

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 6, June 2017

# Effect of Cows Mastitis Treatment with Using Different Antibiotics on Milk Yield, SCC, Electric Milk Conductivity and Milking Time

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**ABSTRACT:** The aim of this study was to assess the efficiency of different antimicrobial agents, used for mastitis treatment. The following objectives were set to reach the aim: to identify the most common mastitis pathogens in farm X; to identify antimicrobial resistance of the most common microorganisms in farm X; to analyse the relationship between the types of microorganisms and somatic cell count; to assess the efficiency of selected products for the cows with mastitis, considering electrical conductivity, milk yield, milking time, and somatic cell count.

The most common mastitis pathogens in farm X were *S. agalactiae* (30 %), *S. dysgalactiae* (20 %), *KNS* (20 %), *E. coli* (10 %), *S. faecalis* (10 %). Was found a relationship between mastitis pathogen and SCC. Electrical milk conductivity increases in beginning of mastitis treatment and decreases after 14 days after treatment in all groups. Milk yield decreases in first day of treatment and increases after 14 days after treatment but did not reach the level of milk yield on – 14 day. Milking time on the first day of treatment increased and 14 days after treatment, milking time decreased in all groups.

**KEYWORDS:** mastitis, cow, SCC, milk yield, electrical conductivity, milking time.

### I. INTRODUCTION

Cow mastitis - udder inflammation spread between 30.0 to 40.0 % of dairy cows (1). The disease can lead to irritation, trauma, but the main cause is the bacterium (2). In 95 % of all cow mastitis cases the agent is *Streptococcus agalactiae*, *Staphylococcus aureus*, *Streptococcus dysgalactiae*, *Streptococcus uberis*, or *Escherichia coli* 5 % infections caused by other viruses (3). One of the possible ways to diagnose the dairy cow health problems, before they are diagnosed clinically, is to use a computer system (4). Computer herd management system is able to identify each cow's milk yield (kg), electrical conductivity (mS / cm) and the milking time (s) the average milk flow (kg / min), activity and other characteristics. Decreased of milk yield, is one of the clearest evidence of mastitis. Will productivity be significantly reduced, depending on the degree of inflammation, which can be identified by the SCC milk (5).

Clinical mastitis forms of knowledge, bacteriological tests based therapy and treatment efficiency - these are essential requirements in order to efficiently and effectively with mastitis disease (6). The main aim of antimicrobial therapy - quick removal of pathogenic microflora to prevent irreversible tissue damage and further maintain milk production (7).

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## II. METHODS AND MATERIALS

Scientific research was carried out in Large Animal Clinic of Veterinary Academy of Lithuanian University of Health Sciences and farm X during the period of August – October, 2016. Were created 3 research groups with 10 cows in each.

Group 1 (G1) was with mild mastitis form It was treated with “Rifen” (Manufacturer: Richter Pharma AG, Austria. Composition: ketoprofen 100 mg/ml, meat withdrawal period - 4 days, milk - 0 days) 15 ml i.m, for 2 days, “Karbseptas” (Manufacturer: „Ruvera“, Lithuania. Composition: 100 g of ointment contains: oxytetracycline 2 g, methyl salicylate 2 g, 2 g camphor, carbamid (urea) 5 g, 89 g of excipients, meat withdrawal period - 0 days, milk – 0 days) was applied externally to the affected quarter after milking during all treatment time; if inflammation did not pass after 2 days, “Synulox RTU” (Manufacturer: Zoetis Belgium SA, Belgium. Composition: amoxicillin (trihydrate) 140 mg/ml, clavulanic acid (potassium clavulanate) 38.5 mg/ml, meat withdrawal period - 28 days, milk – 2,5 days) 20 ml i.m. was started to be injected on the third day for 3 days and “Synulox LC” (Manufacturer: Zoetis Belgium SA, Belgium. Composition: 3 g syringe contains amoxicillin (trihydrate) 200 mg, clavulanic acid (potassium clavulanate) 50 mg, prednisolone 10 mg, meat withdrawal period - 7 days, milk – 3,5 days) 3 syringes each 12 hours i.m. Groups 2 and 3 were with severe clinical mastitis.

Group 2 (G2) was treated with “Synulox RTU” 20 ml i.m. for 3 days and “Synulox LC” 3 syringes each 12 hours i.m., “Rifen” 15 ml i.m. for 2 days, “Karbseptas” was applied externally to the affected quarter after milking during all treatment time.

