

EVALUATION OF SOME MINERAL IN SHEEP IN BASRA

Bahjah ghassan

Israa abdul wadood

Internal and Preventive Medicine ,Collage of Veterinary Medicine ,Univrsty of
Basrah,Basrah, Iraq.

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ABSTRACT

The present study was conducted in Basra province to evaluate of some minerals (copper,, zinc and cobalt) in sheep. The study constituent examination of 1400 sheep and 200 of it showed sings of mineral deficiency and 25 as a control, the study include: clinical, hematological examination, and level of serum(copper, zinc, and cobalt).

A number of 200 (14.2%) sheep revealed a clinical signs of mineral deficiency from total of (1400) sheep which were clinically examined in this study, And the study showed that the values of copper, zinc, and cobalt in serum were significantly low ($0.15\pm 0.03\text{ppm}$, $0.73\pm 0.35\text{ppm}$, $0.57\pm 0.12\text{ppm}$). and the most important clinical signs presented by alopecia (47.5 %), parakiratosi (18%), diarrhea (11.5%), pale mucous membrane (49%), lacrimation (6%), ataxia (4%).

Also the study reveal that the body temperature within normal ($39.47\pm 0.33\text{ C}^\circ$), but increase of pulse rate, and respiratory rate in affected animals were ($90.48\pm 4.53\text{Min}$, $33.99\pm 0.29\text{Min}$) respectively.

And the study showed that the RBCc of affected sheep significantly low ($6.57\pm 0.10 *10^6/\text{ml}$), also the PCV, Hb, MCV, MCH, were significantly low ($19.75\pm 0.24\%$, $6.88\pm 0.11\text{ g/L}$, $31.07\pm 0.49\text{ fl}$, $11.06\pm 0.53\text{ pg}$) respectively, whereas MCHC in affected sheep was significantly high ($34.92\pm 0.45\%$) and the mean of WBCc of affected sheep were($6.43\pm 0.1110^3/\text{ml}$) and there is no significant different when compared with control.

INTRODUCTION

Living organism need mineral as well as essential nutritional element to continue their normal development (1). In number of diagnostic situation, analyzing

for trace minerals have been fruitful in determining potential sources of herd disease problems and should be considered in appropriate situation (2).

Copper is an essential nutrient in sheep, readily available in the diet and rapidly absorbed through the stomach and duodenum. And when it incorporate into specific cuproenzymes, copper serves as a critical cofactor, catalyzing. The facile electron transfer reactions required for cellular respiration, iron oxidation, pigment formation, neurotransmitter biosynthesis, antioxidant defense, peptide amidation, and connective tissue formation (3).Copper deficiency induced hypo chromic macrocytic anemia (4).

Zinc essential for the function of more than 200 enzymes, zinc containing enzymes are found in all of the major metabolic pathways involved in carbohydrate, lipid, protein, and nucleic acid metabolism (5), zinc also plays a role in maintaining hoof tissue through stimulation of growth of epithelial cells, production of keratin, improved wound healing and improved cellular integrity (6).

Ratio of copper to zinc, potentially reflecting changes indicative of an acute phase inflammatory response,(7, 8).

The trace element; cobalt is a dietary essential element for ruminants, allowing synthesis of vitamine B12 is cofactore for two enzymes, methyl malonyl – CO A mutase and methionine synthase. ruminant normally do not have any dietary sours of vitamin B12 , therefore their supply of this vitamin has to be ensured by continues adequate supply of dietary Co (9). Therefore, Vit.B deficiency can be induced by long-term consumption of Co-inadequate diets.

The clinical signs of cobalt deficiency are non-specific but lambs are particularly susceptible, exhibiting loss of appetite, growth retardation, debility, emaciation and a watery discharge from the eyes(10). The present study conducted to estimation clinical, hematological, and serum level of copper, zinc, and cobalt. In ewes suspected to be suffer from copper, zinc, and cobalt deficiency in Basra province.

MATERIAL AND METHODS

The study conducted in Basra province during 2013, the area of the study is divided into north, east, west, and south region.

