Assessment of serum values of copper in cross-breed cows in Sarab

Saied Razaghi[1*], Amir Parviz Rezaie Saber[2], Ali Hassanpour[2]

1- DVM, Faculty of Veterinary Medicine, Tabriz Branch, Islamic Azad University, Tabriz, Iran
2- Department of Clinical Science, Faculty of Veterinary Medicine, Tabriz Branch, Islamic Azad University, Tabriz, Iran
*Author for all correspondence: aprs_1352@yahoo.com

Abstract: The most common reason to assess the trace mineral status of ruminants is because performance is below expectation. Accordingly, the assessment is done to determine the presence or prevalence of nutrient deficiencies (or toxicities) within a population. Assessment also is done to evaluate efficacy of dietary supplementation or to compare available supplements. The aim of this study was to assessment of serum values of copper in cross-breed cows in east Azerbaijan province of Iran. In this study, 316 blood serums were obtained from cows growing in the pasture conditions were used as a material in 4 season of a year. The sera were extracted from the blood taken, and kept in the deep freeze in -20°C, until they are analyzed. The copper analyses in the serum were made with spectrophotometric method by Randox kit. The values found were evaluated by "t test". According to the table 1 and 2, mean value of copper and ceruloplasmin was 0.21±0.85 ppm and 0.91±3.74 mg/dl in understudying animals respectively. So, based on ANOVA comparative test, there was significant difference in serum values of copper and ceruloplasmin in term of seasons. According to the tables 3 and 4, the serum value of copper in pregnant and non-pregnant cows was 0.21±0.84 and 0.21±0.87, respectively. Also, the serum value of ceruloplasmin in pregnant and non-pregnant cows was 0.87±3.68 and 0.94±3.81, respectively. So, based on ANOVA comparative test, there was no significant difference in serum values of copper and ceruloplasmin in term of pregnancy. It has been thought that this study will fulfill an important gap, because of not to be present the normal value of serum copper belonging to the sanjabian races. It is known that the excess and insufficiency of trace elements cause some disorders and decrease in production. So in order to search the effects of these substances, the normal values should be known.
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1. Introduction

The living things, obtain the mineral substances of their body from air, water and soil on behalf of blants, depending on the conditions of the climate. Thats why the health of the organism is related to the soil on which it lives and the geological structure of the soil (Curthbertson, 1970). Since the trace elements are in lots of biomolecules such as hormon and enzyme and have an important role on growing, they should be found in the food of human being and animals (Underwood, 1971; Tietz, 1986; George and becking, 1976). The zinc having a role in various functions of organism is a trace element which is very important in the diagnosis of the diseases (Slater et al., 1971; Underwood, 1962; Torunoglu, 1981; Baysal, 1977). It was also recorded that it has some effect on the activity of insulin, GH, TSH, LH, FSH, ACTH (Baysal, 1977), in addition to its effect on the some enzyme such as; leucine amino peptidase (Wart and Lin, 1981), alkali phospatase (Jacob, 1973), carbonic anhidrase (Jacob, 1973; Urman, 1966; Antaplı, 1990), lactate dehidrogenase, ribonuclease (Jacob, 1973). The copper value in the blood serum differs, depending on the age of the animal, pregnancy and the absence of the copper in the diet (Ashton, 1970). The symptom of zinc and copper are associated with the enzyme defeats.

Polyfenol oxidase which has a role in the synthesis of melanine includes copper. The Acromatrichia is seen in the absence of melanin (Hall and MccHowell, 1973; Smith et al., 1973). Smith et al., indicated that the effects of zinc and copper on growing is due to on the mineralization of the bone and zinc has an active role on the metabolism of vitamin A and protein and zinc are needed in the blood for the mobilization of vitamin-A in the liver (Smith et al., 1973). Vural reported that, zinc has a role on the vitamin-C, metabolism and if there is high zinc in the diet, it increases the concentration of plasma of vitamin-C (Vural, 1981).

