996)].

Skin lesions (alopecia): Regarding the clinical signs of skin lesions (alopecia) in examined sheep in different parts of the body with intensive itching and scabs formation (Table1) coincided with those previously described by Blackmon, *et al.* (1967); Rai, (1980); Abdel-All, (1983); Martin, (1983); Haynes (1986); Kambarage (1992); O'Brien, *et al.*, 1995 and Radostits, *et al.* (1995).

II-Biochemical findings:

A highly significant decrease ($P < 0.01$) in blood serum vitamin A and Beta-carotene levels were detected in sheep suffered from parasitic enteritis, indigestion, bronchopneumonia and skin lesions (alopecia) than the control ones (Table 2). The obtained data were in agreement with those previously obtained by Tayeb, (1972); Matta, (1997) and Narouz, (1997).

Such reduction could be suggested either by the fact that parasitic infestations either external or internal lead to impaired absorption or loss of blood of the host with consequent decrease in level of vit A and Beta-carotene in blood. Enteritis would also interfere with the conversion of carotene to vitamin A because this conversion occurs in the intestinal epithelium (Kaneko and Cornelius, 1970; Tayeb, 1972 and Coles, 1986).

Meanwhile the decrease in blood serum levels of vitamin A and Beta-carotene in sheep suffered from bronchopneumonia can be attributed accordingly to bacterial toxins which affect directly on the liver (site of storage) or to the degree of anorexia which is reflected upon the absorption of vitamin A (Atkins and Bodell, 1972). Another explanation of such reduction in vitamin A and Beta-carotene levels, was offered by Radostits *et al.* (1995) who stated that the low level of vitamin C interferes with the absorption of vitamin A in blood.

Regarding vitamin E level in the blood serum of examined sheep, the highly significant decrease ($p < 0.01$) observed in sheep suffering from bronchopneumonia and skin lesions (alopecia), while a significant decrease ($p < 0.05$) was noticed in sheep suffering from parasitic enteritis. Such reduction in blood serum vitamin E levels can be explained on the bases that vitamin E is responsible for immunoenhancement and it enhances humoral immune response and its deficiency leads to decrease in such immunity with consequent stress on the animal (Bendich, 1987). Vitamin E deficiency leads also to reduce phagocytic cell function and reduction of immune responsiveness (Tengerdy *et al.* 1981 and Tengerdy, 1989 and 1990).

The decrease ($p < 0.05$) in vitamin E level in the blood serum of sheep suffered from parasitic enteritis may be attributed to the greater consumption of the nutrient by parasites or due to loss of appetite by the animal or due to loss of blood due to parasitic infestation. (Kaneko and Corneliuss, 1970).

Highly significant decrease ($p < 0.01$) in the blood serum levels of vitamin C in sheep suffered from parasitic enteritis, broncho-pneumonia and skin lesions (alopecia) were detected (Table 2). The obtained data coincided with those previously described by Matta, 1997 and Narouz, 1997.

Such reduction can be explained by Dobsinska *et al.* (1981) and Hornig *et al.* (1984) who reported that vitamin C inter in the defensive mechanism and has a detoxified action in the animal body. Another view may explain the fact that vitamin C is responsible for improving the immunocharging capacities especially as an antioxidant agent and enhance the ability to survive infections (Anderson, 1982; Panuch and Delafuents, 1985 and Aderianne, 1987). Chatterjee *et al.* (1975) stated that any infections in the lungs or gastrointestinal tract cause a reduction in the ascorbic acid content in the blood plasma. also Cumminus and Brunner, (1991), proved that calves with enteric and respiratory infections have lower plasma vitamin C concentrations.

