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# Х А Б А Р Ш Ы С Ы

# ВЕСТНИК

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

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*НАН РК сообщает, что научный журнал «Вестник НАН РК» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Вестника НАН РК в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному мультидисциплинарному контенту для нашего сообщества.*

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# THE ROLE OF PLANT PREPARATIONS IN IMPROVING THE SAFETY AND QUALITY OF MILK IN SUBCLINICAL MASTITIS OF COWS

**Abstract.** The production of safe and high-quality milk in case of cow disease with mastitis is an urgent task. In the production of milk, it is necessary to strictly observe the technology and the veterinary and sanitary rules for milking, to carry out timely diagnosis and treatment of cows at subclinical mastitis. In the conditions of the Chuvash Republic, an analysis of the causes of lesions in the quarters of the mammary gland was carried out and the main directions for timely diagnosis and prevention of subclinical mastitis of cows were established. The dynamics of affection of udder quarters with mastitis during the lactation period was determined and with a positive effect it was tested the combined use of plant preparations - pihtoin ointment and trauma-gel for the treatment of subclinical mastitis of cows, which ensures the safety and high quality of products.

The use of pihtoin ointment in the treatment of cows with subclinical mastitis led to recovery of the udder in 16.7% of the cows. The quantity of mesophilic aerobic and facultative anaerobic microorganisms in milk decreased 1.6 times.

The use of the trauma-gel in the treatment of subclinical mastitis in cows led to the recovery of the udder in 63.2% of sick cows. The content of microorganisms in milk declined by 13%.

The results of studying the effect of the combined use of pihtoin ointment and trauma-gel preparation on the milk quality of cows showed that with the combined treatment of subclinical mastitis, all 14 sick cows recovered, that was 100%.

In the treatment of subclinical mastitis of cows during the lactation period, we recommend the combined use of plant preparations - pihtoin ointment and trauma-gel 2 times a day with an interval of 12 hours for 5 days. The combined use of pihtoin ointment and trauma-gel preparation for the treatment of cows allowed to reduce not only the number of somatic cells and improve the quality of milk, but also the cost of treatment by 3.8 times.

Preparations on a plant basis have excluded the damage from milk rejection, which is presented in the treatment with antibiotics.

**Keywords:** milk safety, subclinical mastitis, somatic cells, microorganisms, trauma-gel, pihtoin ointment.

**Introduction.** Dairy cattle husbandry is the leading direction in the structure of the entire agro-industrial complex [1-23]. Getting quality and safe milk from cows is an urgent task for milk producers [1-8, 14-23]. One of the reasons for the poor quality of milk is cow disease with mastitis [6-13]. The high content of somatic cells in milk reduces heat resistance and other technological properties of milk. Milk received from cows with mastitis causes staphylococcal infections in humans. Diagnosis of latent mastitis is of great importance both during lactation and during the dry period, as well as to increase the competitiveness of any breed of dairy cattle and breeding of healthy young-stock. [24-26].

The aim of the research is to develop and to conduct veterinary and sanitary measures for the prevention and treatment of subclinical mastitis of cows during the lactation period.

To achieve the aim, the following objectives were set:

1. to conduct a veterinary and sanitary examination of cows' milk.

2. to determine the factors affecting the content of microorganisms and somatic cells in the milk of cows, and to take measures to reduce them.

3. to establish the dynamics of affection of the udder of cows with subclinical mastitis.

4. to analyze the effectiveness of the use of plant-based preparations - pihtoin ointment and trauma-gel preparation, and to justify their combined use for the treatment of cows with subclinical mastitis.

**Methods of research.** The experimental work was carried out on the basis of the Accredited Testing Laboratory of the budget institution of the Chuvash Republic "Chuvash Republican Veterinary Laboratory" of the State Veterinary Service.

Research and production studies were carried out on the basis of a dairy farm SKHPK-collective farm named after Lenin of the Cheboksary district of the Chuvash Republic (CR).

For the conducting research, 3 experimental groups and 1 control group of holsteinized black-and-motley cows were formed according to the analogue group method, taking into account body weight and age of animals. The quality of cow's milk was homogeneous in terms of physico-chemical parameters. During the study period, cows of all groups were on the same feeding diet under the same maintenance, feeding and milking conditions.