Group 3 (G3) was treated with “Lincocin forte S” (Manufacturer: Huvepharma NV, Belgium. Composition: 10 ml syringe containing lincomycin (lincomycin hydrochloride) 330 mg, neomycin (neomycin sulfate) 100 mg, meat withdrawal period - 3 days, milk – 3,5 days) 3 syringes, each 12 hours i.m., “Rifen” 15 ml i.m. for 2 days, “Karbseptas” was applied externally to the affected quarter after milking during all treatment time.

Mastitis form, pathogen and sensitivity to antibiotics was identified before treatment. Milk yield, electrical conductivity of milk, average milk flow, milking time somatic cell count was examined before and after treatment with help of computer herd management program. Mastitis form was determined according general clinical examination plan.

## III. EXPERIMENTAL RESULTS AND DISCUSSION

The most common mastitis pathogens in farm X were *S. agalactiae* (30 %) *S. dysgalactiae* (20 %), *KNS* (20 %), *E. coli* (10 %), *S. faecalis* (10 %) (Fig. 1.).

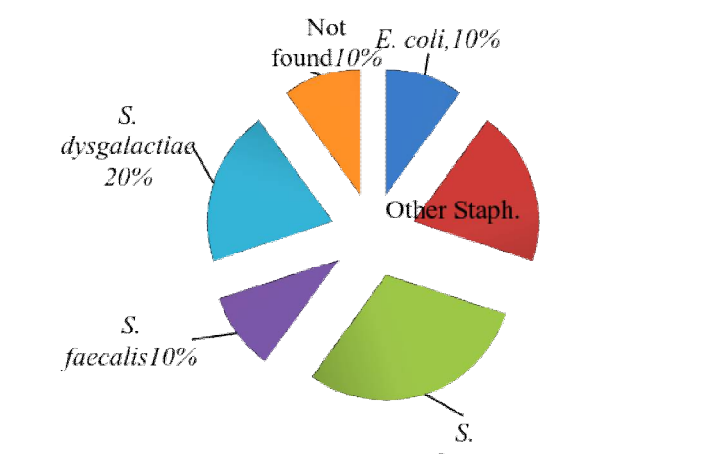


Fig. 1. The most mastitis pathogens on X farm.

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In the etiology of mastitis, it is very important for the micro-organism to interact with the cow, its pathogenicity and its amount (8). In a bacteriological study of milk samples we found *S. agalactiae* (30%), *S. dysgalactiae* (20%) and CNS (20%) were detected in 3 samples from 10 samples, 1 sample was detected *E. coli* (10%) and *S. faecalis* (10%) was detected in one sample. In addition, no culture of microorganisms was detected in 1 out of the 10 samples, which may have been due to the specificity of the infection, low bacterial titre or sample storage conditions (9). In the literature are described as highly pathogenic and contagious *S. aureus*, *S. agalactiae*, *E. coli*, *S. dysgalactiae*, *S. uberis* as less pathogenic - *C. albicans*, CNS. According to researchers, they are not equally distributed among all herds (8). In the samples of milk tested for cows with mastitis in France, CNS accounted for 13.7% and *S. dysgalactiae* was 9.3%. (10). 19.42 % of the cause of the Finnish cow's mastitis are *S. aureus*, 3.8% - CNS, 4.91% - *S. uberis* (8). According to other authors, *S. uberis* is found about 28%, *E. coli* - 13%, CNS and *S. aureus* - 8%. (9).

There was a relationship between mastitis pathogen and SCC: *S. agalactiae* 1,254 million/ml, *S. faecalis* 1,203 million/ml, and *S. dysgalactiae* 953,5 thousand/ml accounted for the highest SCC in the studies samples. Meanwhile, the number of somatic cells in other staphylococci 675 thousand/ml, and *E. coli* 511 thousand/ml samples was significantly lower.

Similar data is provided by other authors: in samples from infected CNS and *Streptococcus* spp., SCC was found 13.6 million / ml. CNS, *S. aureus* and *Streptococcus* spp. Was most commonly found in samples with SLS ranging from 200 ppm to 2 ppm. (11). In the case of intramammary infections caused by *S. aureus*, 357 thousand / ml SLS was detected, with CNS-138 thousand / ml, *S. agalactiae* - 857 thousand / ml, *S. uber* - 10,24 million / ml, *S. dysgalactiae* - 547 thousand / ml. (12).

