# CHOLINE CHLORIDE POSSIBLE IMPACT ON COW'S PRODUCTIVITY

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**Abstract.** In order to know choline chloride effect on health of dairy cows and changes of milk ingredients. The research took place in the „X" farm and the Cathedral of non-infectious disease of LUHS in 2015. 40 cows were selected using analogical reasoning in their 3rd or 4th lactation period. All cows 3 weeks before calving were divided into two groups – experimental (n=20) and control (n=20). Calving feeds of experimental cows were added with cholin supplement (dose – 100g/d) before 30 days until calving. We learned that yield increase was substantial, because after 7 days the experimental group's milk yield was higher by 5.42 ± 0.1 L and after 28 days the milk yield was 7.28 ± 0.1 L. The research is considered reliable when $p < 0.05$. It was learned that the electrical conductivity of milk decreased from 4.957 mS/cm to 4.804 mS/cm after 14 days, while the control group kept the same electrical conductivity. Although after the 28 days the research showed that the experimental group's milk electrical conductivity decreased, and were 4.738 mS/cm, while the control group electrical conductivity decreased slightly from 4.964 mS/cm to 4.837 mS/cm. It was learned that the ratio of fat and protein in the study group was higher than it was in the control group. It was learned that choline use did not have impact to the decrease of somatic cell count.

**Keywords.** Choline chloride, ketosis, lactating, calving

**Introduction.** One of the reasons for the gynecological disorders of dairy cows is acidosis, that is disfunction of carbohydrates and fat metabolism, called ketosis. Ketosis usually occurs to many dairy cows which are well-fed 10 days to 6 six weeks after calving. The most of the highly productive cows might get ketosis at the beginning of the lactation, because the outcome of the milk is high and the appetite is low. It has to rely on body fat (reserved fat). Some of the foreign experts even claim that about 70-80 % of ketosis cases are subclinical (not-recognisable) form, which is why farmers fail to recognize the disorder before they are forced to deal with its consequences (weight loss, fertility problems, reduced milk income etc.). It is also known that if the cow had a subclinical ketosis, its productivity during lactation is decreased by 10-15 %, servis period increased twice, decreased the lifetime of the cow and the immunity is weakened to diseases. (Minkevičius, Pikelis, 2006). Cows, experiencing lack of energy, when the need to meet physiological and productivity demands are greater, when receive only usual feeds and getting all kind of diseases become highly possible. Most of the energy cows receive via rumen microflora, which commits degradiotn of carbohydrates to volatile fatty acids: propionate, acetate and butyrate. However dairy cows organism receives very little glucose, even thou milk synthesis requires high quantity of it. The calving time and the first lactation month is the hardest period for dairy cows during which most of the problems manifests. According to R. Antanaitis and other scientists (2010), in order to prevent the „ post-calving disease complex", the measures of early herd's health testing must be taken. It is the best way to do so by various blood and milk tests. It shows energy balance and it is an important matter in order to prevent the diseases since cows blood biochemical index best reflects the condition of nutrition and metabolism. Also, milk quality index depends on nutrition quality, proper milking procedures and cows health. The milk is a very complex biological system and greatly depends on many factors with the cow's health being the most important one. (Sloth et al., 2003).

**Objectives and tasks:** to indicate cholines impact regarding cows health as well as changes in the composition of milk structure.