It is also reported that zinc and copper also limit the deposition of iron as ferritin by affecting the absorption of iron (Tietz, 1986; Wart and Lin, 1981). It is suggested that no ingestion of trace elements or in sufficiency of them, may be led to affects on animals and serious problems which may result with death (George and becking, 1976; Underwood, 1962). The insufficiency of trace elements, especially zinc and copper, stimulates the catabolism of protein, limits the biosynthesis of protein by making differences on the nucleic acid metabolism and as a

reslt of this effects, the regeneration and growing of the tissue is affected (George and becking, 1976; Slater et al., 1971; Riordan, 1976; Kirchgessner, 1971; Stephan, 1973; Karabıyıkoglu and Bor, 1988; Cin et al., 1978).

Cin et al., revealed that the feather is rough and mixed, and growing is less than the control group, in calves fed with feed including insufficient zinc (Cin et al., 1978). A group of researchers (Dalkılıç, 1982; Wart and Lin, 1981) reported some diseases that are seen with the paraketototic skin and the differantion of the colour of the skin and the dropping of skin around eyes, was related to the samples of the plant including insufficient zinc and copper that was given to the sheep. The aim of this study was to assessment of serum values of copper in cows in east Azerbaijan province of Iran.

2. Materials and methods

This study was conducted to measurement of copper in serum of cows during a year. In this study about 316 blood samples from apparently healthy cows were obtained and blood samples taken near the ice and sent to the laboratory and after serum preparation were freezing inside the micro tube. In this inspection, age, body condition score and Pregnancy status of animals was investigated. Simultaneous inspection of animals, attempting to obtain blood samples of 10 ml of jugular vein was done by venoject. In lab, blood samples centrifuged at 2000 RPM for 15 minute. Measurement of copper in serum was followed by spectrophotometric method. In this study to analyzing and comparison of data were used of ANOVA test and to evaluate the relationship between the variables together, correlation test was used (Yıldız and Bircan, 1991).

3. Results

According to the table 1 and 2, mean value of copper and ceruloplasmin was 0.21±0.85 ppm and 0.91±3.74 mg/dl in understudying animals respectively. So, based on ANOVA comparative test, there was significant difference in serum values of copper and ceruloplasmin in term of seasons.

Table 1: Frequency distribution of serum levels of copper in term of seasons

Season	No.	Mean (ppm)	Mean square between groups	Mean square within groups	F	P
Spring	91	0.21±0.79	0.323	0.043	7.51	0.000
Summer	60	0.27±0.85				
Autumn	99	0.17±0.85				
Winter	66	0.16±0.95				
Total	316	0.21±0.85				

Table 2: Frequency distribution of serum levels of ceruloplasmin in term of seasons

Season	No.	Mean (mg/dl)	Mean square between groups	Mean square within groups	F	P
Spring	91	0.907±3.47	6.54	0.77	8.44	0.000
Summer	60	1.13±3.78				
Autumn	99	0.78±3.69				
Winter	66	0.709±4.18				
Total	316	0.91±3.74				

According to the tables 3 and 4, the serum value of copper in pregnant and non-pregnant cows was 0.21±0.84 and 0.21±0.87, respectively. Also, the serum value of ceruloplasmin in pregnant and non-pregnant cows was 0.87±3.68 and 0.94±3.81, respectively. So, based on ANOVA comparative test, there was no significant difference in serum values of copper and ceruloplasmin in term of pregnancy.

Table 3: comparison of serum values of copper in term of pregnancy

Group	No.	Mean (ppm)	F	t	df	p-value
Non-pregnant	159	0.21±0.87	0.28	1.41	314	0.158
Pregnant	157	0.21±0.84				

Table 4: comparison of serum values of ceruloplasmin in term of pregnancy

Group	No.	Mean (mg/dl)	F	t	df	p-value
Non-pregnant	159	0.94±3.81	0.69	1.22	314	0.223
Pregnant	157	0.87±3.68				

4. Discussion and conclusion

Copper proteins have diverse roles in biological electron transport and oxygen transportation, processes that exploit the easy interconversion of Cu (I) and Cu (II). The biological role for copper commenced with the appearance of oxygen in earth's atmosphere. The protein hemocyanin is the oxygen carrier in most mollusks and some arthropods such as the horseshoe crab (Limulus polyphemus). Because hemocyanin is blue, these organisms have blue blood, not the red blood found in organisms that rely on hemoglobin for this purpose. Structurally related to hemocyanin are the laccases and tyrosinases. Instead of reversibly binding oxygen, these proteins hydroxylate substrates, illustrated by their role in the formation of lacquers. Copper is also a component of other proteins associated with the processing of oxygen. In cytochrome c oxidase, which is required for aerobic respiration, copper and iron cooperate in the reduction of oxygen. Copper is also found in many superoxide dismutases, proteins that catalyze the decomposition of superoxides, by converting it (by disproportionation) to oxygen and hydrogen peroxide. Several copper proteins, such as the "blue copper proteins", do not interact directly with substrates, hence they are not enzymes. These proteins relay electrons by the process called electron transfer.