16 herds of sheep consisting of (1400) affected sheep were examined in Basra province. Among these sheep a total of 200 sheep were suspected with mineral

deficiency {north, east, west, and south} 50 animals from each area and 25 normal sheep used as a control.

A clinical examination was performed on all sheep and included examination of the body temperature, respiratory rate, heart rate and clinical Signs of deficiency.

Blood samples were taken with and without anticoagulant from the jugular vein for hematological and trace element analysis.

Value of erythrocyte (RBCc), packed cell volume(PCV), hemoglobin(Hb), and total leukocyte count(WBCc) according to (11) .

Serum samples were analyzed for copper, zinc and cobalt contents by using an atomic absorption spectrophotometer. This technique was preferred because it was rapid, simple and accurate.(12)

The absorbance of copper , zinc and Cobalt in standards and samples solutions were measured by flame atomic absorption spectrophotometer (FAAS) under conditions was described by (13) .

The significance of variation in the various values of sheep with mineral deficiency and those of normal control sheep were analyzed statistically using SPSS version 11.5, (14).

RESULT AND DISCUSSION

Body temperature, heart rate and respiratory rate were recorded in animals in different area of the study, body temperature similar in both group (control and in mineral deficiency animal), while respiratory and pulse rate high in affected animal ($90.48 \pm 4.53 \text{ Min}$, $33.99 \pm 0.29 \text{ Min}$) respectively Table (1).

Table (1) : mean value of body temperature, heart rate and respiratory in sheep affected with mineral deficiency.

Parameters	Control	Affected sheep	Affected sheep in Basra province region			
			North	East	West	South
			Mean ±SE	Mean ±SE	Mean ±SE	Mean ±SE
Temp.C°	39.45± 0.80	39.47±0.33	39.47±0.63	39.47±0.74	39.52±0.56	39.41±0.69
P.R. /Min	76.60±0.68	90.48±4.53	102.26±18.12	87.74±0.90	86.6±0.69	85.32±0.95
R.R./ Min	28.76±1.07	33.99±0.29	34.42± 0.47	33.98 ±0.80	34.32±0.48	33.26±0.52

There was no significant difference in temperature between control and deficiency sheep, this generally occurs in chronic cases. the same finding were recorded by(15, 16).

Respiratory and Pulse rates were higher in affected sheep than in control. this result similar to result of (16, 17.)

Kusiluka & Kambarage (18) explained that the increase in respiratory and pulse rates with mineral deficiency occur to compensate the hypoxia and anemia which resulted from copper or zinc deficiency in order to support cells with oxygen which effect from hypoxia because the decreased in RBCc , which appear as a pale mucus membrane and the loss of natural light pink color as a result of anemia associated with copper deficiency (19) .

Table (2) show the clinical signs in sheep which suspected suffer from some miner deficiency alopecia (47.5 %), parakeratosis (18 %), diarrhea (11.5 %), pale mucus membrane (49 %), lacrimation (6 %), ataxia (4 %).

Table (2) Clinical signs of sheep affected with Cu, Zn and Co deficiency.

Signs	No. of affected sheep	(% of affected sheep)	Cu ppm	Zn ppm	Co ppm
			Mean \pm SE	Mean \pm SE	Mean \pm SE
Alopecia	95	47.5	0.15 \pm 0.03	0.71 \pm 0.03	0.52 \pm 0.01
Parakeratosis	36	18	0.14 \pm 0.00	0.77 \pm 0.05	0.43 \pm 0.00
Diarrhea	23	11.5	0.13 \pm 0.00	0.77 \pm 0.06	0.39 \pm 0.00
pale M.M	98	49	0.15 \pm 0.00	0.73 \pm 0.03	0.56 \pm 0.01
Lacrimation	12	6	0.12 \pm 0.00	0.82 \pm 0.09	0.36 \pm 0.00
Ataxia	8	4	0.12 \pm 0.01	0.76 \pm 0.12	0.35 \pm 0.00

There were 200 (88.8%) animals showed the following clinical signs of mineral deficiency ; alopecia , parakeratosis, diarrhea, pale mucous membranes, lacrimation and ataxia. Similar signs were recorded by (20, 21, 1, 16).

