IMPROVING COWS HEALTH WITH THE HELP OF MINERAL SUPPLEMENTS

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Abstract. The objective of our studies was to investigate evaluate the effect mineral supplements on cow's reproduction and common disorders. The research was performed in a dairy farm. Cows were divided into two groups. For the 1st group of cows (n=50) we gave mineral supplement contains: 16.0% calcium, 4.5% phosphorus, 4.2% magnesium, 63 mg calcium D pantothenate, 100 000 mcg biotin, 1200 mg copper, 500 mg copper chelate, 7000 mg zinc, 3000 mg zinc chelate, 3000 mg magnesium, 2000 mg manganese, 30 mg cobalt as butyl cobalt (II) carbonate, 150 mg iodine as calcium iodate anhydrous. Vitamin B1, vitamin B5, 250mcg vitamin B12, 5 mg folic acid, 150 mg nicotinic acid, 30 mg selenium, 15 mg selenium organic form from Saccharomyces cerevisiae CNCM I-3060 (3b8.10), citrus and grape fruit pulp, which contains a large number of polyphenol compounds with strong antioxidants. The 2nd group of cows (n=50) did not get mineral supplement. The researches of blood *Copper* (Cu) and *Zinc* (Zn) and somatic cells count were made before and after the study. It was determined that in the 1st group, reproductive and general disorders were observed at 25.8% it was less evident than in the control group during the study ($p < 0.05$). Using 0.5 - 0.4 g. in a day Cu, plasma levels of 10 μmol / l were fixed, which significantly altered the health of the cows and the amount of production. After the study SCC 1 group cows decreased 64% ($p<0.05$). Meanwhile, in the second group of cows milk SLS decreased by 45%.

Keywords: supplements, somatic cells count, blood, cows

Introduction. High-quality, valuable milk is obtained when the ration contains the required amount of energy, food and mineral substances, vitamins. If the mentioned substances are lacking in ration, milk yield decreases, cow health deteriorates, reproduction is disturbed, nutrition decreases in milk, and therefore the quality of the produced products is inferior (Weiss et al., 2006).

The natural resistance of the animal to the disease depends on the herd's diet. In order for the cattle to absorb enough nutrients, it is necessary to create an appropriate ratio of mineral and other substances in the diet. In order to ensure the absorption of the appropriate trace elements in dairy cows, it is necessary to know more than just the feeding rates for these elements. Water and nutrients can contain high levels of calcium, sulfur, molybdenum, or iron, which can reduce the absorption of some trace elements from feed. The trace element complexes are one way manufacturers can increase the amount of trace elements in dairy cows. Trace element deficiency and its effects have been observed for more than 30 years. According to scientists, in the study of hay and corn silage, a deficiency of copper, cobalt, zinc, selenium was found, and often lack of manganese and iodine (Sales at al., 2010).

Cu is important for immune system response and immunity formation. It is even more complicated because of interaction with other minerals. It has been established that big number of diseases and weakening of the immune system are caused by *Cu* deficiency or excessive amount, which is determined by the variation of the immune variables *Mo* and *Fe*. It's involved in phagocytosis function – it can isolate peripheral blood granulocytes (firstly neutrophils), for example, it can effect *Candida albicans* more than 2 times for that reason (Suttle, 1991). It is also established that resistance for *S. aureus* is decreasing because of *Cu* lack, especially for heifers. Therefore, cattle are not only dependent on feed, but also on their digestibility and its effective absorption, which may be affected by substances present in the feed. The lack of trace elements is often thought to be the cause of ultimate health disorders in the herd. Zinc high concentration found in the skin, in hair. Of course, animals have some specific zinc enzymes. These enzymes are pancreatic carbohydrate, carboxypeptidase, lactate dehydrogenase, alkaline phosphatase and thymidine kinase. Zinc is an enzyme system activator; it is involved in cellular replication and differentiation, especially in nucleoside metalozyme. Zinc has structural and functional integrity. Zinc and its activated proteins are required in the 2000 transcriptional processes (Beattie et al. 2004; Cousins et al., 2006).