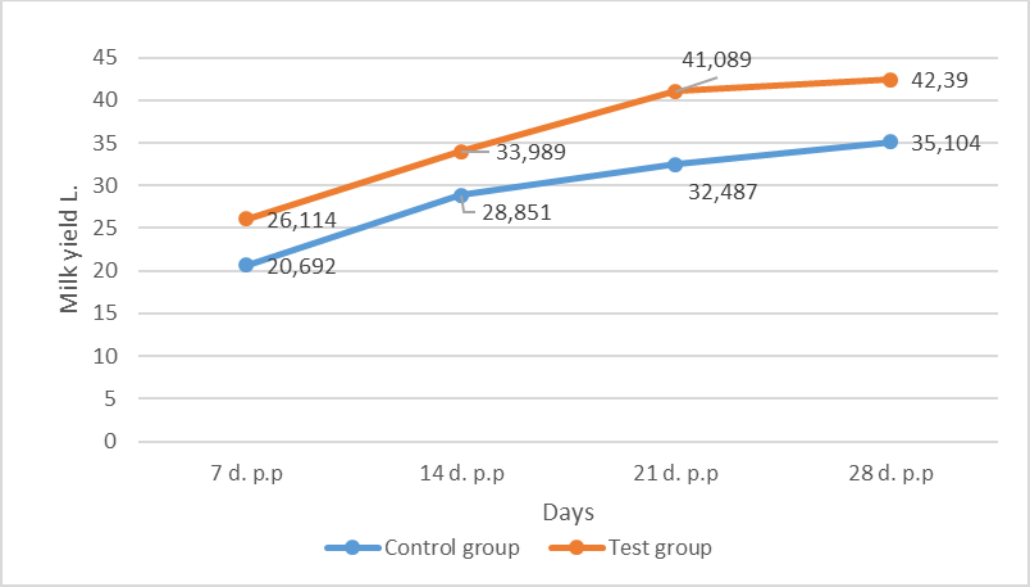
**Methods and materials.** The research took place in the „X" farm and the Cathedral of non-infectious disease of LUHS in 2015. 40 cows were selected using analogical reasoning in their 3rd or 4th lactation period. All cows 3 weeks before calving were divided into two groups – experimental (n=20) and control (n=20). Calving feeds of experimental cows were added with cholin supplement (dose – 100g/d) before 30 days until calving. Control group cows were given its usual feeds according to the balanced diet ratio. (see. 1 table) .

1 table. ***Dairy cows diet ratio***

| **Ratio structure:** | **Quantity** |
|---|---|
| Corn silage, kg | 5,0 |
| Bloom, kg | 12,0 |
| Straw, wheat, kg | 3,0 |
| Mix beans, vetch, oats | 0,8 |
| Accessory mineral, kg | 0,15 |
| Nutritious**:** | |
| DM, g/kg | 679 |
| NEL, MJ/kg DM | 5,18 |
| Crude Ash, g/kg DM | 124 |
| Crude Fibres, g/kg DM | 259 |
| Useful Crude Ash, g/kg DM | 122 |
| RNB, g/kg DM | 0,4 |
| Calcium g/kg | 6,48 |
| Phosphorus g/kg | 4,11 |
| Magnium g/kg | 2,91 |
| Natrium g/kg | 2,19 |
| Potassium g/kg | 20,46 |
| Chlorine g/kg | 6,16 |
| Sulfur g/kg | 2,06 |

The milk quantity outcome and electrical conductivity was compared of both groups. The milk quantity, structure and cows disorders rate were recorded in the herd control program Dairy Plan C21. Also fat, protein, somatic cell count, milk urea was measured of every control cow's milk, and general well beeing was observed of the cows.

**Results and discussions.**




1 picture. ***Milk yields changes in control and experimental groups***

Experimental‘s groups milk quantity outcome increased steadily. It was compared from the beginning of research and milk increased by 16.28 kg. After 28th d.p.p milk yield was 17.19 %. ($p>0,05$) higher than in the control group.

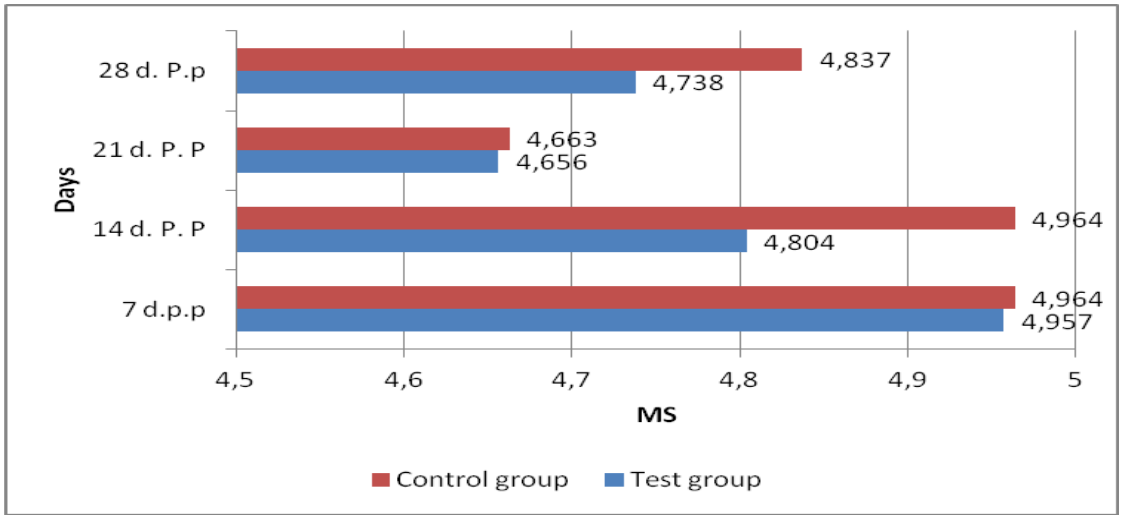
Out of all the factors, milk quantity outcome mostly depends on feeds. Feeds and care respond to 50-60 % of cows productivity. (Jukna Č., 1988). The cow‘s milk yield depends not only on bulls genetics but also on good care and feeding. Inappropriate feeding has a tremendous importance on cows well beeing in first two weeks after calving (Stevenson J., 1988).

