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مستوى النحاس فى دم الأغنام والأبقار مع الاشادة بمستواه فى الجاموس المصرى

نبيلة جازية

استهدفت هذه الدراسة مناقشة مشكلة نقص النحاس فى الأغنام والماعز وشملت دراسة مستوى النحاس فى الخلايا وسوائل الجسم . كما أشارت الدراسة الى الأعراض الاكلينيكية التى تظهر على الأغنام والأبقار المصابة بنقص النحاس .

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COPPER STATUS AND ITS BLOOD LEVELS IN SHEEP AND CATTLE WITH SPECIAL REFERENCE TO EGYPTIAN WATER BUFFALOES

By

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SUMMARY

The present work discussed the problem of cupper deficiency in sheep and cattle. Thus the work included the analysis of serum activities in cells or biological fluids. The role of cupper in body metabolism was evaluated. Clinical signs of sheep and cattle suffering from copper deficiency were stated.

Marginal trace element deficiences are problems of increasing importance in developing as well as developed countries, since they are hampering animal productivity, fertility and resistance to diseases. The reasons for this unfortunate development are several, it might be a consequence of changed farming procedure or might be the results of a continously growing demand for higher productions which in turn increase the animal sensitivity ot inadequate diets (MOUSTAGAARD, 1977).

The criteria that determine the essentiality of any element are, first, repeated and significant responses in growth or health to dietary supplements of the element and this element alone, and second, development of a deficiency state on diets otherwise adequate and satiofactory. i e. containing all other known dietary essntials in adequate amounts and proportions and free from toxic properties (UNDERWOOD, 1971)

The mineral deficiency, might either be due to an actual lack of an element in the total diet or to inadequate availability of elements eventually caused by nutritional imbalances.

During the last decades, much more information has become available on the precise role played by trace elements in the maintenance of health and normal functions.

The aim of optimizing animal production systems of which the prevention of disorders is one aspect will need to include an increasingly accurate means for detection of deficiencies (WIENER 1978).

For such diagnostic purposes it becomes essential to use biochemical or physiological parameters for detection of trace element deficiencies in animals as analysis of blood plasma, hair, liver and other relevant tissues

As more and more trace element-containing or dependent enzymes are discovered, it seems evident that most of the known essential micro minerals exert their function through such biological catalyzer, (WEGGER, 1981)

So, the analysis of enzyme activities in cells or biological fluids opens great possibilities for detecting trace element deficiencies at any early stage.

Among trace elements, copper is one from eight essential micro minerals in animal nutrition.

The presence of copper in animal organism was demonstrated more than 100 years ago. Since, then a very large work has been done with view to ascertaining the bicohemical importance of this mineral to the animal organism

Hematopoiesis was considered to be the principal physiological activity involving copper until fluid studies with sheep & cattle in various parts of the world revealed wider functions of this element

BARBER et al , (1955) found that copper enhanced growth rate and food conversion efficiency and could be used as growth stimulating factor.

Copper is vitally concerned in the process of pigmentation and keratinization of woll (UNDERWOOD, 1962) it is essential for the formation of dihydroxyphenylalnine (DOPA) from tyrosine and further conversion to melanin Copper is also essential for bone formation, reproduction and myelination of the spinal cord.

As copper acts as a catalyst in the production of haemoglobin, facilitates the absorption of iron from

the gastro-intestinal tract and moreover plays an essential role in enabling iron derived from the breakdown of red blood cells to be used again in the formation of new cells, one should expect anaemia in connection with all kinds of copper deficiency (GUSTAV et al. 1960). They stated also that, the study of etiological factors in connection with the copper deficiency in domestic animals has revealed that it is necessary to differentiate between a real, simple or uncomplicated copper deficiency, due to a low content of the copper in the diet and a more or less "conditioned" copper deficiency, where conditioning factors are acting upon copper metabolism with the result that symptoms of copper deficiency are produced, although the diet is adequate in copper

The first indication of conditioning factors involved in hypocuprosis in cattle was the discovery of (FERGUSON et al. 1938, 1943 & 1945) that copper is able to cure the profused socuring occuring on "Tart", a herbege in Somerset in England, due to an exess of molybdenum in pasture. After that, it has been reported from many parts of the world.

As it was cited by (GUSTAV et al., 1960), different plant species have different capacities for absorbing minerals Clover is richer in copper than the grass species but, on the other hand, is also rich in molybdenum.

