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SOME BIOCHEMICAL STUDIES ON TRACE ELEMENTS DEFICIENY ACCOMPANIED WITH ANEMIA

Mona, M. Heta; Abeer, S. Abd EL-Rahman and **EL Ramady, R.A.

*Biochemistry department, Animal Health Research Institute, Cairo- Dokki -Giza

ABSTRACT

To study the proper cause of the observed unthriftiness in goat herds at El-Wahate governorate. Blood and serum samples were collected from one hundred and thirty three goat aged 2.5 years old of both sexes at EL-Wahat desert, Egypt, suffering from variable signs of poor growth , weakness, emaciation, depraved appetite and unthriftness and were kept on improved pasture together with twenty apparently healthy goats kept on unimproved pasture to be used as control reference animals.

Blood picture in unthrifety goats indicated presence of anaemia, low RBCS count, low Hb and MCHC % with low lymphocyte and high monocyts. On the other hand serum analysis showed low levels of copper, zinc, iron, glucose, cholesterol, total protein and albumin with increase in the level of AST, ALT and cortisol.

Chemical analysis of feedsamples taken from that pasture revealed presence of high concentration of both molybdenum and zinc with limited copper content.The obtained result indicated presence of anaemia due to secondary copper deficiency as a result of high molybdenum and zinc which interfere with absorption of copper.

INTRODUCTION

Goat is one of the most important agricultural animals in tropics and subtropics. The world total production of goats was estimated to be 809 million head in 2005 ***(Web site of FAO)***. The annual world meat production from goats was recorded to be 455791 metric tons of which 1800 metric tons are producted in Egypt in 2005 ***(web site of FAO).***

Increasing demand to animal protein necessitate increasing of the intensive production of goats especially for its least expense. The losses in health and economic efficiency of lives stock resulting from deficiency of minerals and trace elements have been fully described ***(Anon, 1982 & Graham,et al.,1994)*** also wasting diseases of animals have been attributed to the deficiencies of copper and cobalt in the soil and consequently in the fooder ***(Whitelaw,1977& Whitelaw,et al.,1979)***.From the stand point of view, obvious clinical diseases resulting from serious nutritional deficiencies have been easily recognized, but sub clinical cases caused by mild deficiencies or imbalance in mineral intake are difficult to be detected and corrected, In El-wahat desert losing of health and economic efficiency of livestock were the main complain described by the owner. The health of the flock had been subnormal from 6 months ago, the goat stock had been reduced. The affected goat were showing variable signs of depraved appetite, poor growth, emaciation, and ill thriftness. the present study was undertaken to determine the proper cause of the observed unthriftiness in a goat herd at El wahate governorate.

History of affected flock concerning animal's data nutrition and management were recorded before the animals being clinically examined.

MATERIAL AND METHODS

A clinco – laboratory survey was conducted on 133 unthrifty 2-5 years old goats showing clinical signs of nutritional deficiency, particulary microelements. The animals were raised among large flock belonging to El-wahat breeding farm recently established at new reclaimed area. In El-wahat desert losing of health and economic efficiency of live stock were the main complain described by the owner. The health of the flock had been subnormal from 6months ago. And consequently the goat stock had been reduced. The affected goat were showing variable signs of depraved appetite, poor growth, emaciation, and ill thriftness. History of affected flock concerning animal's data nutrition and management were recorded before the animals being clinically examined. Twenty apparently healthy goat of the same ages were selected from another flock with no signs of apparent illness as proved by clinical and laboratory and grazing adjacent pasture which had not subjected to dressing of fertilizers were served as control.

Samples and methods:

Blood samples:

Two blood samples were collected from each examinated goat with and without anti coagulant at once. The anticoagulated blood samples were used to determine RBC_S, Hb, PCV and total and differential leucocytic count ***(Coles, 1986)*** while the other was under taken for separation of serum samples which used for determination of copper, zinc, iron and molybdenum concentration by using atomic absorption spectrophotometer ***(Cowell, 1973)(Calstorn, et al., 1988)***. Also serum total protein, albumin,

glucose levels and the activities of ALT and AST were estimated using test kits (Boehring corporation) with serum cortisol ***(Calstorn, et al., 1988)*** and cholesterol ***(Richmound, 1973)***.