The study of the dynamics of udder affection and the influence of plant drugs on the effectiveness of the treatment of subclinical mastitis and the quality of cows' milk was performed in the commercial dairy farm No 1 (CDF 1) with a population of 180 milking cows. The way of keeping cows is tethered, using pasture in summer. During the housing season, cows are kept on a leash in a room; for regimen of cows, the walking areas are used. The farm is equipped with the ADM-8 milking machine with a milk line. Milking of cows is carried out in stalls in glass milk lines. The research included a study of the quality of milk in terms of organoleptic and physicochemical parameters; analysis of milk from each quarter of the udder for subclinical mastitis using the California test and the kenotest, as well as clinical examination of cows with a high content of somatic cells in milk.

In the preparatory period, we conducted an examination of the quality of milk in the dairy laboratory of the farm for organoleptic and physico-chemical properties. The number of somatic cells in milk, the bacterial contamination of milk, the presence of abnormal milk, antibiotics, inhibiting substances were determined in the republican veterinary laboratory. In the milk of cows at CDF 1, it was revealed an increased content of somatic cells. The results of milk quality research in the initial period were taken as the initial ones.

In the main period, cows' milk was examined for subclinical mastitis with the help of rapid mastitis tests. They determined the frequency of attack rate of quarters of the cows' udder with subclinical mastitis during lactation and revealed the causes of the disease.

In the final period, cows were treated with plant-based preparations - pihtoin ointment and trauma-gel preparation, and their effectiveness in treating subclinical mastitis was determined (table 1).

Table 1 - Administration of herbal preparations

| Indicator | Group | | | |
|---|---|---|---|---|
| | 1 experimental | 2 experimental | 3 experimental | 4 control |
| Number of cows, heads | 45 | 45 | 45 | 45 |
| Number of cows, heads:<br>- with subclinical mastitis;<br>- recovered | <br>18<br>3 | <br>19<br>12 | <br>14<br>14 | <br>7<br>4 |
| Preparation | Pihtoin ointment | Trauma-gel | Pihtoin ointment and Trauma-gel | Mastiet Forte |
| Frequency of treatment | 2 times a day with an interval of 12 hours | | | 1 time per day in a dose of 10 ml |
| Method of treatment | application to the affected quarter of the udder | | | intramammary |
| Duration of treatment, day | 5 | | | |

The studies were performed using zoohygienic methods: temperature, humidity, air velocity, carbon dioxide, ammonia and hydrogen sulfide content in the air, microbial contamination and dust content in the room air were determined on a commercial dairy farm. Clinical and physiological methods were used to determine body temperature, pulse rate and respiration in animals of the control and experimental groups. The veterinary and sanitary examination of milk was carried out using the following methods: organoleptic method - for determining color, smell, taste, and texture; areometric method - for density; titration - for acidity; filtering - for the purity group; Gerber's acid method - for a mass fraction of fat; measuring the mass fraction of total nitrogen according to Kjeldahl - the mass fraction of protein; the arbitration method - for the mass fraction of dry matter and nonfat milk solids; method of counting colonies of mesophilic aerobic and facultative anaerobic microorganisms - QMAFAnM; with the use of indicator of methylene blue - inhibiting substances; by identifying bacteria of the genus Salmonella - pathogens, incl. salmonella; by changing the viscosity in a visual way and using a viscometer - the number of somatic cells.

Statistical processing was performed by the method of variation statistics on the reliability of the differences in compared indicators. The values of arithmetic averages (M), standard deviations (σ), mean errors (m) were calculated using the Microsoft Office Excel 2007 computer program. The degree of reliability of differences in mean values in cases of normal distribution was determined using Student's criterion.

**Research results.** In the integrated agricultural production center - the collective farm named after Lenin of the Cheboksary District of the Chuvash Republic, dairy production is carried out on two farms. CDF 1 uses the tie-up housing, CDF uses 2 loose keeping of cows. The quality of milk differs depending on the method of keeping cows. Mass fraction of protein and fat in milk are within the basic norms. Acidity, purity group, density of milk meet the requirements.

The content of microorganisms and somatic cells in milk significantly exceeds the requirements, which makes it necessary to identify the causes, to develop and to take measures to eliminate them.

In this regard, in the conditions of the collective farm named after Lenin the production experiments to determine the safety and quality of milk were conducted. It was decided to develop and take the veterinary and sanitary measures to reduce the content of microorganisms and somatic cells in the milk of cows.

Cows' milk, like other types of agricultural products, is primarily defined by safety. These requirements are also reflected in modern regulatory and technical documents. Russian Federation has a technical regulation of the Customs Union “On the safety of milk and dairy products” (TR CU 033/2013).