The objective of our studies was to investigate evaluate the effect of mineral supplements on cow's reproduction and common disorders**.**

Materials and methods. The work was carried out in the X dairy holding in 2016-2017, following 1997 11 06 The Republic of Lithuania law for animal's care, housing, and usage Nr. 8-500 („Valstybės žinios", 1997 11 28, Nr. 108).

Selected 100 cows with 3th–4th lactation productivity of 6500-7500 kg. Lithuanian Black - White and Holstein breeds cows.

For the 1st group of cows (n=50) we gave a day doses about 200-250 gr. mineral supplement. The mineral supplement contains: 16.0% calcium, 4.5% phosphorus, 4.2% magnesium, 63 mg calcium D pantothenate, 100 000 mcg biotin, 1200 mg copper, 500 mg copper chelate, 7000 mg zinc , 3000 mg zinc chelate, 3000 mg magnesium, 2000 mg manganese, 30 mg cobalt as butyl cobalt (II) carbonate, 150 mg iodine as calcium iodate anhydrous. Vitamin B1, vitamin B5, 250mcg vitamin B12, 5 mg folic acid, 150 mg nicotinic acid, 30 mg selenium, 15 mg selenium organic form from *Saccharomyces cerevisiae* CNCM I-3060 (3b8.10), citrus and grape fruit pulp, which contains a large

number of polyphenol compounds with strong antioxidants. The 2nd group of cows (n=50) did not get mineral supplement. Mineral supplements were given every day 6 months in a row.

Blood tests were performed before and after examination. Blood tests were performed in the X laboratory using the Selectra junior biochemical analyzer. Blood samples, for the determination Zn of the quantity, were sent to the X laboratory, where the inductively coupled plasma mass was investigated using an absorption spectrometer 300D. Blood samples were taken from farmed animals of the studied cows.

Table 1. **Criteria for classification cooper and zinc in plasma mineral concentrations (Kincaid, 1999)**

Status	Deficient	Marginal	Low adequate	High adequate	Toxic
Copper plasma (µg/mL)	< 0.5	0.5-0.7	0.7-0.9	0.9-1.1	>1.2
Zinc plasma (µg/mL)	< 0.4	0.5-0.8	0.8-1.4	2-5	3-15

Somatic cell count studies were performed by SI „Pieno tyrimai“ before starting to give mineral supplements and after they. The general (hair, body condition, milk production, hoof) and reproduction (SCC, mastitis, metritis, retained placenta) disorders of both groups were observed prior to the experiment. Skin changes (no lesions / lesions, friable skin areas and other lesions / swelling). Skin lesions detected during the test are swollen areas, irregularities / sequestered. An animal assessment of this distance of not more than 2 m is investigated in zone 5 (neck, back, shoulders, quadrant, sides, udder). Only violations that were at least 2 cm in diameter in their longest position were counted. White space: areas in which fields fall; the skin is not damaged; parasite-induced fissure shrinkage; possible hyperkeratosis; Damaged skin - scratches, wounds, swelling. Brain restraint: a movement disorder caused by a malfunction of one or more limbs normally. During the study, the following symptoms were observed (frequent sleeping, standing - just at the angle of the nail, slipping or missing signs of the above mentioned tingling). Somatic cell count more than 400 thousand/ml. During the research we calculated these cases: metritis, retained placenta, clinical mastitis incidences and SCC ratio changes in the groups.

The statistical analysis of the data was performed by the statistical package (SPSS for Windows 15, SPSS Inc., Chicago, IL, USA). Data analysis uses descriptive and one-factor statistics (ANOVA) and Speaman correlation matrix. Student t-test is used to estimate differences. Data are considered statistically reliable when $p < 0.05$.