Primarily, wool abnormalities were usually related to deficiency of copper, zinc and cobalt (Church and Pond, 1988).

Alopecia and steely wool might attributed to defective keratinization. The mechanism of alopecia in zinc deficient animal might be contributed to the reduction of the follicular epithelium capacity to produce a fiber (22). Alopecia was the most frequent sign in sheep with zinc deficiency.

Moreover, parakeratosis might be attributed to the importance of zinc as an activator of some enzymes contributed in carbohydrate, lipids, protein and nucleic acid metabolism (23, 24). The clinically observed parakeratosis and in some cases hyperkeratosis are the main lesions. These pathological changes have been attributed to the involvement of zinc with cell replication in the skin (25).

Diarrhea occurs when levels of copper, zinc and cobalt fall to (0.13 \pm 0.00, 0.77 \pm 0.06, 0.39 \pm 0.00) respectively, (26,27).

Diarrhea is usually a major clinical finding in secondary copper deficiency associated with molybdenosis, and may occur due to the atrophy of intestinal villi. The inhibitory role of copper in the regulation of intestinal motility leads to disturbances in the gastrointestinal motility.

A number of affected group showed signs of enzootic ataxia when level of minerals in serum was (0.12 ± 0.01) . Enzootic ataxia, lack of balance and atrophy of hind legs with the evidence of the neurological signs of sheep were mentioned by (28) and who discussed that the deficiency of copper in the diet causes a damage of nerves due to its role in the synthesis of phospholipids, and it is due to deficient myelination in the spinal cord, and there are also lesions in parts of the cerebral white matter and brain stem (28).

Red blood cell of affected sheep were $(6.57 \pm 0.10 * 10^6/\text{ml})$; RBCc of affected sheep in north of Basra were $(6.75 \pm 0.25 * 10^6/\text{ml})$, in east $(6.37 \pm 0.16 * 10^6/\text{ml})$, in west $(6.47 \pm 0.22 * 10^6/\text{ml})$, and in south were $(6.69 \pm 0.20 * 10^6/\text{ml})$. The RBCC was significantly lower ($p < 0.05$) in affected sheep than in control sheep, hemoglobin of affected sheep were $(6.88 \pm 0.11 \text{ g/L})$. The Hb of affected sheep in north of Basra were $(7.05 \pm 0.27 \text{ g/L})$, in east $(6.46 \pm 0.14 \text{ g/L})$, in west $(7.04 \pm 0.22 \text{ g/L})$, and in south $(6.97 \pm 0.22 \text{ g/L})$. Hb was significantly lower ($p < 0.05$) in affected sheep than in control, and PCV of affected sheep were $(19.75 \pm 0.24 \%)$, PCV of affected sheep in north were $(19.88 \pm 0.48 \%)$, in east $(19.62 \pm 0.45 \%)$, in west $(20.26 \pm 0.55 \%)$, and in south $(19.24 \pm 0.42 \%)$, PCV was significantly lower ($p < 0.05$) in affected sheep than in control sheep.

WBCc of affected sheep were $(6.43 \pm 0.11 * 10^3/\text{ml})$, the WBCc of affected ewes in north of Basra were (6.55 ± 0.20) , in east (6.18 ± 0.22) , in west (6.33 ± 0.21) , and in south (6.67 ± 0.23) . From the study WBC was similar in control and sheep affected with mineral deficiency, there was no significant variations ($p > 0.05$) table (4)

Table(4): Hematological values of normal control sheep & affected with minerals**Deficiency**

Parameters	Control	Affected sheep	Affected sheep in Basra province region			
			North	East	West	South
			Mean ±SE	Mean± SE	Mean ±SE	Mean ±SE
RBCc10 ⁶ /ml	7.86±0.31	6.57±0.10	6.75±0.25	6.37± 0.16	6.47±0.22	6.69±0.20
PCV. %	25.00±0.56	19.75±0.24	19.88±0.48	19.62±0.45	20.26±0.55	19.24±0.42
Hb g/L	8.86±0.33	6.88±0.11	7.05±0.27	6.46±0.14	7.04±0.22	6.97±0.22
WBCc10 ³ /ml	6.72±0.19	6.43±0.11	6.55±0.20	6.18±0.22	6.33±0.21	6.67±0.23