The quantity of mesophilic aerobic and facultative anaerobic microorganisms (QMAFAnM) at the beginning of the research in the spring-summer period in milk of cows of the CDF 1 was 390-497, the CDF 2 - 340-413 thousand CFU/cm$^3$. On average, QMAFAnM in milk of cows of the CDF 1 was 440, of the CDF 2 - 370 thousand CFU/cm$^3$ at the norm for milk not more than 100 thousand CFU/cm$^3$.

In the milk of cows of CDF 1, the Somatic Cell Count (SCC) averaged 600 thousand/cm$^3$ with an oscillation interval of 430-1000 thousand/cm$^3$, while the norm for milk does not exceed 400 thousand/cm$^3$. In the milk of cows of CDF 2, the Somatic Cell Count was significantly lower and averaged 500 thousand/cm$^3$, the interval was 310-580 thousand/cm$^3$.

Thus, the bacterial infection of the milk of cows of CDF 1 exceeded the requirements by 5 times, the milk of cows of CDF 2 was 4 times higher. SCC in the milk of cows of CDF 1 exceeded the requirements by 50%, CDF 2 - by 25%.

In this regard, the implementation of sanitary and hygienic measures aimed at reducing bacterial contamination and the somatic cell count in milk of cows, is relevant.

The results of our research confirm that an important factor in preserving the quality of milk is a proper organization of the hygiene of cows milking and compliance with instructions for using milking equipment.

To reduce the total bacterial number in milk, the somatic cell count and to improve its quality and safety in dairy farms of the agricultural collective farm named after Lenin together with the specialists of the farm developed and conducted sanitary and hygienic measures: bacteriological studies of the secretion of the udder of cows suffering from mastitis; identifying the source of the disease; timely implementation of preventive and therapeutic measures; monitoring compliance with the rules of milking; identification

and treatment of cows with reproductive organs; regular monitoring of the state of the mammary gland of cows; control of the level of somatic cells in milk with rapid mastitis tests to detect latent mastitis.

Taking sanitary and hygienic measures led to the fact that the bacterial contamination of milk in the spring-summer period of the second year of research compared with the first year of the same period on CDF 1 decreased 1.8 times and amounted to 73-373 thousand CFU/cm$^3$. At CDF 2 QMAFAnM decreased 4.6 times with an interval of fluctuations of 59-117 thousand CFU/cm$^3$. The average content of QMAFAnM in the milk of cows of CDF 1 and CDF 2 was 250 and 80 thousand CFU/cm$^3$, respectively, while the norm for milk is not more than 100 thousand CFU/cm$^3$ (table 2).

Table 2 – The effect of sanitary and hygienic measures on the content of microorganisms and somatic cells in the milk of cows

| Indicator | Norm for milk according to TR CU 033/2013 | Research results | | | |
|---|---|---|---|---|---|
| | | The first year | | The second year | |
| | | CDF 1 | CDF 2 | CDF 1 | CDF 2 |
| QMAFAnM, CFU/cm$^3$ (g), not more | $1 \cdot 10^5$ | $3.4 \cdot 10^5$ | $3.7 \cdot 10^5$ | $2.5 \cdot 10^5$ | $0.8 \cdot 10^5$ |
| Pathogenic, including salmonella in 25 g of product, (cm$^3$) | not allowed | not found | | not found | |
| Somatic cells in 1 cm$^3$, not more | $4 \cdot 10^5$ | $6 \cdot 10^5$ | $5 \cdot 10^5$ | $5 \cdot 10^5$ | $4 \cdot 10^5$ |
| *Note:* QMAFAnM - the quantity of mesophilic aerobic and facultative anaerobic microorganisms. | | | | | |

The veterinary and sanitary measures carried out in the first and second years of research at the CDF2 allowed to reduce the SCC in milk from 500 to 400 thousand/cm$^3$, which meets the requirements of the Technical Regulations of the Customs Union "On the safety of milk and dairy products" (TR CU 033/2013) . At CDF 1, SCC in milk decreased from 600 to 500 thousand/cm$^3$, however, these figures exceed current requirements.

A high concentration of microorganisms and somatic cells in the milk of cows of CDF 1, in our opinion, is a sign of parasecretion of the udder or disease of cows.