Faecal samples and skin scraping:

Faecal samples and skin scraping were examined for determination of gastrointes- tinal parasites and dermatophytes and metazoan parasites respectively ***(Coles, 1986).***

Diet samples:

Two samples of herbage from both improved (by adding fertilizers) and unimproved (not dressed by fertilizeres) were collected and examined for copper, molybdeneum and sulphur determination ***(AOAC, 1975).***

RESULTS AND DISCUSSION

Clinical survey conduct on 133 unthrifty goat revealed variable degrees of poor growth and depraved appetite with previous history of loss of health and economic efficiency of the animals kept suggestive of nutritional analysis of herbage samples taken from improved and unimproved pastures for estimation of copper level indicated no significant difference between the two pastures as shown in Table (1) where the estimated copper content considered adequate for the requirement of goat. This result indicates may be attributed to secondary deficiency of copper as reported by ***(Underwood and Suttle, 1999)***. On the other hand the obtained results Table (1) showed that herbage of the improved pasture have high concentration of both molybdenum and sulphur two folds than that in unimproved one. The complex interrelationship between copper, molybdenum and sulphur in improved pasture denote that the

copper deficiency is caused by the relatively high concentration of molybdenum and sulphur in the herbage which effectively reduce the availability of dietary copper for the affected goat. In this regard molybdenum and sulphur react to form tetra thio molybdates that then react with copper and particulate matter in the rumen, resulting in the formation of highly stable compounds that can not be digested or absorbed ***(Allen and Gawthoren, 1987)*** similar results were previously recorded ***(Ward, 1979)*** where the study proved that high molybdenum intake often lead to secondary copper deficiency even when copper content is quite, and the effect can be prevented by increasing copper intake.The author recorded that the critical ratio of Cu to Mo in feed is 2:1, with 5:1 recommended for grazing goat reflected clearly the effect of this high molybdenum inducing copper deficiency. This findings coincided with those previously mentioned ***(Whitelaw, et al., 1983)*** in similar conditions. Also a decrease in blood serum zinc was recorded in goat suffering from copper deficiency when compared with corresponding values in clinically healthy ones. Such decrease may be attributed to loss of appetite ***(Taha et al., 1993 and Mandour, 1991)***. Contrary to the present results antagonism between zinc and copper was recorded ***(Schwarz and Kirchgessner, 1979)*** where they inhibit the absorption of each other. It has been reported that zinc would interfere with copper metabolism. Also the blood serum iron in goat, Suffering from copper deficiency behaved highly significant decrease (P<o.o1>) when compared with those clinically healthy ones. Similar results ***(Georgievskii, 1982)*** proved direct interaction between copper and iron in their formation of haemoglobin. As copper is essential for iron level,so,iron decreased in copper – deficent animals ***(Nabila,1983)*** it has been proved that copper deficiency results in

decreased iron content in the body and decreased its mobilization from the tissues ***(Bath, et al.,1985)*** a fact which is clearly evident in the present study.

On the other hand a highly sigmficant increase (P<o.o5)was existed in blood serum molybdenum level of goat suffering from copper deficiency in Table (2)when compared to clinically healthy ones. Similar results were previously clinically obtained ***(Ali, 2000)*** such elevation cleared the antagonist relationship between copper and molybdenum which was previously described ***(Dick,et al., 1975& Huisingh et al., 1976).***

Results concerning haematological profile of unthritly goat which presented in Table (3) reveald significant statistical (P<O.O5) depression in total RBC_S count , hemoglobin value, MCHC, with no significant alterations in total and differential leucocytic count with the exception of lymphocytes which revealed a significant decrease may be due to the high cortisol level (Table 4) that cause dissolution of this cell. These results revealed generally , a coexistence goat based on the role of copper in the production of hemoglobin through the reutilization of iron liberated from normal break down of erythrocytes ***(Radostitis et al ., 1995)*** .