Ozan, in his study, examining the zinc and copper levels between the healthy group of sheep and the group dropping its spring wool found that, the blood serum zinc level average of the healthy group was 27 ± 0.63 and the copper level was 33.72 ± 0.77 µg/100 ml and in the spring wool dropping group, it was respectively 14.45 ± 0.25 and 63.5 ± 1.17 µg/100 ml. This may be due to the conditions of the environment and the climate and especially the trace element concistency of the soil and to the various races of the sheep (Ozan, 1985).

It is reported that the level of plasma copper in sheep shows differences according to the level of the copper and antagonists (Pb, CaCO3, Zn, Mo, S) in the norishment, environment and seasons, drought and rain, and pregnancy (Chergariu, 1978). Lorentz and Gibb reported that the plasma copper concentration should be more than 50 µg/dl normally, concentrations below this signals hipocuprosis (Lorentz and Gibb, 1975).

Çamas reported that the serum copper concentration in normal Akkaraman sheep 95.22 ± 1.52 µg/100 ml (Çamas, 1974). Sina and Miller determined in their studies that serum copper value in the Daglıç sheep is 60, in Imroz sheep 99, in Kıvırcık sheep 73, in Merinos sheep 48 µg/dl (Sina and Miller, 1968). Sina also determined the average copper value in Kıvırcık sheep 93 µg/dl in on other study (Sina, 1967). It is also reported that the average copper concentration in Akkaraman sheep was 80.8 ± 1.41 µg/dl (Töre et al., 1978). Serpek in one of his studies determined the serum copper concentration in Daglıç, Imroz, Kıvırcık and Merinos sheep respectively as, 59.01 ± 2.37, 101.79 ±2.02, 83.40 ± 1.83 and 79.02 ± 2.19 µg/dl (Serpek, 1983).

It has been thought that serum copper concentration differs according to the environment.

Antaplı (Antaplı, 1990), in one of his studies the plasma zinc concentration in Merinos sheep 32,5-150 µg/100 ml.

It has been thought that this study will fulfill an important gap, because of not to be present the normal value of serum copper belonging to the sanjabian races. It is known that the excess and insufficiency of trace elements cause some disorders and decrease in production. So in order to search the effects of these substances, the normal values should be known. With this study determining the normal values of the copper element which have great importance on the growing of the animals in and around Kars that have a wide potential of stockbreeding, and finding that there aren't any great differences in sanjabian races, led to thought that this study will be useful in the diagnosis of lots of diseases and can light the way to the further coming studies.

References

1. Curthbertson D. Introduction to the symposium "Trace Element Metabolism in Animals" (Mills CF, Ed.) Livingstone, Edingburg and London 1970;1-2.
2. Underwood EJ. Trace element Metabolism in human and animal nutrition Academic Press. Inc New York 1971;pp:48-99.
3. Tietz NW. Textbook of Clinical Chemistry. 1986;975.
4. George C, becking G. Trace Element metabolism. The Medical Clinics of North America 1976;60.
5. Slater JP, Milduan AS, Loeb LA. Zinc in DNA polymenase Biochem. Biophs Res Commun 1971;44: 37.
6. Underwood EJ. Academic Press inc. New York 1962;48:156.
7. Torunoglu M. Meme kanserlerinde serum protein, Zn ve Cu degerleri. Acta Ohcologia 1981;1-4:17-20.
8. Baysal A. Beslenme. Hacettepe Üniv. Yay Ankara 1977;132:119.
9. Wart V, Lin SH. Metal Binding Stoishiometry and mechanism of metal Ion Modulation of the Activity of Porcine Kidney Leucine