Maintaining udder health in cows is especially important during the lactation period, when the mammary gland of a cow is under tremendous stress. Mastitis of cows causes significant damage to the farm from premature culling of cows, reduced performance of dairy cows, the incidence of calves, the cost of diagnosis, treatment, etc. It is important to recognize the disease in time to prevent its spread - an important task of farmers.

To successfully solve the problem of increasing the number of somatic cells in milk, we studied the distribution of subclinical mastitis of cows during lactation. Studies of a quarter of the udder of cows for detection of mastitis were performed on CDF 1 for two years during lactation. To determine the number of somatic cells in the secretion of the udder, California mastitis test and kenotest were used. Milk with a positive reaction was tested by settling-out sample (table 3).

Table 3 – The affection of the udder by the inflammatory process in subclinical mastitis of cows during lactation

| Udder quarters | Groups | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 experimental | | 2 experimental | | 3 experimental | | 4 experimental | |
| | Year of experiment | | | | | | | |
| | first | second | first | second | first | second | first | second |
| 1 quarter, % | 63.6 | 72.2 | 69.6 | 57.9 | 100 | 64.3 | 60.0 | 28.6 |
| 2 quarter, % | 36.4 | 22.2 | 30.4 | 36.8 | – | 37.7 | 40.0 | 71.4 |
| 3 quarter, % | – | – | – | 5.3 | – | – | – | – |
| 4 quarter, % | – | 5.6 | – | – | – | – | – | – |
| Sick cows, heads | 11 | 18 | 23 | 19 | 1 | 14 | 10 | 7 |
| Sick cows, % | 24.4 | 40.0 | 51.1 | 42.2 | 2.2 | 31.1 | 22.2 | 15.6 |

It was established that subclinical mastitis of cows during lactation often develops in spring and summer. So, in November, subclinical mastitis was found in 30 cows, which is 16% of the herd, in July - in 58 cows or 32%.

The use of pihtoin ointment in the treatment of cows with subclinical mastitis led to a recovery of the udder in 16.7% of the cows. The quantity of mesophilic aerobic and facultative anaerobic microorganisms in the milk of the first experimental group decreased by 1.6 times. The somatic cell count with the use of pihtoin ointment in the experimental group did not change and amounted to 420 thousand in 1 cm3 of milk, while the norm of top-grade milk was 400 thousand in 1 cm3. Thus, the milk of cows in the control and experimental groups according to the content of microorganisms and somatic cells corresponds to the first grade.

The use of the trauma-gel preparation in the treatment of subclinical mastitis of cows in the second experimental group resulted in recovery of the udder in 63.2% of sick cows. The content of microorganisms in milk decreased by 13%. At the same time, QMAFAnM amounted to 410 thousand CFU/cm$^3$, which exceeds the norm. The somatic cell count in the milk of cows in the experimental group decreased by 2.4% and amounted to 400 thousand in 1 cm$^3$, which corresponds to the requirements of TR CU 033/2013.

In the third experimental group, it was studied the effect of the combined use of pihtoin ointment and trauma-gel on the quality of milk of cows. With the combined treatment of subclinical mastitis, all 14 sick cows recovered, which was 100%. It was established that QMAFAnM decreased by 2.6 times and amounted to 180 thousand CFU/cm$^3$, at a norm of 100 thousand CFU/cm3. The somatic cell count in the milk of the third experimental group decreased by 1.3 times and amounted to 320 thousand in 1 cm3. A significant decrease in the number of somatic cells in cow's milk with combined treatment led to the improvement in the quality of milk.

From our point of view, this is due to the fact that the trauma-gel preparation has a hydrophilic base penetrating deep into the tissues, such a base makes it possible to apply it even on fresh wounds. Trauma-gel quickly restores tissue immunity in the lesion focus, blocks the development of pathogenic microflora, stimulates wound self-cleaning and the development of granulation tissue.

In our studies, the trauma-gel preparation was applied to the affected or painful places after the pre-toilet with a thin layer 2 times a day, easily rubbing into the skin. At the same time, a decrease in the number of somatic cells by 2.5% was established. The combined use of pihtoin ointment and the trauma-gel for the treatment of cows allowed to reduce the somatic cell count and improve the quality of milk (table 4).

