TOXICO EPIDEMIOLOGY OF LEAD, NICKEL AND CADMIUM LEVELS IN SHEEP SERUM OF AL BASRAH PROVINCE

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ABSTRACT

The comparison toxico-epidemiological study designed to evaluate the Lead, Nickel and Cadmium levels in healthy sheep of different regions in Al Basrah province and compared with sheep from Animal Farm of Agriculture College /University of Basrah(as control group). Sixty three adult male sheep were tested for the study (6 animals for each region). Blood samples were collected from each ram, the Pb, Ni and Cd values were measured. AST, ALT and creatinine values were also determined. The results revealed to high increase levels of Cd, and Pb concentration among the different regions and compared with control rams values. There were no significant differences in the transaminase enzymes activity and creatinine concentration among the animals tested. In spite of the rise in trace minerals values but it did not threshold to harmful effect on rams' body physiology.

INTRODUCTION

During the 1980s, many studies found that the level of trace metals in Basrah were much lower than those reported at heavily contaminated sites in the world [1].The unpolluted nature of the environment in Basrah during the 1980s was concluded from the low trace metals concentration in sediments, fishes [2], and plants [3]. A study has done by [4] reported that, the level of trace metals in water, sediment, and soils in different Basrah regions was increasing

Basrah governorate is the second largest city of Iraq that has different oil industries and related services, also over 1624 factories, including 12 large industries are involved in the manufacture of a diverse array of chemical and industrial products that found in Basrah [5].

Trace minerals particles (Cadmium, Nickel and Lead) carried by air for long distances, before falling down in the ground or water land it binds strongly to soil particles and some of it dissolves in water. Trace minerals accumulate in the liver for a many years of exposure, and could affect the body physiology [6].

The presence of heavy metals in human and animal bodies always draws scientific concern as these are considered responsible for affecting health, especially in these days where the release of toxic wastes in the environment has been increased. The inadequate intake of trace elements by ruminants and the interrelationships of copper and selenium are of interest [7].

From the viewpoint of husbandry and the predisposition of species, sheep appears to be the most endangered animal [8].Same metals are essential for life, others have unknown biological function, either favorable or toxic, and some others have the potential harmful to produce disease. Those causing toxicity are the ones, which accumulate behavior in the body through food chain, water and air [9].

Aim of the study:

The present study designed to evaluate the level of trace mineral in the blood of sheep as indicator for pollution in Basrah province and\or deficiency factor that effect on animal health especially on liver and kidney function.

MATERIALS AND METHODS

These study was includes 36 healthy rams aged between (10-12 month) grazed in five different regions in Basrah (6 for each region) Shatt Alarab, Abo Alkhaseeb, Mudina, Hartha, and Zubair, while 6 rams fed on concentrated feed in Agriculture college, animal Farm . The rams were selected randomly. Blood samples were collected by vein puncture from each ram 10 ml of blood and directly centrifuge with 3000 rpm for 5 minutes. Supernatant were separated and divided into two parts to determined Pb,Ni and Cd levels and biochemical enzymes activity and creatinine.

The first part prepared for digestion by added of 2ml of Nitric acid (HNO_3) and then 1 ml of perchloric acid and left for one hour after that it embedded in Hydrochloric acid (HCl) to become ready for trace elements measurement by Atomic absorption spectrophotometer device [10]. Serial dilution of Lead 5,10, 20, 30, Mg/100ml. Nickel 5, 10, 15, 20 Mg/100ml and Cadmium 5, 10, 20, 30 Mg/100ml; standard solutions (reagent blanks) was read by Atomic absorption spectrophotometer (AAS) and their calibration curves were plotted for metals standard solutions . All blood samples were analyzed for AAS. The GOT and GPT activities for liver functions determined by using (Biomeghrib Kit) and creatinine determined by using of (Biolab kit) and read by spectrophotometer at 550 nm wavelength. The statistic of data was analyzed by program of SPSS V.13 program. A value of $p \leq 0.05$ was considered statistically. Variable are mentioned by mean ± SE.