Regarding the results of trace elements recorded this investigation, there were a highly significant decrease ($p < 0.01$) in the blood serum levels of iron, copper, zinc, cobalt and manganese of sheep suffering from parasitic enteritis, indigestion and skin lesions (alopecia) when compared with the control ones. Meanwhile, sheep suffered from bronchopneumonia have relatively more significant decrease ($p < 0.01$) in blood serum levels of iron and copper, but blood serum level of zinc, cobalt, and manganese levels showed a significant decrease ($p < 0.05$). The obtained data agreed with those previously obtained by Blackmon, *et al.* (1967); McCosker, (1968); El-Hetw *et al.* (1975); El-Sherif *et al.* (1976); Abdel-Aziz, (1979); Abdel All, (1983) and Haynes, (1986).

Loss of blood & loss of appctite were, in the view of Kaneko and Corneliuss, (1970) the main general causes of these blood trace elements deficiency which accompany similar disease conditions either bacterial or parasitic. The authers attributed such reduction mainly to impaired absorption or increased excretion of respective elements.

Concerning the molybdenum levels, there were significant increase ($p < 0.05$) in blood serum of sheep suffered from indigcstion,

bronchopneumonia and skin lesions (alopecia). This can be explained by the antagonist relationship between copper and molybdenum which was previously described by Dick *et al.* (1975) and Huisingh *et al.* (1976). On the bases that increased molybdenum level causes a reduction in absorption of copper from the intestinal tract and thus decrease its availability at the metabolic sites of action. Meanwhile highly significant decrease ($P < 0.01$) in the blood serum molybdenum levels recorded in sheep suffering from parasitic enteritis may be due to the loss of blood by parasites or loss of appetite with consequent reduction in the necessary feed intake (Kaneko and Cornelius 1970).

Finally, it can be concluded that the diseased conditions in sheep have a great reflection on the blood serum levels of studied antioxidant vitamins and trace elements especially those suffering from digestive disorders (parasitic enteritis and indigestion), skin lesions and respiratory disorders (bronchopneumonia). So we must put in consideration to add additional treatment namely vitamins (especially vit A, E and C) as well as trace elements during the course of traditional medical treatment of such diseased conditions. This may help to maintain their demand and the respective immune responses at the required optimum levels. By this way we assume that the ability of the animal to resist the damage resulting from the parasites and the liberated toxins will prevent the depletion of the required nutrients.

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Table (1) Clinical signs and some laboratory findings in healthy and diseased sheep

Groups	Number of animals	Clinical signs and some laboratory findings
Healthy control	25	Well developed body conformation – good appetite. The skin is normal with shiny elastic coat. The wool is well fixed. Foul flank. Small hard pellets of faeces. – Normal body temperature. The mucous membranes were rosy red colour. Parasitological examination revealed absence of internal, external as well as blood parasites.
Parasitic enteritis	37	- The infested sheep showed loss of weight, cessation of growth, emaciation, easily detached wool, diarrhoea and general weakness. In some cases, showed profuse, persistent watery diarrhoea. The odor of the faeces was foetid. Signs of dehydration was evident. Anemia and anaemia were evident in some cases. - Faecal examination of dissected examined sheep revealed the presence of <i>Trichostrongylus</i> spp., <i>Heteromacrus</i> spp., <i>Ostertagia</i> spp. and <i>Trichouris ovis</i> spp.
Indigestion	22	- Partial or complete anorexia, chilliness, depression and cessation of rumination. - The ruminal motility is suppressed or absent. - Passage of soft watery diarrhoea with foul odor. In some cases scanty amount of faeces contain grains were observed.
Broncho-pneumonia	17	- No systemic reactions were observed – pulse, temperature and respiration are not changed. - Rapid and shallow respiration, signs of dyspnoea and painful moist cough were observed. - Nasal discharge may or may not present. There is fever of various degree associated with anorexia, depression and elevated pulse and respiratory rate were evident.
skin lesions (Alopecia)	32	- In early stage vesicular sound is increased. Moist rales developed in bronchiopneumonia as broncholar sound and can be heard on lung affected area, and on the paraplural moist and crepitation rates were evident. - Signs of pruritis, restlessness, weakness and untidiness appearance were recorded. Intensive itching and scales formation. - Skin scrapings of diseased sheep revealed the presence of psoroptic mite (<i>Psoroptes ovis</i>) and in some few cases mixed infection of psoroptic, sarcoptic and otodectic mites with alopecia and presence of dermatitis around the nose, ears, neck, withers were observed.