The mean of electrical milk conductivity (EMC) of group 1 was  $6.33 \pm 0.034$  mS / cm<sup>2</sup> 14 days before the start of treatment. On the first day of treatment, it increase to  $6.72 \pm 0.044$  mS / cm<sup>2</sup>. Consequently, the average EMC on the first treatment day was 0.39 mS / cm<sup>2</sup> or 5.8%. ( $p > 0.05$ ). It dropped to  $4.98 \pm 0.042$  mS / cm<sup>2</sup> for 14 days after treatment. The EMC of group 1 from the beginning of treatment was statistically significantly ( $p < 0.01$ ) decreased by 1.74 mS / cm<sup>2</sup>, which was 25.9%. In G2, the mean electrical conductivity was  $5.04 \pm 0.037$  mS / cm<sup>2</sup> for 14 days prior to the start of treatment. On the first day of treatment, it increase to  $5.32 \pm 0.028$  mS / cm<sup>2</sup>. On the first day of treatment, the EMC increases on average 0.28 mS / cm<sup>2</sup> or 5.3%. ( $P > 0.05$ ). It dropped to  $5 \pm 0.038$  mS / cm<sup>2</sup> for 14 days after treatment. This indicates that the electrical conductivity of milk from the beginning of treatment decreased by 0.32 mS / cm<sup>2</sup>, which corresponds to 6%. ( $P < 0.05$ ). In the 3rd group, the mean electrical conductivity was  $5.87 \pm 0.037$  mS / cm<sup>2</sup> 14 days before the start of treatment. On the first day of treatment, it increases to  $5.98 \pm 0.031$  mS / cm<sup>2</sup>. Consequently, the EMC on the first day of treatment averaged 0.11 mS / cm<sup>2</sup> or 1.8%. ( $P > 0.05$ ). It decreased to  $5.01 \pm 0.035$  mS / cm<sup>2</sup> for 14 days after treatment. The electrical conductivity of group 3 cows decreased from 0.97 mS / cm<sup>2</sup> from the start of treatment ( $p < 0.05$ ), which corresponds to 16.2%. (Fig. 2).

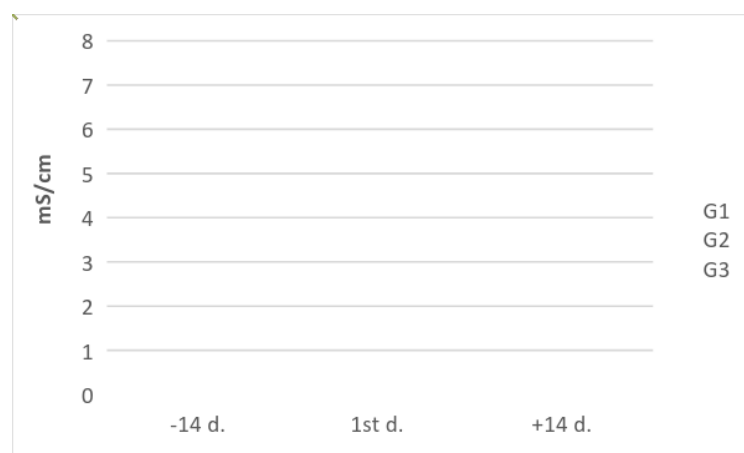


Fig. 2. Comparison of the variation of the milk electrical conductivity in the investigated groups.

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The results of the study showed that the mean milk yield (MY) of group 1 was  $14.7 \pm 2.9$  kg 14 days before treatment. On the first day of treatment it dropped to  $7.3 \pm 1.7$  kg. On the first day of treatment, G1 MY decrease of 7.4 liters, corresponding to 49.7%. ( $P < 0.05$ ). Within 14 days after treatment, milk increased to  $10.3 \pm 2.9$  kg or 29.1%. Much more than on the first day of treatment, but did not return to baseline before treatment - a decrease of 4.4 kg (29.9%). In G2, the mean milk yield was  $12.2 \pm 2.2$  kg for 14 days before treatment. On the first day of treatment, it decreased to  $10.1 \pm 1.9$  kg. G2 cows decreased by 2.1 17.2% on the first day of treatment. ( $P < 0.05$ ). Within 14 days after treatment, it has increases to  $11.7 \pm 2.4$  kg (Fig.3).

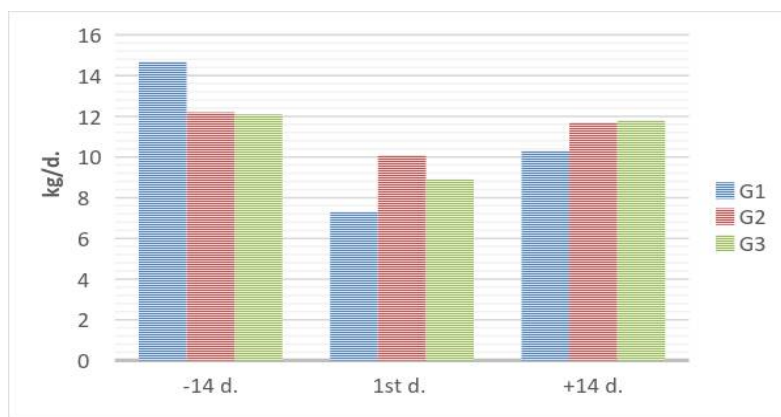


Fig. 3. Comparison of the variation of the milk yield in the investigated groups.