Newly absorbed copper is transported in the blood bound to albumin. It is however, well known from chemical analyses that most of the stable copper in plasma is bound to another protein called ceruloplasmin

The explanation for these apparently contradictory results was obtained in longer lasting experiments with ^{64}Cu & ^{76}Cu (EVANS, 1973). These studies showed that ingested copper rapidly concentrates in the liver where it is incorporated into ceruloplasmin which is subsequantly released to the plasma. Ceruloplasmin has enzymic properaties and acts as an oxidase towards polyamides and polyphenols. No definite physiological function has been ascribed to it although it has been postulated to control copper balance. The case for this is not entirely proved although it explains "Wilson's" diesease in the human which on this basis would be explained by low plasma ceruloplasmin levels favouring the pathological accumulation of copper in tissue (SCHEINBERG 1966).

TODD (1970) has showed that there are direct reacting copper with no oxidase activity and indirect reacting copper in ceruloplasmin and constitutes a large proportion of the total plasma copper (probably about 80%). It is not surprising therefore that highly significant correlations have been found between ceruloplasmin and various blood copper fractions such as plasma copper , serum copper and total blood copper

This has been shown to hold for various species. Correlation coefficient of 0.80 to 0.94 have been obtained between whole blood copper and ceruloplasmin (TODD 1970). These findings confirm, therefore, that ceruloplasmin estimation may be used as a rapid screening method for detecting copper deficiency.

The concentrations of copper in either whole blood or serum have been used for many years to assess the copper status of various animals and in particular to indicate deficiency status (THOMPSON and TODD, 1976)

Plasma copper does not increase following meals nor decreased during fasting. There are no significanct sex differences in whole blood or plasma copper in most species, but plasma copper is higher in human females than in males. Parasitic infestation interferes with copper absorption as it was reported in calves heavily infested with parasites, (UNDERWOOD 1971) & (EL-HETW, et al. 1975) in sheep suffering from mange and liver fluke infestation.

WIENER et al. (1970) stated that the concentration of copper in the blood of sheep was shown to have been affected by the breed, by cross breeding, by previous swayback history & by other factors as the age, live weight and lambing performance of the ewes. BUTLER and BARLOW (1963) reported that copper levels of young females pregnant for the first time fell more during pregnancy than did the levels of older ewes and that after parturition these levels did not rise as far as the older sheep. Whilst this would confirm to the idea that the physiological demands on young sheep during this period are greater than those on older ones. The reason why some classes of sheep apparently maintain copper levels in the blood on a more even level than others is a matter for speculation. One possible mechanism could be related to the amount of copper stored in other tissues, notably in the liver. It is generally considered that concentrations of copper in the blood of sheep,

below about 0.6 p.p.m. may be considered low and that normal range lies between 0.7 & 1.2 p.p.m., comparble to those have been reported by UNDERWOOD(1962) for mature healthy sheep.

In cattle, the copper in blood is normally divided approximately equally between cells and plasma or more accurately, the concentration of copper in whole blood is very similar to the concentration in plasma (EDEN, 1941 and McDOUGALL, 1947)

However, plasma copper is more labile than corpuscular copper and is more reliable indicator of changes in the copper status of an animal than whole blood copper. UNDERWOOD (1962) reported normal values ranged from 0.7-1.7 ug/ml of whole blood or serum for healthy cows.

Severe diarrhea, scouring disease associated with a low copper status of the blood and tissues of affected animals were recorded in different parts of the world.

In a study by (GUSTAV et al. 1960) they found the depigmentation of the hair around the eyes and on the cheeks was the first obvious symptom. The appetite was always reduced and sometimes combined with diarhea and the blood haemoglobin content was low when compared with the normal values cited by DUKE,(1955).

DYNNA (1963) described the depigmentation of the hair layer in animal reared on deficient areas at Norway as "copper spectacle" due to the localization of the fading to a ring around the eyes looks like a spectacle

A very little work has been done on the normal blood copper of different breeds of buffaloes In a trial done on forty Egyptian water buffaloes at the abbatior the plasma copper levels, measured by the spectrophoto metric method described by THOMPSON and BLANCHFLOWER 1971, ranged from 84 to 126 Ug/100 ml with an average of 104 ± 0.16 Ug/100 ml (NABILA GAZIA, unpublished data). These values are quite comparable with those reported by PATEL et al. (1971) and PANDF et al (1981) for Surti and Mehsani buffaloes. For the first (Surti buffaloes) the copper values as mg% of whole blood ranged from 0.098 to 0.108 with an average of 0.112 mg%, while for Mehsani buffaloes the values were ranging from 83.31 to 146 with an average of 105.88 Ug Cu/100 ml. serum.

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