Table (5) reveal that the Mean corpuscular volume MCV of affected sheep were (31.07±0.49 fl) , the MCV of affected sheep in north of Basra were (30.60±0.98 fl) , in east (31.55±0.94 fl) , in west (32.42±1.07 fl) , and in south (29.72±0.94 fl) . The MCV of affected sheep was significantly lower than control sheep (p<0.05) . Also the Mean corpuscular hemoglobin MCH of affected sheep were (11.68±0.53 pg) . the MCH of affected sheep in north of Basra were (10.59±0.25pg) , in east (10.35±0.29 pg) , in west (11.06± 0.33 pg) , and in south (10.70±0.38 pg) . The MCH of affected sheep was not significantly different than control sheep (p>0.05). And the Mean corpuscular hemoglobin concentration (MCHC of affected sheep were(34.92±0.45 %) . The MCHC of affected sheep in north of Basra were (35.58±1.20 %) , in east (32.83±0.60 %) , in west (34.80±0.74 %) , and in south (36.45±0.93 %) . The MCHC was significantly high (p>0.05) in total affected sheep than in control sheep.

Table (5) : RBC indices of control sheep & affected with minerals deficiency

Parameter s	Control	Affected sheep	Affected sheep in Basra province region			
			North	East	West	South
	Mean± SE	Mean± SE	Mean ±SE	Mean ±SE	Mean ±SE	Mean ±SE
MCV fl	33.57±1.72	31.07±0.49	30.60±0.98	31.55±0.94	32.42±1.07	29.72±0.94
MCH pg	11.68±0.53	11.68±0.53	10.59±0.25	10.35±0.29	11.06± 0.33	10.70±0.38
MCHC %	36.46±1.68	34.92±0.45	35.58±1.20	32.83±0.60	34.80±0.74	36.45±0.93

From the present study the result of blood picture indicate a significant variation of erythrocytic count and significant decrease values of packed cell volume and hemoglobin , This decrease might be due to disturbance in the regular metabolism of iron as copper deficiency decreases the absorption of iron, releasing of iron from body stores and utilization in hemoglobin synthesis (4) ,this result agree with those reported by (29,30, 16).

Values of total leucocytic count showed a non-significant change, that mean most affected sheep in chronic state (21). This result was coincided with those of (17, 15, 16).

The present study reveal that the values of copper in serum of affected sheep were (0.15±0.03 ppm), the values of copper in serum of affected sheep in north of Basra were (0.13±0.04) , in east (0. 16±0. 52 ppm) , in west (0.17±0.09 ppm) , and in south (0.14±0.04 ppm) table (6) .

Also table (6) show values of zinc in serum of affected ewes were (0.73±0.35 ppm), the values of zinc in serum of affected sheep in north of Basra were (0.74±0.06ppm) , in east (0.79±0.07 ppm) , in west (0.68±0.06ppm) , and in south (0.72±0.08 ppm).Also the study show values of cobalt in serum of affected sheep were (0.57±0.12 ppm), the values of cobalt in serum of affected sheep in north of Basra were (0.40±0.07) , in east (0.73±0.05 ppm) , in west (0.63±0.06 ppm) , and in south (0.52±0.04 ppm) , copper, zinc, and cobalt value were significantly low ($p<0.05$) in affected sheep than in control group.

Table (6): serum value of cu, zn and Co in sheep affected with mineral deficiency and control.