Results. It was determined that in the 1 group (Table 2), reproductive and general disorders were observed at 25.8% it was less evident than in the 2 group (Table 3) during the study ($p < 0.05$). Using 0.5 - 0.4 g. in a day Cu, plasma levels of 10 µmol / l were fixed, which significantly altered the health of the cows and the amount of production. We found that when zinc plasma levels are between 11 and 16 µmol / l in productive cows, metritis or mastitis, it is less pronounced and is more likely to recover. The recommended rate for high productivity cows is 1 g zinc per day, which provides about 14 µmol / l of blood plasma.

We create a table with basic disorders. Disorders we set without scientific literature and on farms most often disorders case which how tell farmers and veterinary doctors.

In the 1 group we give a better result 47,2 % and skin changes was less express, than in the second group. In the 1 group received a better result 26,1 % and we observe lighter symptoms and hoof regeneration. Zu and Cu blood plasmic level in these cases was 14,8 – 18,8 (µmol/l) and 15,3 % higher than the 2 group cows.

Before the introduction of the mineral supplement in both groups of cows, the mastitis was similar, respectively, in 11 and 16 cases.

In analysing 1 group of cows somatic cell count, we noticed that the general SCC was 451,20 ± 127,19 thousand/ml. After the study SCC decreased 64% ($p<0.05$). Cu an Zn blood plasmic rate by 14,6 – 16,8 (µmol/l). Meanwhile, in the second group of cows milk SLS decreased by 45% and Cu/Zn blood plasmic rate by 10,6 – 15,9 (µmol/l**).** Before the study, the number of somatic cells in the milk of the second group of cows was 480 ± 114,22 thousand/ml (Fig.1).

Table 2. **Distribution of plasma copper and plasma zinc in the 1 group from the median to the upper limit**

	Cu	(µmol/l)	Zn	(µmol/l)
Cases	50	12.1-14.8	50	14.8-18.9
General disorders:				
1. Poor hair condiotion	12	12.1-12.6	6	14.5-18
2. Poor body condition	8	9.9-11	9	14.5-17.8
3. Low milk production	11	11.6-14	4	11.7-18.-
4. Hoof	6	9.9-12	6	12.9-16.9
Reproduction disorders:				
5. SCC changes	34	12.6-14.6	14	13.3-16.8
6. Mastitis	16	13.2-14.1	12	12.9-16.9
7. Metritis	11	13.3-13.8	6	12.9-16
8. Retained placenta	3	10.9-12	2	14-16

Table 3. **Distribution of plasma copper and plasma zinc in the 2 group from the median to the upper limit**

	Cu	(μmol/l)	Zn	(μmol/l)
Cases	50	11.1-13.8	50	12.8-15.8
General disorders:				
1. Poor hair condiotion	26	12.1-12.6	16	11.5-15
2. Poor body condition	28	9.9-11	19	10.5-13.8
3. Low milk production	17	11.6-14	14	9.7-10.9
4. Hoof	23	9.9-12	16	9.9-14.8
Reproduction disorders:				
5. SCC changes	34	10.6-13.6	24	9.3-14.8
6. Mastitis	20	11.2-13.8	31	12-15.9
7. Metritis	11	12.3-13	16	11.9-14
8. Retained placenta	10	9.9-12	12	13-16

