MINERAL SUPPLEMENTS INFLUENCE FOR DAIRY COWS UDDER'S WELLNESS

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Abstract. The objective of our studies was to investigate the effect to reduce somatic cells count in the milk and cow's blood biochemical tests before giving the supplements and after giving the microelements. The research was performed in a dairy farm on 2014– 2015. The cows were divided into 2 groups. For the 1st group of cows (n=40) we gave mineral supplement Supra-Lak For the 2nd group of cows (n=40) we gave mineral supplement Calcivit. The researches of blood (*Calcium (C)*, *Phosporus* (P), *Magnesium* (Mg), *Copper* (Cu) and *Zinc* (Zn) and somatic cells count were made 2 weeks before dry-off, 2 weeks after calving and 5th lactation month. The blood samples were to Ca rate corresponded to 83.3 percent cows ($p<0.05$). P rate matched - 72.5 percent During the period of these materials has increased from 13.3 - 15.3 per cent. The highest concentration of Cu 2 weeks after calving 80 percent. tested cows, and the lowest - 5th lactation month - 45 percent. Zn positive balance of fixed 5th lactation month to 75 per cent ($p<0.05$). The lowest 2 weeks before dry-off - 25 percent cows. The use of organic additives and antioxidants, and compared them with simple mineral additives mastitis occurred in 26 percent cows and set 16.23 percent somatic cell counts, than with a simple mineral supplements. Using mineral supplements Supralak, mastitis decreased by 14 percent ($p>0.05$).

Keywords: somatic cells count, mineral supplements, cows

Introduction. Minerals in cow's organism ensure physiological reactions and metabolic products like catalysts participate in different biochemical reactions and also are the part of some enzymes composition. They affect animal's production, growth intensity, and reproduction functions. Mastitis is a big problem in nowadays milk farms. It is calculated that very effective farms experience about 16 – 25 % economic damage per year. That's why mastitis is lowering, in a use of more efficient medical and prevention measures. That's why we need to be in charge of the right ration's preparation and cow's immunity strengthening by the microelements which help to fortify the immunity and to create the resist for diseases (Andrieu, 2008).

We are working to create the most efficient prevention way which would stop mastitis manifestation, quicken somatic cells decline in the milk and also would improve the quality of the milk. In this situation the biggest influence has Zinc and his chelation form (facilitates material's transfer and intake into the organism), it increases the resistance of immune system and improves the resist for diseases. In combine with lymphocytes, they activate and encourage positive cells response - strengthen the milk's gland (Cortinhas et al., 2010). Zinc is a must for the tissues and cells production, skin's integrity. The udder is the organ which is originated from the skin that's why this element holds right keratin's amount and teat's canal integrity. In the use of the Zinc, somatic cells count is reduced about 33 % (O'Rourke, 2009), that's the positive effect for mastitis. Zinc also takes part in free radical removal – in extracellular and cytosolic level merged with Copper (activates cytoplasm's proteins, needed for peroxidase, which 60 % of the spleen is discarded in blood when needed, also increases resistance (*E. Coli*) and with vitamin A (Hotenius et al. 2004). Copper (Cu) has the strongest interaction with Zinc (Zn), that's how proteins are activated, they protect the iron and manganese and neutralize the radicals of oxygen. They activate the immune system and are one of inflammation response modulators in blood, also acquire important protective function (Gropper et al. 2005). With the help of researches, it's found that this element reduces mastitis clinical signs severity and duration (yang et all., 2015). Vitamin E and selenium (Se) are integral components of the antioxidant defence of tissues and cells. Cattle consuming stored forages are likely to be low in vitamin E, unless supplemented, and vitamin E deficiencies are frequently observed in peripartum dairy cows (Pavalata et al., 2002) Vitamin E and Se deficiency leads to impaired PMN activity. Selenium is a cofactor for enzyme glutathione peroxidase. It is found in the cytoplasm (70 %) and mitochondrial matrix (30 %) (Erskine et. al. 1989). Peroxidase is processing here (Hydrogen peroxide) which cleans the organism and strengthens the immunity (Hernandez, 2013).

Feeding should always be aimed at meeting the nutritional requirements of the dairy cow during the various stages of lactation cycle. During the transition period, the dairy cow can experience negative energy balance, which can have a major impact on the immune response (O'Rourke, 2009).

The objective of our studies was to investigate the effect to reduce somatic cells count in the milk and cow's blood biochemical tests before giving the supplements and after giving the microelements

Materials and methods. The work was done in 2014-2015 in a dairy farm 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).

Eighty Lithuanian Holstein dairy cows in the third and fouth lactation, milk yielding 6500-7500 kg, were inluded in the study.