Since there are many factors, that can triger post-calving disorders, many professionals (Ingvartsen et al.,2003;Le Blanc,2008) agree to divide them into two groups:

**Metabolism disorders** (ketosis, acidosis, DA, mastitis).

**Reproduction disorders** (metritis, endometritis, placenta retention, functional disorders of sexual physiology).

All the calving related diseases are related. For example, paresis is a major risk factor for transition cow's problems, such as ketosis, placenta retention, mastitis, DA (Spain, Scheer,2001).

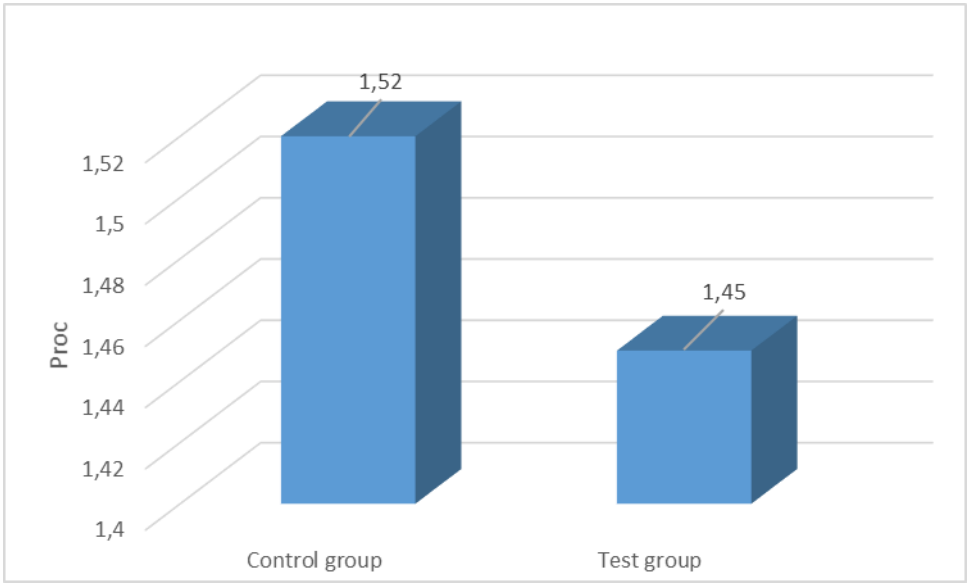



2 picture. ***Milk's electrical conductivity of control and experimental groups***

In the beginning of the research electrical conductivity was higher. The largest difference between two groups was on 14 d.p.p, where conductivity in experimental group reduced by 3.22 % ($p>0,05$). At the end of the research 28 d.p.p experimental groups milk electrical conductivity reduced 21.9 mS/cm ($p>0,05$) or 4.4 %.

Milk electrical conductivity is a reverse index of milk electrical resistance, that mostly depends on strength of veins. It is known, that this index can be used in mastitis diagnostics. (Antanaitis R. 2010; Norberg, 2005).

Another important index is a milk fat and protein ratio. In order to calculate this ratio the dividing is needed: fat/protein (comparing control and experimental groups results: control group 5.569/3.645=1.52 %; experimental group 4.689/3.224=1.45 %). Control's group fat/protein ratio is 1.45 %, it indicates there are no sick cows in experimental group. That is normal for post-calving cows. Meanwhile, control group cows' result is 1.52 %. That indicates the high possibility of cows having ketosis. If the result were 1.2 % or less than 1%, the rumen acidosis can be suspected. The best dairy cow's rumen pH is 6.3 – 6.8 (Paulauskas, 2010). On the other hand, when fat and protein ratio is 1.5 % or more, ketosis can be suspected.