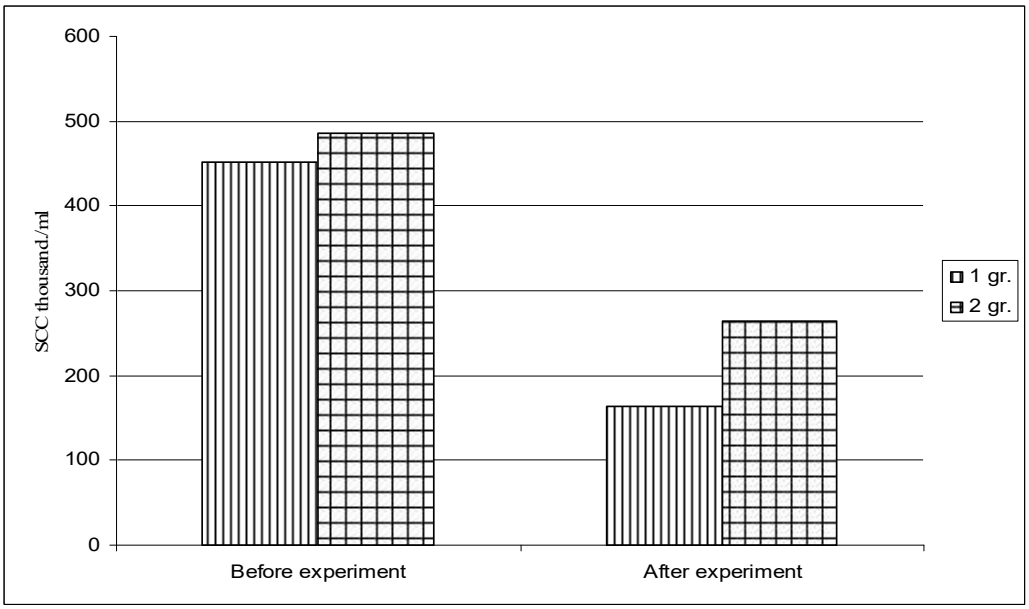

Figure 1. **Somatic cell count before and after giving the mineral supplements**

Discussion.

Low copper plasma levels increase the risk of health problems and slow down growth and cell regeneration. The largest changes in the deficit ratio were observed during the grazing period, since pastures contain a large amount of molybdenum, which blocks the absorption of copper as the heavy metal. Therefore, even calves during calving do not have enough copper, which results in a significant reduction in immune system (Enjalbert et al., 2002; Ward at al., 1997). In addition, copper is actively involved in humoral response (Spears and Weiss, 2014). Because of the high lack of copper, heart diseases are developing; cattle experience weakness, drastically decreases in productivity, soon often dies, anemia occurs, also tissue degeneration and mitochondrial degeneration show up (Kwun et al., 2007). Using 0.5 - 0.4 g. Cu in a day, in the blood plasma levels Cu were fixed 10 μmol/l amount, which significantly changed the health of the cows and the amount of production.

The symptoms of productive cow's skin and the udder are noticeable. Additionally, in the absence of Zn, a significant decrease in feed intake of 5-8 μmol / l has been observed, and significant somatic cell oscillation and a strong drop in production have been observed. Nail diseases and their deformities are not rarely recorded. Lack of zinc in a large role plays an important role in immune responses, reduces antibody and cellular response (Dresler et al., 2016). We found that when zinc plasma levels are between 11 and 16 μmol / l in productive cows, metritis or mastitis, it is less pronounced and is more likely to recover. The recommended rate for high productivity cows is 1 g zinc per day, which provides about 14 μmol / l of blood plasma. This results in a high level of immune response caused by increased Zn levels, a high level of immunity of the udder and organism, a stable suction and a better insemination factor.

Generally, high levels of plasma copper reflect inflammation or infection (Soroj et al., 2015), with plasma values greater than 18 μmol / l. In addition, the infection reduces the plasma zinc content (Mc Donald at al., 2010),

if the value is less than 10 μmol / l, it can be said that the body is fighting the infection. When zinc was detected, it was observed that its concentration was at least 2 weeks prior to the fasting and 2n after calving (1-3 days), Zn significantly decreased <2.42 μmol / L at a rate of <9.64 μmol / L, but its level increased even during lactation 75 percent cows. Therefore, at low Zn levels, there is a higher likelihood of the disease, such as: mastitis, metritis. In addition, it responds to the quality of the colostrums (Soroj at al., 2015).

This study shows that copper and zinc, as well as the main drawbacks of micro - macro elements, are the risk factors of health disorders for extremely high productivity cows both in reproduction and in high milk synthesis. Therefore, the studies carried out show that the best zinc concentration in plasma is 14 μmol / L, which ensures a positive status in the milk production and optimizes the cow health balance. Increased data researching could determine the most efficient boundaries between macro-micro elements and formulate the correct trends in the delivery of mineral additives based on the amount of milk and the expression of animal health.

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