The cows were divided into different groups. For the 1st group of cows (n=40) we gave mineral supplement Supra-Lak which ingredients are: 16.0% Calcium, 4.5% Phosphorus, 4.2% Magnesium, 63 mg of calcium D-pantothenate, 100 000 mcg of biotin, 1,200 mg of Copper, 500 mg of Copper chelate, 4000 mg of Zinc, 3000 mg of Zinc chelate, 3000 mg

of Magnesium, 2000 mg of Manganese, 30 mg of Cobalt as Butylated Cobalt (II) carbonate, 150 mg of Iodine as Anhydrous Calcium Iodate. 1.000.000 TV Vitamin A**,** 100.000 TV Vitamin D3, 5000 mg of Vitamin E (as alfa-Tocerolacetat), 130 mg of Vitamin B1, 38 mg of Vitamin B2, 15mg of Vitamin B5, 250 mcg of Vitamin B12, 5 mg of Folic acid, 150 mg of Nicotinic acid, 30 mg of Selenium, 15 mg of Selenium organic form from *Saccharomyces cerevisiae* CNCM I- 3060 (3b8.10), citrus and cherry fruit pulp puree which has plenty strong antioxidants of polyphenol group. For the 2nd group of cows (n=40) we gave mineral supplement Calcivit which ingredients are: 3.0% Phosphorus, 18.0% Calcium, 5.5% Sodium and Magnesium 4.0%. Vitamin A (E672) 1.000.000 TV, Vitamin D3 (E671) 100.000 TV, 1.000 mg of Vitamin E, 7.500 mg of Zinc (E6), 2.500 mg of Manganese (E5), 1.000 mg of Copper (E4), 80 mg of Iodine (E2), 3,9 mg of Cobalt (E3), 40 mg of Selenium (E8). Mineral supplements were given incessantly from 2014 till 2015. The researches of blood (Ca, P, Mg, Cu and Zn) and somatic cells count were made 2 weeks before dry-off, 2 weeks after calving and 5th lactation month.

Statistical analysis was done with a statistical package (SPSS for Windows 15, SPSS Inc., Chicago, IL, USA). The descriptive and one-factor statistic model (ANOVA) was used to analyze the data. To analyze the data we also used Spearman's correlation matrix. To evaluate differences we used Student's t-test. The data was considered reliable when $p<0.05$.

Results. We found that before the research 68 % of cows matched Ca rates. Doing the research before dry-off 2 weeks Ca rates consisted 76 % of cows. 2 weeks after calving Ca rates – 87 % of cows. In the 5th lactation month fixed 76 % of cows. Calcium rates matched 83.3 % of cows which received mineral supplement Supra-Lak. With the help of this mineral supplement we found 15.3 % increase of Calcium $p<0.05$.

Before the research P rates matched 72.5 % of cows. Working in progress 2 weeks before the dry-off we found that 87.5 % of cows matched the rates. 2 weeks after calving – 90 %, in 5th lactation month P matched 80 %. P rates matched 85 % of cows which received mineral supplement Supra-Lak. With the help of mineral supplement we found 13.3 % increase of Phosphorus $p<0.05$.

P correlation in the separate research's periods. When we completed researches of Mg, we have found that 2 weeks before dry-off 92.5 % of cows matched the rates. 2 weeks after calving 87.5 % of the cows matched the rates. In the 5th lactation month we found that 100 % of cows matched Mg rates. Mg rates 0,6 – 0,9 mmol/l.

When we researched Cu from blood's serum – we found that the lowest concentration rates were 67.5 % 2 weeks before dry-off, the highest concentration – 2 weeks after calving 80 %. In the 5th lactation month concentration was 45 %.

2 weeks after calving Zn rates matched 37.5 % of cows, 2 weeks before dry-off – 25 %. In 5th
lactation month the positive concentration consisted 75 % of cows.

When testing Zinc, we found that its concentration was lowest 2 weeks before dry-off. 2 weeks after calving (1 – 3 days) Zn decreased <2.42 µmol/L when normal rates are < 9.64 µmol/L but during the lactation its level increased 75 % of the cows (Fig.1).