Parameter	Control	Affected sheep	Affected sheep in Basra province region			
			North	East	West	South
			Mean± SE	Mean± SE	Mean± SE	Mean± SE
Cu ppm	0.4±0.18	0.15±0.03	0.13±0.04	0.16±0.52	0.17±0.09	0.14±0.04
Zn ppm	1.09±0.59	0.73±0.35	0.74±0.06	0.79±0.07	0.68±0.06	0.72±0.08
Co ppm	0.78±0.20	0.57±0.12	0.40±0.07	0.73±0.05	0.63±0.06	0.52±0.04

Values of copper in serum showed significant variation $P < 0.05$ when compare control and affected sheep (0.4 ± 0.18 ppm; 0.15 ± 0.03 ppm), this result was agree with those of (31, 28, 32). which indicated that value of copper in serum decreased in animal which supported by a low concentration diet or soil, The values of Zinc in serum showed significant variation $P < 0.05$ in which a clinical sings of mineral deficiency reported .zinc deficiency result in a decreased feed intake ,This could be due to the facts that pastures rarely contain zinc $< 20 \text{ mg kg}^{-1}$ DM and that sheep are able to absorb zinc very efficiently at low intakes (33). Among factors that predisposes sheep to zinc deficiency are increased calcium and phosphorus intake (decreases zinc absorption), diets rich in legumes (high calcium) or high-phosphorus grain supplements, elevation of soil pH above 6.5 and increased soil fertilization with nitrogen and phosphorus (16)

Values of cobalt in serum showed a significant variation ($P < 0.05$). (1) Showed a deficiency of cobalt in sheep and attributed that to the deficient level of cobalt in the diet especially when livestock are depending on forages those originally receiving a limited amounts of cobalt from soil. Whereas (34) showed that related of deficiency in cobalt to the interaction of minerals although if cobalt is abundant.

تقييم بعض المعادن في الأغنام في محافظة البصرة

بهجة غسان إسرائ عبد الودود

فرع الطب الباطني والوقائي،كلية الطب البيطري، جامعة البصرة ، البصرة ، العراق .

الخلاصة

أجريت الدراسة الحالية لتقييم بعض المعادن في الأغنام المصابة بنقص المعادن في محافظة البصرة. شملت الدراسة فحص 1400 رأس من الأغنام أظهرت 200 حيوان علامات سريريته للإصابة بنقص المعادن و 25 حيوان سليم سريريا عدت كمجموعه سيطرة، شملت الدراسة إجراء الفحص السريري والفحوصات الدموية وكذلك قياس مستوى النحاس والزنك والكوبلت في مصل الأغنام.

حيث أوضحت الدراسة إن 200 (14.2%) رأس من الغنم أظهرت علامات سريريته لنقص المعادن من أصل 1400 تم فحصها سريريا، وتمثلت أهم العلامات ألسريته ب (تساقط الشعر، 47.5 %) ، فرط التقرن (18%) ، إسهال(11.5%)، شحوب الاغشية المخاطية (49%) ، تدمع العين(6%) ، والترنج (4%) . كذلك أظهرت هذه الدراسة أن معدل درجات الحرارة كانت ضمن الطبيعي (39.47 ± 0.33) ، بينما هناك زيادة في معدلات النبض ، والتنفس (، 90.48 ± 4.53 و 33.99 ± 0.29) على التوالي.

إن نسبة كريات الدم الحمراء كانت منخفضة معنويا في الحيوانات المصابة وبنسبه (6.57 ± 0.10 $10^6/ml$ *) وكذلك انخفاض معدل حجم الكريات المضغوطة، خضاب الدم، متوسط الحجم الكريبي، ومتوسط الهيموكلوبين الكريبي(19.75 ± 0.24 % ، 6.88 ± 0.11 g/Ll ، 31.07 ± 0.49 fl ، 11.06 ± 0.53 pg) على التوالي، بينما بالنسبه لمتوسط تركيز الهيموكلوبين الكريبي مرتفعة معنويا في الحيوانات المصابة وبنسبه (34.92 ± 0.45 %) .

بينما لم يكن هناك فرق معنوي في معدل كريات الدم البيضاء مقارنة بمجموعه السيطرة ($6.43 \pm 0.11 10^3/ml$) اما بالنسبة لمعدل تركيز النحاس، الزنك، والكوبلت في مصل الاغنام المصابه منخفضة معنويا مقارنة بمستويات السيطرة وبالمعدلات التاليه (0.15 ± 0.03 ppm ، 0.73 ± 0.35 ppm ، 0.57 ± 0.12 ppm) على التوالي .

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