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**EVALUATION OF SERUM VALUES OF COPPER AND COBALT IN HOLSTEIN
DAIRY COWS WITH SILENT HEAT**

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ABSTRACT

Minerals can be divided into two main categories, 1) macro-minerals and 2) micro or trace minerals. Macro minerals are minerals that are needed/required in relatively large amounts in comparison to micro or trace elements which are needed/required in relatively small amounts. In general macro minerals are required at concentrations greater than 100 ppm of the diet and are often expressed as a percentage of the diet while trace minerals are required at concentrations less than 100 ppm. The objective of present study was to evaluate of serum values of Copper and cobalt in Holstein dairy cows with silent heat. In present study, by referring to dairy farms of Tabriz, 30 cows with silent heat were detected. For this, after injection of vetaglandin at the dose of 2cc/case, estrus signs must be appeared maximum till 5 days. Blood samples were obtained from tail vein using Venoject and after centrifuging, serum was isolated and kept at -20°C. Then, serum values of Copper and Cobalt were measured using atomic absorption method and spectrophotometry. Data showed that serum mean value of Copper in control group was 63.85 µg/dl and in silent heat group was 54.45 µg/dl so that, there is statistical difference among groups (P<0.01). Also, serum mean value of Cobalt in control group was 16.17 µg/l and in silent heat group was 14.98 µg/l so that, there is no statistical difference among groups (P>0.05).

Keywords: Copper, Cobalt, Serum, Silent Heat, Dairy Cow

INTRODUCTION

Minerals can be divided into two main categories, 1) macro-minerals and 2) micro or trace minerals. Macro minerals are minerals that are needed/required in relatively large amounts in comparison to micro or trace elements which are needed/required in relatively small amounts. In general macro minerals are required at concentrations greater than 100 ppm of the diet and are often expressed as a percentage of the diet while trace minerals are required at concentrations less than 100 ppm [1]. Macro minerals such as phosphorus, potassium, sulfur, magnesium, sodium, and chloride and trace minerals such as copper, zinc, iodine, manganese, selenium, cobalt, and iron are considered essential for dairy cow [2]. Macro minerals have important physiological functions in dairy cow and therefore must be supplemented to dairy cow diets when forages or rations are deficient or have the incorrect proportions of macro minerals. If not supplied in the correct amounts and ratios, specific metabolic diseases and/or toxicities can be produced. However, several of the mineral imbalances commonly observed in dairy cow are due to imbalances in trace minerals. To promote normal tissue growth, homeostasis, enzyme function, cell regulation, and immune function, it is imperative that trace minerals

be maintained within narrow concentrations within the body [1, 3]. Trace mineral deficiencies, toxicities, and imbalances require the animal to metabolically compensate for the nutrient deviation [1, 3]. In doing so, certain metabolic diseases can be produced and overall animal performance can be depressed [1, 3]. Focusing this article on trace minerals involved in dairy cow production by no means indicates that macro minerals (phosphorus, calcium, potassium, etc.) are not important in dairy cow production. In fact the macro minerals play a significant role in dairy cow production. However, the majority of mineral questions/problems observed in the field seem to focus around trace minerals. Therefore, the intent of this review is to: 1) give a general description of the function of trace minerals in dairy cow 2) discuss the impact of trace minerals on performance parameters in dairy cow, and 3) discuss factors that can potentially affect trace mineral requirements in dairy cow. For an in depth review of both macro and trace minerals see the textbooks written by [1, 3].

The objective of present study was to evaluate of serum values of Copper and Cobalt in Holstein dairy cows with silent heat.

MATERIALS AND METHODS

In present study, by referring to dairy farms of Tabriz, 30 cows with silent heat were detected. Those animals prepared for artificial insemination, in rectal examination in case of existence and palpation of corpus luteum without signs of estrus indicates silent heat. As well as, those animals show no estrus signs with injection of PG and existence of corpus luteum are detected. For this, after injection of vetaglandin at the dose of 2cc/case, estrus signs must be appeared maximum till 5 days. Of 30 cows that clearly showed estrus signs were used as control group. Blood samples were obtained from tail vein using Venoject and after centrifuging, serum was isolated and kept at -20°C. Then, serum values of Copper and

Cobalt were measured using atomic absorption method and spectrophotometry. Data were analyzed using SPSS and comparison between groups was done using T-test and $p < 0.05$ considered as statistical significance.

RESULTS

Data showed that serum mean value of Copper in control group was 63.85 µg/dl and in silent heat group was 54.45 µg/dl so that, there is statistical difference among groups ($P < 0.01$). Also, serum mean value of Cobalt in control group was 16.17 µg/dl and in silent heat group was 14.98 µg/dl so that, there is no statistical difference among groups ($P > 0.05$).