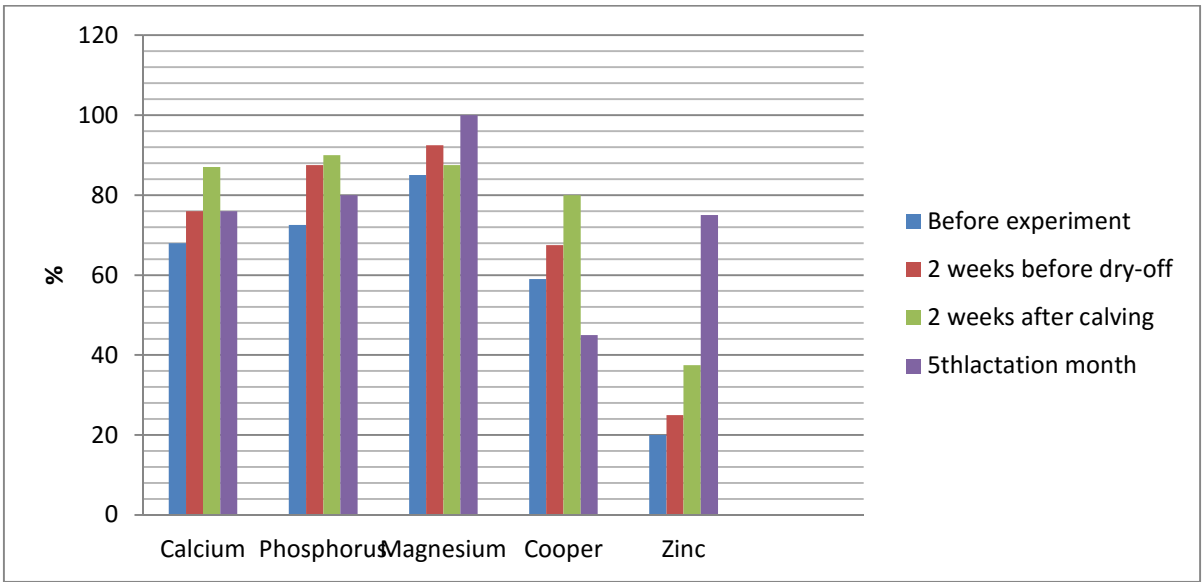

Fig.1. **Changes in blood parameters**

In analysing 1 group of cows somatic cell count, we noticed that the general SCC was 451,20 ± 127,19 thousand/ml. 2 weeks after calving days decreased 36,18% ($p<0,05$). In 5 th lactation month SCC was 163 tūkst ± 66,43 thousand/ml.

In analysing for the 2nd group of cows, we noticed that the general SCC was 486,40 ± 124,19 thousand/ml. 2 weeks after calving days decreased 20.00 % ($p<0,05$) . In 5 th lactation month SCC was 193 tūkst ± 68,11 thousand/ml. (Fig.2).

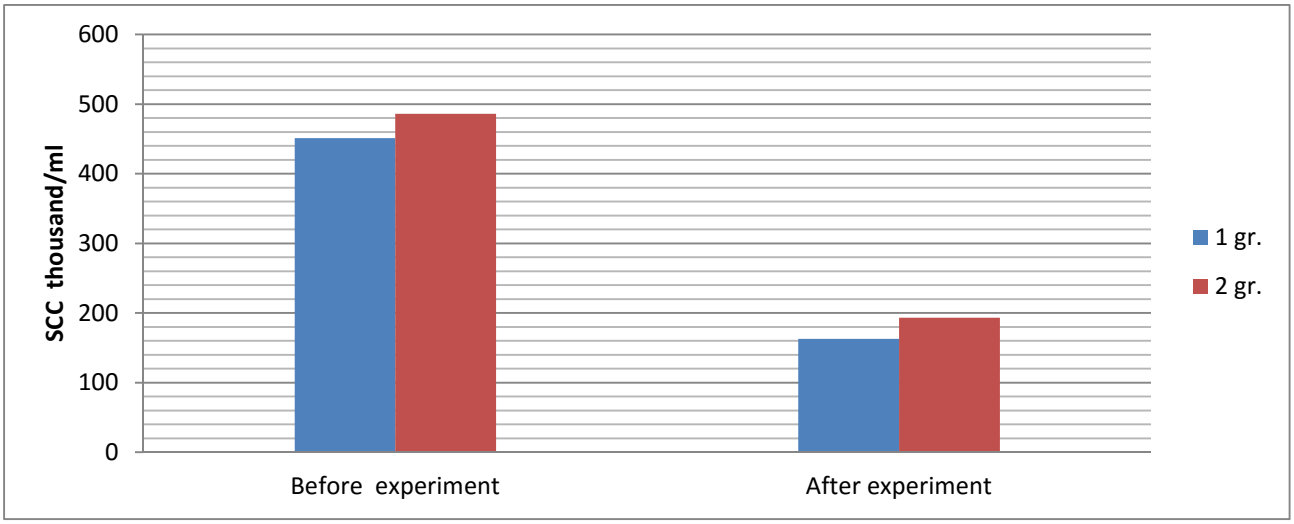

Fig.2. **Somatic cell count before and after giving the mineral supplements**

In summarising the efficacy of mineral supplement, 16.23 percent. better obtained using organic additives and antioxidants in reducing somatic cell counts.