Data repersinting serum biochemical profile are presented in Table (4) Total protein and albumin decrease showed in the unthrifty goat compared to serum glucose level in goat suffering from copper deficiency was significantly (P<O,O5) decreased compared to that clinically healthy ones this may be attributed to the fact diseased status leads to anorexia and depraved metabolic processes which consequently reflected up on

glucose metabolism and its level ***(Coles, 1986)***. Results of the present study showed that the serum total cholesterol was decreased in unthrifty group as compared to healthy ones (Table 4). This findings were similar to those previously reported ***(Hannan,et al., 1980)*** which proved that reduction in serum choleslerol level is common in copper deficient animals and may reflect either reduced feed intake or early hepatic damage ***(Ulvund, 1990)***. The high values of serum cortisol reported in Table (4) may be attributed to hypocuprosis via influencing the adrenal cortex.

Abraham and Evans. (1974) stated that copper deficiency altered the content of the adrenal gland.

Regarding ASt and AlT activities, significant increase was noticed in serum of unthrifty goat.This increase may be due to alteration in the metabolic rate which accompanied copper deficiency. Previous findings observed eelevation of enzymes in the blood of goat fed copper deficient diet indicating hepatic disfunction ***(Ulvund,1990; Sutherland, et al., 1979 and Fell, 1981).***

Generally it could be concluded that, more copper supplementation is needed to overcome the antagonistic interaction with dietary molybdenum when goot raised intensively in El-Wahate governorate.

Table (1): some trace element Contents in improved & un improved pastures.

	Copper mg/kg	Molybdneum mg/kg	Sulphur%
Improved pasture	7.41/±0.36	5±0.26**	0.56±0.14**
Unimproved pasture	6.66±0.13	0.90±0.01	0.20±0.01

** Highly Significant (P<0.01)

Table (2): some serum trace elements in healthy and unthrifly goats.

	Copper/ug/100	Zinc/ug/100	Iron/ug/100	Molydenum/ mug/100
Healthy goat	99.06±03	75.6±05	140±0.1	53±2.9
Unthriply goat	74.39±1.2***	50.9±2.1***	98.8±3.1***	109±3.2***

* healthy goat -Fed on unimproved pasture. * unthrifty goat- Fed on improved pasture

Table(3): haemogram of the unthrifly and healthy goats.

	Healthy goat	UN healthy goat
T.RBC$_S$ 10 Cu ml	7.8±0.46	5.6±2.1
.PCv %	32.6±±0.7	30.8±1.5
Hb g/dl	9.3±0.12	8.8±0.46*
MCV(Cu)	46.05±0.42	52.3±0.8
MCH (ug)	13.1±0.2	11.58±0.8
MCHC %	28.3±0.07	25.05 ±0.31*
.T.WBC$_S$ 10 Cu ml	11.34±0.2	9.05±0.1
Neutrophils %	32.46±1	37.7±0.12
Eosino phils %	7±0.41	5±0.24
Baso phils %	0.46±0.019	0.09±0.01
lymphocytes %	55.0±2	48.6±2.9*
Monocytes %	4.9±0.41	6.5±0.51*

Table (4):

	Healthy goat	Unthrifty goat
T.Protein g/dl	7.18±0.62	6.48±1.8
Albumin g/dl	3.78±1.01	2.5±0.3
Globulin g/dl	3.4±1	3.8±0.23
A/G ratio %	1.08±0.04	0.63±0.01
Glucose mg/ 100	64.6±1.03	46.4±2.3
Cholestrol mg/ 100	108±0.19	94.5±3.3
AST lu/l	39.3±0.9	75±2.1
ALT lu/l	13±1.1	18.4±2.1
Cortisol	6±0.12	9±1.2

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