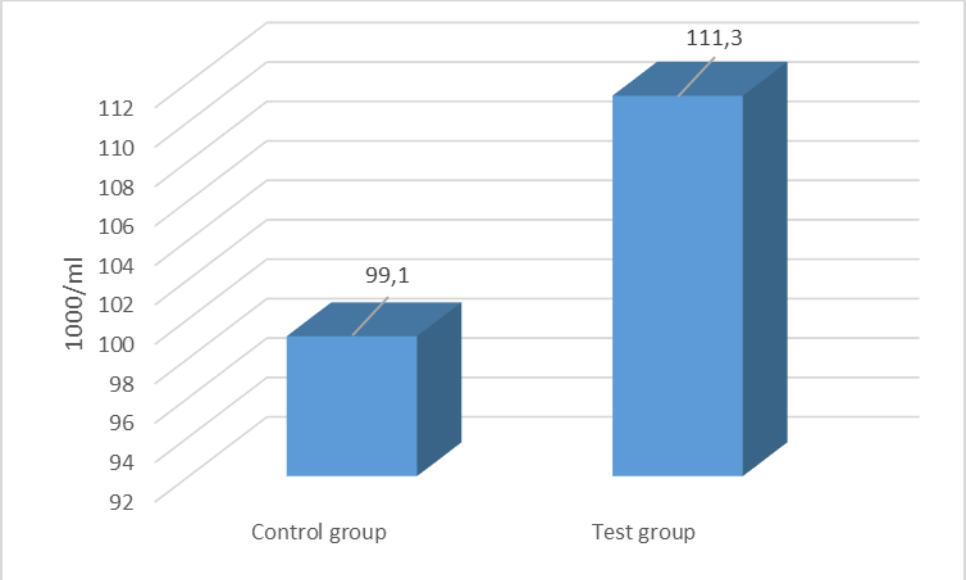



3 picture. ***Milks fat and protein ratio***

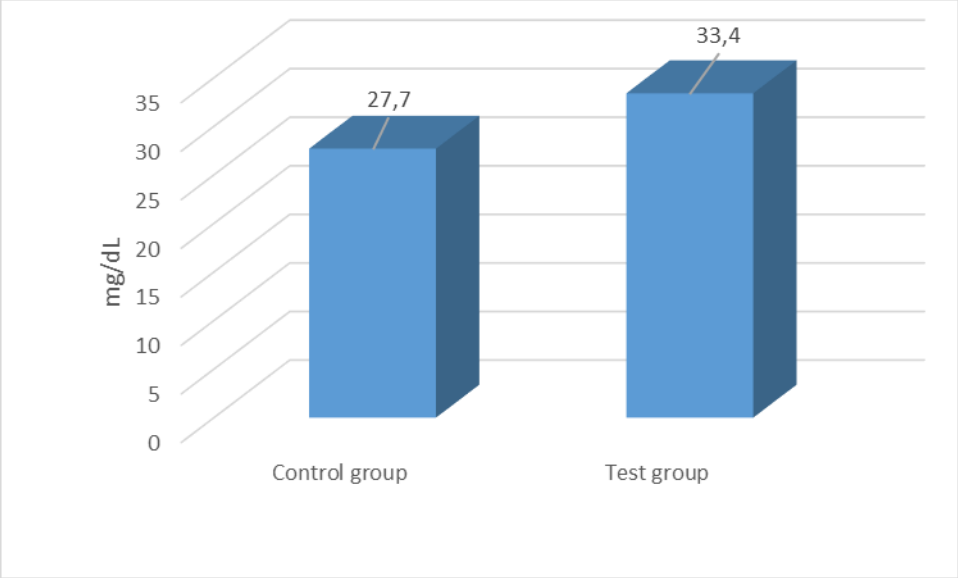
2 tab. ***The composition of milk and quality comparison of test and control groups***

| Indicators | The control group | The test group |
|---|---|---|
| Milk fat content, % | 5,569±1,663 | 4,689±1,650 |
| Milk proteins, % | 3,645±0,497 | 3,224±0,281* |
| Somatic cells x$10^3$/mL ', | 99,1±59,187 | 111,3±188,776 |
| UREA, mg/dL | 27,7±6,111 | 33,4±8,262 |

*p<0,05




4 picture. ***Somatic cell counts.***




5 pic. ***Urine concentration.***

In picture 4 and table 1 shows that experimental groups somatic cell count is **12,200 cells/mL** (p>0,05) higher than the one in the control group.

The most important factor for the number of somatic cells is carried by the cows that have a subclinical mastitis. For this reason, we can see that number of somatic cells in the experimental group exceeds the number in the control group.