Table 4 – Effect of pihtoin ointment and trauma-gel preparation on the content of microorganisms and somatic cells in the milk of cows

| Indicator | Norm for milk according to TR CU 033/2013 | Group | | | |
|---|---|---|---|---|---|
| | | 1 experimental | 2 experimental | 3 experimental | 4 experimental |
| QMAFAnM, CFU/cm$^3$ (g), not more | $1 \cdot 10^5$ | $3.0 \cdot 10^5$ | $4.1 \cdot 10^5$ | $1.8 \cdot 10^5$ | $4.7 \cdot 10^5$ |
| Somatic cells in 1 cm$^3$ (g), not more | $4 \cdot 10^5$ | $4.2 \cdot 10^5$ | $4.0 \cdot 10^5$ | $3.2 \cdot 10^5$ | $4.1 \cdot 10^5$ |

Timely diagnosis of subclinical mastitis, reliable prevention, effective treatment form the basis of measures to control mastitis and contribute to enhancing the quality of milk.

The quality control of cows' milk with the help of the California test and kenotest revealed subclinical mastitis and timely treatment.

It was revealed that QMAFAnM (the quantity of mesophilic aerobic and facultative anaerobic microorganisms) in the milk of cows of the experimental and control groups ranges from 180 thousand to 470 thousand with a norm of not more than 100 thousand CFU/cm$^3$. SCC in the milk of cows of the 1 experimental group was 420 thousand in 1 cm³ ($P \leq 0.05$), of the 2 experimental group - 400 thousand ($P \leq 0.05$), of the 3 experimental group - 320 thousand ($P \leq 0.05$), of the control group - 410 thousand in 1 cm$^3$.

Thus, the quality of cows milk of the 2 and 3 experimental groups according to the SCC meets the requirements of TR CU 033/2013. Milk of cows in the 1 experimental and the 4 control groups - does not correspond.

**Discussion of the research results.** Milk by the specificity of its receiving always contains a certain number of bacteria. The higher in quality it is, the lower the content of bacteria and mechanical impurities. In Russia, the number of mesophilic aerobic and facultative anaerobic microorganisms in accordance with the requirements of the technical regulations of the Customs Union "On the safety of milk and dairy products" (TR CU 033/2013) in cow's milk is allowed no more than $1 \cdot 10^5$ CFU/cm$^3$, the somatic cell count is not more than $4 \cdot 10^5$ in 1 cm$^3$.

According to the norms of European standards, in milk no more than $2.5 \cdot 10^5$ somatic cells per 1 cm$^3$ are allowed. In the USA, a herd of cows is considered prosperous to mastitis if the somatic cell count in milk is not more than $2 \cdot 10^5$ per 1 cm$^3$.

Various factors contribute to the appearance of mastitis in the herd. First of all, bacteria are present in the environment of cow, and especially a lot of them are on the litter. Mastitis caused by the environment, appears mainly as a result of poor-quality, dirty litter in animals, which was revealed at the initial stage of our research. Udder invasion occurs between milkings. Cows are particularly susceptible to these bacteria at the beginning of their “dry” period, when the nipple channels are open [14].

Mastitis in cows is observed in any period of lactation, while high-yielding animals more often get sick, which leads to significant losses. To increase the effectiveness of the developed measures for the prevention of subclinical mastitis of cows during lactation, it is necessary to identify all the factors that contribute to the emergence and distribution of the disease. Our research confirms the results of scientists of the need to organize the timely detection of the initial stages of mammary gland inflammation of cows with regular milk testing and the necessary treatment [8-12].

The criterion for the intensity of the incidence of cows with mastitis and the presence of impurities of mastitis milk is the somatic cell count. However, it should be remembered that this indicator in healthy cows may increase immediately after calving, before drying off, during oestrus, as well as in old animals that had previously suffered from mastitis.

Somatic cells are the usual components of normal milk, they are represented by leukocytes and epithelium of the alveoli and the lactating ducts. The secret of healthy cows is dominated by epithelial cells formed during natural aging and tissue renewal. With mastitis, leukocyte migration increases to the inflammatory focus, which leads to a sharp increase in the number of somatic cells. According to research, 1 ml of milk of all ages healthy cows contains an average of 250 thousand somatic cells, and with the disease of subclinical mastitis it is almost four times more. Counting somatic cells in raw milk as well as counting bacterial contamination are common methods for assessing the quality of milk in all countries producing milk and dairy products. These indicators are used not only as payment criteria for milk producers, but also they are a means of assessing the state of the cow udder [6].

As a result of our research, investigations of other scientists and practitioners, the main factor affecting the number of somatic cells is an infection of the udder in the past or present. Other factors, such as lactation period, age and seasonality, are considered less significant. [1-6, 13-16].