Table (2) Antioxidant Vitamins levels in control and diseased sheep

Items	Beta carotene µg/100ml		Vitamin A µg/100ml		Vitamin E µg/100ml		Vitamin C mg/100ml	
	X ± S.D	Min-Max	X ± S.D	Min-Max	X ± S.D	Min-Max	X ± S.D	Min-Max
Healthy control sheep	7.88 ± 2.22	5 - 12	43.45 ± 4.34	38.55 - 50.65	4.98 ± 1.25	3 - 6	2.26 ± 0.52	1.7 - 3.8
Parasitic Enteritis	4.76 ± 0.63**	3.5 - 5.5	30.18 ± 2.83**	25.5 - 35.8	3.68 ± 1.02*	2.6 - 4.9	1.21 ± 0.37**	0.6 - 1.7
Indigestion	5.33 ± 0.72**	4.2 - 6.3	35.43 ± 2.74**	32.0 - 38.5	4.23 ± 0.87	3.0 - 5.8	2.17 ± 0.44	1.7 - 3.7
Bronchopneumonia	3.97 ± 0.89**	2.6 - 4.7	27.86 ± 3.25**	24 - 32.5	3.32 ± 0.79**	2.2 - 4.5	1.05 ± 0.32**	0.5 - 1.5
Skin lesions (alopecia)	3.64 ± 0.94**	2.5 - 4.5	24.36 ± 2.96**	21.5 - 27.5	3.15 ± 0.69**	2.0 - 4.2	1.45 ± 0.48**	0.8 - 2.2

* Significant (P<0.05)
** Highly significant (P<0.01)

Table (3) Trace elements levels in control and diseased sheep

Items	Iron µg %		Copper µg %		Zinc µg %		Cobalt µg %		Manganese µg %		Molybdenum µg %	
	X ± S.D	Min-Max	X ± S.D	Min-Max	X ± S.D	Min-Max	X ± S.D	Min-Max	X ± S.D	Min-Max	X ± S.D	Min-Max
Healthy control sheep	137.2 ± 12.7	116 - 162	108.7 ± 8.4	80 - 130	65.2 ± 4.7	50 - 73	6.4 ± 2.1	3 - 9	9.5 ± 1.7	7 - 14	7.6 ± 2.3	4 - 10
Parasitic enteritis	65.5 ± 10.7**	45 - 77	60.3 ± 6.2**	42 - 74	40.2 ± 5.2**	32 - 50	4.1 ± 1.8**	2 - 7	6.1 ± 1.2**	5 - 10	4.6 ± 1.2**	2 - 7
Indigestion	90.8 ± 9.4**	78 - 106	80.4 ± 5.5**	70 - 92	45.6 ± 4.1**	38 - 52	4.3 ± 1.9**	2 - 7	5.8 ± 1.6**	4 - 10	9.3 ± 0.8*	8 - 11
Bronchopneumonia	87.9 ± 11.5**	73 - 110	89.3 ± 6.9**	68 - 98	52.8 ± 6.3*	45 - 62	5.4 ± 1.7*	3 - 8	7.7 ± 0.9*	6 - 10	9.1 ± 0.9*	8 - 10
Skin lesions (alopecia)	69.3 ± 13.5**	52 - 78	59.2 ± 7.8**	47 - 68	28.5 ± 3.6**	22 - 37	4.7 ± 1.4**	2 - 7.5	5.3 ± 1.2**	3.5 - 7	8.7 ± 1.3*	7 - 10

* Significant (P<0.05)
** Highly significant (P<0.01)