RESULTS AND DISCUSSION

As shown in the table (1) there were a significant increase ($p \leq 0.05$) in trace of minerals;Pb and Cd concentration among the serum of rams in Shat Alarab (0.01 and 0.013 mg/l respectively), Abo Alkhaseeb (0.008 and 0.014 respectively) as compared with control group values(0.006 and 0.011mg/l respectively) and the other explore areas (Hartha 0.005mg/l Pb and 0.011mg/l Cd ,Mudina 0.005 mg/l Pb and 0.010 mg/l Cd and Zubair 0.006 mg/l Pb and 0.011mg/l Cd), while the Ni values appear no significant ($p \leq 0.05$) among the serum of rams in Mudina city shows values significantly ($p \leq 0.05$) less than control and the other areas values. Some evidences had been reported by [11] that the soil and the air of Basrah province are polluted with trace mineral.. Whereas other study has done by [12] indicated to high risk of Al Zubair city pollution due to the industries and manufactories around this area. The results of the present heavy metal traces study referred to the rise in Shatt Alarab and Abo Alkhaseeb area in Pb and Cd values due to the increased pollutant sources a like human settlement in these certain areas as well as private factories and car exhaust which were lead to increased levels of exposure. Sheep are able to adapt on marginal areas by using low-quality resources for maintenance, which cannot be used by other domestic animals, due to their structural characteristics; sheep capable to live in a very unsuitable conditions. While heavy metal

uptake across plants essentially all of the sheep dietary constituents, whether they be metal ions, carbohydrates, fats, amino acids, vitamins, etc., will be effected [13]. Liver and kidney of the sheep are the most important organs of the metabolism and storage and these tissues can accumulate heavy metals elements at high levels [14], but the results of present study referred to insignificant differences of AST and ALT values of sheep for different areas of Basrah when compared with control sheep group values. The same following of the creatinine, that appeared insignificant differences among the rams of different areas of Basrah with the control ram group. These results confirmed that trace minerals concentration in Basrah did not reach to the toxic level to effect on sheep health.

Table (1) Trace mineral concentration (mg/L) in sheep serum of different area of Basrah(Mean ± SE)

Places	Pb	Ni	Cd
control	0.006± 0.0018b	0.005± 0.0009ab	0.011± 0.0012b
Shatalarab	0.01 ± 0.0025 a	0.006± 0.0005 a	0.013± 0.0014 a
Aboalkhaseeb	0.008± 0.0023 a	0.006± 0.0005 a	0.014± 0.0010 a
Hartha	0.005 ± 0.0019 b	0.005± 0.0014 ab	0.011± 0.0011 b
Mudina	0.005± 0.0012 b	0.003± 0.0010 b	0.010± 0.0017 b
Zubair	0.006± 0.0027 b	0.005± 0.0014 ab	0.011± 0.0025 b

Small letter referred to the significant value($p \leq 0.05$)

Table (2) Transaminases enzymes concentration and creatinine level of sheep from different district of Basrah (Mean ± SE)

Places	AST IU/L	ALT IU/L	Creatinine mg/dl
control	12.53±1.15	10.35±1.24	0.75±0.07
Shatalarab	13.3± 1.14	10.86± 0.92	0.72±0.09
Aboalkhaseeb	12.58± 0.90	11.02± 1.26	0.76±0.08
Hartha	12.5± 1.13	10.22± 1.22	0.74±0.08
Mudina	13.28± 1.14	11.36±1.31	0.68±0.07
Zubair	13.74± 1.18	11.86±0.96	0.74±0.09

قياس تراكيز الرصاص و النيكل والكادميوم لمصل ذكور الاغنام في مناطق مختلفة من محافظة البصرة

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الخلاصة

صممت التجربة لقياس تراكيز الرصاص والنيكل والكادميوم في ذكور الاغنام من مختلف مناطق محافظة البصرة ومقارنتها مع الاغنام المرباة في حقل كلية الزراعة الحيواني / جامعة البصرة (كمجموعة سيطرة). استخدم في هذه الدراسة 36 من ذكور الاغنام البالغة (6 اغنام لكل منطقة) . جمعت عينات الدم من الاغنام لقياس تراكيز الرصاص، النيكل والكادميوم، وكذلك قياس فعالية الأنزيمات الناقلة للامين (AST &ALT) وتركيز الكرياتينين .اظهرت النتائج زيادة معنوية ($p\leq 0.05$) في تراكيز الرصاص والكادميوم بين مناطق البصرة المختلفة مقارنة مع مجموعة السيطرة، بينما لم تسجل اي فروقات معنوية في قيم فعالية الانزيمات الناقلة للامين (AST & ALT) وتركيز الكرياتينين بين مختلف الحيوانات المدروسة ،وعلى الرغم من الزيادة في تراكيز العناصر المعدنية الثقيلة الا انها لم تصل الى التراكيز التي تؤدي الى تاثير مرضي في الاغنام المدروسة.

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