In experimental group 25 % post-calving cows were sick. (diarrhea , lameness , inflammation of the uterus , mastitis and one cow died). These disorders might indicate that there were more somatic cells in the experimental group than there was in the control group.

It is said, that if cow‘s somatic cell count is more than 200.000 cells/mL, the cow has a suclinical mastitis. Cows productivity is decreased by 25-35 % per day and during lactation 10-15 %. Productivity from the whole herd can be 5-10 % lower. (Kondrotaitė D and others. 2013).

Urine quantity increase was slightly visible in the experimental group and it was 17% more than in control group.

Urines concentration in cow‘s blood and milk depends not only on fed digestible crude protein‘s content but also on feeds‘ energy and protein ratio (Faust, Kilmer, 1998; Legath et al., 2001, Želvytė and others., 2006).

**Conclusions:**

We have learned that yields increase was significant using supplement with choline in it, because after 7 days the experimental groups milk yield was higher by 5.42 ± 0.1 L and after 28 days in the experimental group, the milk yield was 7.28 ± 0.1 L . Studies considered reliable when $p < 0.05$. It was learned that the electrical conductivity of milk after 14 days decreased from 4.957 mS/cm to 4.804 mS/cm, while the control group kept the same conductivity. Though the 28-day of research, it showed that the experimental group milk conductivity decreased to 4.738 mS/cm, while the control group‘s conductivity decreased slightly from 4.964 mS/cm to 4.837 mS/cm. It was learned that the ratio of fat and protein in the test group was higher than it was in control group. It was learned that choline use of somatic cell count did not have impact to the decrease.

**References**

1. Antanaitis R., Žilaitis V., Juozaitienė V., Žiogas V. Sveikatos būklės, sezono ir laktacijos įtaka karvių judrumo, masės, produkcijos ir pieno elektrinio laidumo pokyčiams. 2010. Veterinarija ir zootechnika. T. 49 (71). P. 3–7.
2. Caring for Transition Cows / Huntjens F.M., Aalseth E. USA. .2005. P. 24-41.
3. Faust M. A., Kilmer L. H. Evaluation of milk urea nitrogen data. S-ADSA abstract. 1998.
4. Ingvartsen K.L., Dewhurst R.J., Friggens N.C. On the relationship between lactational performance and health: is it yield or metabolic imbalance that cause production diseases in dairy cattle? A position paper. Livestock Production Science. 2003. Vol.83. P. 277–308
5. Kondrotaitė D., Musayeva K., Želvytė R., Juozaitienė V., Monkevičienė I., Sederevičius A. Somatinių ląstelių ir inhibitorinių medžiagų karvių piene tyrimai ganykliniu laikotarpiu. Veterinarija ir zootechnika. 2013. T. 61 (83).
6. Le Blanc S.J. Post-partum uterine disease and dairyherd reproductive performance- a review. The Veterinary Journal. 2008. Vol.176 (1) P. 102–114
7. Legath J., Kovač G., Kovalkovičova N. The concentration of urea in cows milk and its utilization. Folia veterinaria. 2001. Vol. 45. P. 9–11.
8. Norberg E. Electrical conductivity of milk as a phenotypic and genetic indicator of bovine mastitis: A review. Livestock Production Science. 2005. V. 96. P. 129–139.
9. Minkevičius V., Pikelis V. Produktyvių melžiamų karvių šėrimas ir priežiūra. LŽŪKT 2006/12, Kaunas.
10. Paulauskas E. Racionai su apsaugotaisiais riebalais: teorija ir praktika. Mano ūkis. Žurnalas. LVA 2010/11. P. 49 – 51.
11. Spain J.N., Scheer W.A. 100 dienų kontaktas su melžiama karve – 30 dienų prieš ir 70 dienų po veršiavimosi. Tri- State dairy nutrition conference.2001. P. 13-34
12. Stevenson J. Negatyve energy balance, low feed intakes cost you in days open. Hoard‘s Dairymen. Vol. 143. No 15. September. 10. 1998. P. 632.
13. Želvytė R., Monkevičienė I., Balsytė J., Sederevičius A., Laugalis J., Oberauskas V. Probiotiko Levucell ® SCįtaka karvių didžiojo prieskrandžio fermentacinių procesų aktyvumui irprodukcijai ISSN 1392-2130. Veterinarija ir zootechnika. 2006. T. 36(58). P. 96–99.

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