Disccusion

Cows metabolize the necessary trace elements - depends on the stage at which they were, lactation or dry-off period. Trace minerals and vitamins that can influence udder health include selenium (Se) and vitamin E, copper, zinc, and Vitamin A and β-carotene (Pavalata et al., 2002).

This study was analyzed in both primary and secondary micronutrient status. The amount of copper in all 3 phases were stable, steadily decreased throughout lactation. Copper daily rate - we have 225 - 300 mg. Normal copper molybdenum ratio of 5: 1 to 1: 1 (15) when it is placed in a 2: 1 uptaken with difficulty (Kinal et all., 2005). Scaletti et al., (2003) carried out a study in first lactation heifers to assess a potential role for dietary copper (Cu) in enhancing resistance to *E. coli* mastitis.

When testing Zinc, we found that its concentration was lowest 2 weeks before dry-off. 2 weeks after calving (1 – 3 days) Zn decreased <2.42 μmol/L when normal rates are < 9.64 μmol/L but during the lactation its level increased 75 % of the cows.

Based on the conclusion, Zn deficiency could be due to the suppression of Cu or molybdenum, iron sulfate or due to improper diet occurrence. Also Zn deficiency is associated with the production of colostrum and irritated immune system (Gropper et al., 2005). Several studies have examined the effect of supplemental zinc methionine on SCC and in most cases supplementation statistically or numerically reduced SCC. In some studies SCCs were reduced by about 22% (Kincaid et al, 1984)

Mg deficiency rare thing, so it can be said that the magnesium level decreases only in the spring and it's not all the cows. The greater tendency is that Mg concentrations within the normal range or exceeds. Studies have shown it can be said that if sufficient magnesium positively influence metabolism of minerals and dependent on the uptake of such materials as calcium, potassium, phosphorus, copper, vitamin C and zinc (Pirestani et all., 2011).

The use of organic additives and antioxidants, and compared them with simple mineral additives, received 16.23 percent. somatic cell count decrease, than with a simple mineral supplement containing only the oxides and sulfates. Compared to other scientific studies suggest that the use of chelated minerals and antioxidants reached 10-20 percent. reducing the efficiency of the SCC. Thereby interfering with the cow's immune system, which creates a natural hedge. It is activated peroksidacinė system. Antioxidants, which are particularly useful in the mammary gland, as it can often lead to free hydrogen peroxide, breaks down and ensure proper mammary gland cell regeneration (Yang et all., 2015).

To determine trace trace of the body, it is necessary to investigate the immune system functions and the clinical condition of the mammary gland. This facilitates the formation of rations and has a significant impact on reducing the risk of mastitis (Andrieu, 2008).

Hereby increasing the economic benefits and improve the quality of milk. We note that there is a big connection between blood and trace elements, and immune system functions. Therefore, these ties create a health (fitness) as its state concept.

The blood samples were to Ca rate corresponded to 83.3 percent. cows. P rate matched - 72.5 percent. During the period of these materials has increased from 13.3 - 15.3 per cent. The highest concentration of Cu 2 weeks after calving 80 percent. tested cows, and the lowest - 5th lactation month - 45 percent. Zn positive balance of fixed 5th lactation month to 75 per cent., The lowest 2 weeks ago užtrūkinant - 25 percent cows. The use of organic additives and antioxidants, and compared them with simple mineral additives mastitis occurred in 26 percent. cows and set 16.23 percent somatic cell counts, than with a simple mineral supplements. Using mineral supplements Supralak, mastitis decreased by 14 percent.

Ensuring that the cow has adequate energy, minerals and vitamins for optimal milk production is essential for the maintenance of udder health and immune status (O'Rourke, 2009).

Antioxidant vitamins and minerals protect the body from free radicals either by directly scavenging free radicals or by inhibiting the activity of oxidizing enzymes. The supplementation of mastitic dairy cows with antioxidant vitamins as vitamin A (VA) and β-carotene (BC), vitamin C (VC), vitamin E (VE), and antioxidant minerals as selenium (Se), Zinc (Zn) and copper (Cu) is very important to help the animal recover early.

Conclusions

The results have shown, that the blood samples were to Ca rate correspondend to 83.3 percent cows. P rate – 72.5 percent. During the period of these materials has increased from 13.3 - 15.3 per cent. The highest concentration of Cu 2 weeks after calving 80 percent tested cows, and the lowest - 5th lactation month - 45 percent. Zn positive balance of fixed 5th lactation month to 75 per cent. The 2 weeks before dry - off - 25 percent cows. The use of organic additives and antioxidants, and compared them with simple mineral additives 2014 - 2015 mastitis occurred in 26 percent cows and set 16.23 percent somatic cell counts, than with a simple mineral supplements.

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