Aminopeptidase. Biochemistry 1981;20:5682-5689.
10. Jacob RA. Textbook of clinical chemistry. Sounders 1973;1:1232.
11. Urman AK. Kuzularda enzootik ataksi hastalıgı üzerinde patolojik arastırmalar. A.Ü.Vet. Fak. Derg 1966;13:329-353.
12. Antaplı M. Koyunların kanında çinko seviyeleri ile karbonik anhidraz aktiviteleri arasındaki iliskilerin arastırılması. Doga-Tr. J Vet Anim Sci 1990;14:272-281.
13. Ashton WM. Trace elements in enzyme systems with special reference to deficiency of copper and cobalt in some animal diseases. Outlook on Agricalture 1970;6:95-101.
14. Hall GA, MccHowell J. Lesions produced by copper deficiency in neonate and older rats. Br J Nutr 1973;29:95-104.
15. Smith JC, Mc Daniel EG, Fau FG. Zinc a trace element essantial in Vit-A metabolism. Sci 1973;181:954.
16. Vural O. Fe eksikligi anemisi olan vakalarda serum Zn, Cu, Mg düzeyleri. Prof. Tezi. Atatürk Üniv Tıp Fak Erzurum 1981.
17. Riordan JF. Biochemistry of zinc. Med Clin N Amer 1976;60:661.
18. Kirchgessner M. Spurenelementgehalte (Fe, Mn, Cu, Zn, Co, Mo) des Weidegrases in abhangigkeit von Wachstumdaver und Vegetationsperiode. Das Wirthschaftseigene Futter 1971;17:179-189.
19. Stephan JK. Trace elements. J Nutr 1973;103:548-552.
20. Karabıyıkoglu A, Bor N. Cerrahi traumanın çinko ve bakır seviyelerine etkisi. Türkiye Klinikleri Tıp Bil Aras Derg 1988;6:3.
21. Cin S, Çavdar A, Arcasoy A. Degisik sosyo-ekonomik kosullarda çocuk ve gençlerde izelementlerin incelenmesi. Nuray Mat. Ank 1978;21.
22. Dalkılıç E. Larenks Ca'lı hastlarda Zn-Cn ve serum protein degerleri. Acta Oncological 1982;1-4:25-29.
23. Yıldız N, Bircan H. Uygulamalı Istatistik. Atatürk Üniv Zir Fak Yay Erzurum 1991.
24. Ozan S. Karacabey Merinos Koyunlarında Yapagı Dökümü ile Kanda Çinko Bakır Düzeyleri Arasındaki Iliskiler. Selçuk Üniv Vet Fak Derg 1985;1:133-142.
25. Chergariu S. Some factors affecting the inciden ce of zway back in lams: in proceeding of the 3 rd International Symposium on Trace Element Metabolism In man and animals. 1978.
26. Lorentz PP, Gibb FM. Ceruloplasmin activity as in indication of plasma copper levels in sheep. NZ Vet J 1975;23:1- 3.
27. Çamas H. Ankara ili dahilindeki bazı köylerdeki halk elinde bulunan Akkaraman koyunların kan serumu bakır degeri üzerindeki çalısmalar. Ankara Üniv Vet Fak Yay 1974;351.
28. Sina M, Miller TE. Biyokimya yönünden Türkiyedeki koyunların kan analizleri ve bilinen bazı hububatlarla meralardaki iz elementler üzerinde bir çalısma. Pendik Vet Bakt Aras Enst Derg 1968;3:126-145.
29. Sina M. Bir grup sıhhatli koyun ve keçide kan serumlarında Cu degeri üzerinde arastırma. Pendik Vet Bakt Aras Enst Derg 1967;1:72-77.
30. Töre IR, Sendil Ç, Can R, Ası T. Koyunlarda deneysel kronik Cu zehirlenmesinde bazı klinik, hematolojik ve biyokimyasal bulgular. Istanbul Üniv Vet Fak Derg 1978;2:47-69.
31. Serpek B. Koyun Kan serumlarında bakır ve seruloplazmin konsantrasyonları üzerinde çalısmalar. Istanbul Üniv Vet Fak Derg 1983;9(1):47-64..

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