The average of milking time (MT) in G1, 36 days before the treatment, was  $369 \pm 48.31$  s. On the first day of treatment decreased to  $254 \pm 46.21$  s. It is also seen that the duration of milking on the first day of treatment was reduced by 115 s (31.2%,  $p < 0.05$ ). After treatment, the milking time increased by 28 s (9.9%) to  $282 \pm 53.64$  s ( $p < 0.05$ ), but remained at a shorter 87 s (23%) compared to the milking time from the start of the treatment. In the G2 the mean milking time was  $280 \pm 64.89$  s for 14 days before the start of treatment. On the first day of treatment, it decreased to  $274 \pm 43.51$  s. Thus, the duration of milking on the first day of treatment decreased by 6 s (2.1 pct,  $p < 0.05$ ). 14 days after treatment, milking time increased by 12 s (4.2%) to  $286 \pm 59.42$  s ( $p < 0.05$ ), as well as extended by 6 s (2.1%) In G3 the mean cow milking time before treatment was  $294 \pm 56.32$  s. On the first day of treatment MT was lengthened to  $302 \pm 38.46$  s. Thus, the duration of milking on the first day of treatment increased by 8 s (2.6%,  $p < 0.05$ ). 14 days after treatment, milking time decreased by 8 s (2.6%) to  $294 \pm 65.81$  s ( $p < 0.05$ ) compared to the time of milking from the start of treatment, and was equal to the time before treatment (Fig.4).

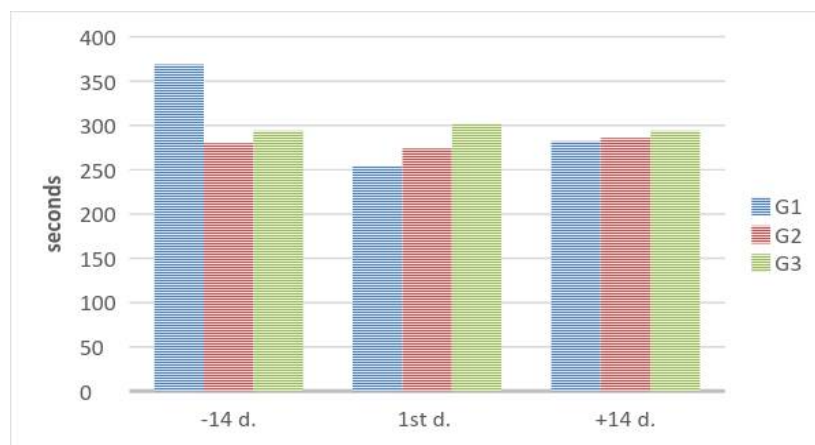


Fig. 4. Comparison of the variation of the milking time in the investigated groups.

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The parameters recorded by the herd management program (milk yield, electrical milk conductivity, milking time) are associated with mastitis, but they are not considered to be indicative of mastitis symptoms. For example, milk production may decrease due to metabolic disturbances and complicated postcalving period (13). Špakauskas et al., (14) suggests that electrical milk conduction decreases after treatment, but in the case of clinical mastitis it remains elevated for another 10 days. Gröhn et al. (15) found that the milk yield generally declines before the clinical mastitis is detected. Reduced production of milk prior to the clinical symptoms of mastitis should be considered as a signal indicating veterinary clinical examination. Larroque et al. (16) concluded that the milking time for healthy cows and those with clinical mastitis is significantly different. Clarke et. al., (17) found that the milking time of cows suffering from mastitis is prolonged as their milk extraction process is slower. This coincides with Larroque et al. (16) suggest that in the case of severe cases of mastitis, time.

## IV. CONCLUSION

The most common mastitis pathogens in farm X were *S. agalactiae* (30 %), *S. dysgalactiae* (20 %), KNS (20 %), *E. coli* (10 %), *S. faecalis* (10 %). Was found a relationship between mastitis pathogen and SCC. Electrical milk conductivity increases in beginning of mastitis treatment and decreases after 14 days after treatment in all groups. Milk yield decreases in first day of treatment and increases after 14 days after treatment but did not reach the level of milk yield on – 14 day. Milking time on the first day of treatment increased and 14 days after treatment, milking time decreased in in all groups.

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