Table 1 shows the mean, standard deviation and standard errors.

Table 1: Mean, Standard Deviation and Standard Errors of Measured Elements in Serum

Element	Group	Mean	SD	SE	p-Value
Copper (µg/dl)	Control	63.85	3.18	0.71	0.01
	Silent heat	54.45	2.76	0.61	
Cobalt (µg/l)	Control	16.17	3.41	0.76	>0.05
	Silent heat	14.98	2.87	0.64	

DISCUSSION AND CONCLUSION

As the genetic capacity for milk production has increased in dairy cattle over time, there has been a tendency for fertility to decrease [4, 5]. There have been trends to feed high levels of crude protein to enhance milk production, but this can be associated with decreased fertility [6]. Imbalances in the

relative availability of protein and energy may affect efficiency of metabolism and energy status. Some reports indicate the use of lipids that are protected from hydrolysis in the rumen with a view to reducing the post-partum interval. However, these treatments have often been associated with reduced embryo survival, possibly due to excessive

estrogen production from the increased follicular growth [7]. Minerals are essential for growth and reproduction and are involved in a large number of digestive, physiological and biosynthetic processes within the body [8]. The most obvious function is as components of body organs and tissues and to provide structural support. In addition, they act as electrolytes, as constituents of body fluids and as catalysts in both enzyme and hormone systems. They therefore fulfil several important functions for the maintenance of animal growth and reproduction as well as health status [3].

Cobalt (Co) was shown to be essential for ruminants in 1935 when it was found to correct a disorder characterized by reduced appetite and weight loss [3]. In 1948, Co was shown to be an essential component of vitamin B12 (cobalamin). Under normal situations, domestic ruminants are not dependent on a dietary source of vitamin B12 because ruminal microorganisms are capable of synthesizing vitamin B12 from Co [2]. The efficiency at which Co is utilized by vitamin B12-producing rumen microorganisms is low. [9]. reported that the amount of dietary Co converted to vitamin B12 in the rumen ranged from 3-13% of intake. Furthermore, rumen microorganisms shunt Co to inactive vitamin B12-like compounds that are

unavailable to the animal [2]. Vitamin B12 is an essential part of certain enzymes involved in metabolic reactions. Most of the cobalamins occur in two coenzyme forms, adenosylcobalamin and methylcobalamin [1, 2]. Cyanocobalamin is converted within cells to either methylcobalamin – a coenzyme form of methyltransferase, or adenosylcobalamin – the coenzyme for mutase [1]. Methylmalonyl CoA mutase is an enzyme involved in the metabolism of propionate to succinate via the conversion of L-methylmalonyl-CoA to succinyl-CoA [1, 2, 9]. 5-methyl tetrahydrofolate homo cysteine methyltransferase is also a vitamin B12-dependent enzyme that is heavily involved in one-carbon and methionine metabolism [1, 2, 9].

[10] conducted a metabolism study in which Angus (n=8) and Simmental (n=8) steers were placed in metabolism crates to monitor apparent absorption and retention of copper. At the end of the six-day metabolism experiment, plasma copper concentrations and apparent absorption and retention of copper were higher in Angus relative to Simmental steers. The authors indicate, from their data as well as from others, that Simmental cattle may have a higher copper requirement than Angus cattle and that these different requirements may be related to

differences in copper absorption in the gastrointestinal tract between breeds. Furthermore, it has also been suggested that these breed differences in copper metabolism may not be due solely to differences in absorption, but also to the manner in which copper is utilized or metabolized post-absorption. [11] reported that biliary copper concentrations are considerably higher in Simmental cattle than in Angus cattle. It is apparent that differences in copper metabolism exist between Simmental and Angus cattle both at the absorptive and post absorptive levels.

An extensive study comparing the mineral status of Angus, Braunvieh, Charolais, Gelbvieh, Hereford, Limousin, Red Poll, Pinzgauer, and Simmental breeds consuming similar diets has also been conducted [12] This work compared not only copper, but also zinc and iron status between all previously mentioned breeds of cattle. In adult cattle, it was shown that Limousin liver copper concentrations were higher than all other breeds, except for Angus. This same trend was not seen for zinc and iron; with very little breed differences observed except for lower liver zinc concentrations in Pinzgauer when compared to Limousin.

Data showed that there is no significant difference among control and silent heat

groups in term of Cobalt. As well as, it doesn't seem that cows of both groups were suffered from Cobalt deficiency. At the end, silent heat in dairy cows is a multi-factorial disorder which is affected by energy imbalance, milk production, deficiency of vitamin A, phosphorous, cobalt and manganese and inadequacy of estrus detection and heredity and environmental factors. So, beside of above mentioned factors, Copper deficiency must be noted.

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