Clinical and subclinical forms of inflammation lead to a significant loss of productivity not only in the current, but also in subsequent lactations. This is due to the death of part of the cells of the secretory epithelium of the mammary gland and regeneration due to connective tissue. In some cases, we observed atrophy of individual quarters of the udder.

Monitoring of the herd to identify the clinical and subclinical forms of mastitis in our studies has made it possible to effectively use a wide range of measures [8-12]. Prevention of mastitis on the farm should consist of a complex of veterinary and sanitary, zoohygienic, zootechnical and economic and organizational activities. Untimely detection, late or irrational treatment of mastitis causes atrophy of the affected udder. As a result, the cow becomes milkless and economically unsuitable. To prevent mastitis in cows, it is necessary to apply full feeding, active exercise, comply with the requirements for sanitary conditions and microclimate of the premises, follow the rules for milking the cows, carry out timely diagnostic tests for detection of mastitis and for treatment. On the farm, it is necessary to organize the diagnosis of mastitis of cows during the dry period twice, checking the cows 10–15 days from the

beginning of the dry period and 10–15 days before calving and carrying out the necessary treatment of the udder with preparations used in the dry period.

Our research confirms that cows are susceptible to new infections within 10 days before and 10 days after calving, due to the fact that the concentration of antibiotics decreases, the teat canals are usually open, the cow lies a lot, and immunological mechanisms change in animals. The most common environmental microorganisms are Esherichia coli and Streptococcus uberis.

Investigations by many scientists confirm that mastitis can be forgotten if all aspects relating to the cow's environment and milking procedures are carefully observed. this reduces the number of bacterial populations on the udder and nipple surfaces, especially at the tips of the nipples.

In the integrated agricultural production center - collective farm named after Lenin two main forms of mastitis were revealed - clinical and subclinical. Clinical mastitis - with visible signs of illness. In this form of mastitis, in cows, the udder edema, high fever, redness, pain, and a change in secretion were observed. Clinical mastitis caused a decrease in milk production. An organoleptic evaluation revealed the presence of flakes and clots in the milk, the watery color of the milk. Subclinical mastitis was determined using special tests. It was defined that the infected part of the udder of the animal looks normal, the milk is outwardly unchanged, but milk yield and milk quality are reduced.

In the work carried out in the conditions of the IAPC-collective farm named after Lenin, cows were examined for subclinical mastitis. During lactation, the frequency of affection of the udder quarters and the causes of cows disease were determined. We studied the effectiveness of plant-based preparations for subclinical mastitis. Based on research, measures have been developed to improve the quality of milk based on the prevention of subclinical mastitis. In the studies, it was used plant preparations - pihtoin ointment and trauma-gel. These means were used to treat cows, alternating every other day: pihtoin ointment – on the 1, 3, 5 day, trauma-gel - on 2 and 4 days. The multiplicity and method of use - 2 times a day with an interval of 12 hours for five days by applying the preparation on the skin of the affected quarter of the udder after washing with clean water, drying and preliminary milk from the patient quarter.

Conducted scientific studies allowed to early diagnose subclinical mastitis and prescribe appropriate treatment, reduce damage from milk loss, prevent culling of the animal, and preserve the quality of milk.

The degree of decline in the productivity of cows due to mastitis depends on the stage of the disease and varies from subtle changes to the complete cessation of milk secretion. Technological indicators of milk of cows with mastitis are reduced due to: an increase in the amount of chlorine and sodium in it; reducing the content of low-fat solids; reduce the ability of milk proteins to coagulate (inertness of rennet, delayed secretion of whey); the appearance of inhibitors in milk as a result of therapeutic interventions.

The results of our research confirm that the incidence can be determined by the somatic cell count in one quarter. Quarters, in the milk of which the number of somatic cells averages up to 100 thousand per 1 ml, is considered healthy. As practice shows, this indicator can vary from 50 thousand to 200 thousand in 1 ml depending on, for example, the age of the cow, the feeding and the conditions in the cowshed. The presence of somatic cells in 1 ml of milk in an amount of 300 thousand to 800 thousand indicates subclinical mastitis. On average, about 5-35% of quarters of the udder of the entire herd are infected with pathogenic bacteria, i.e. have signs of subclinical mastitis.

In the treatment of mastitis, various drugs are used. In our research, we used herbal based preparations. The use of pihtoin ointment in the treatment of subclinical mastitis led to a decrease in QMAFAnM in the milk of cows by 1.6 times. The number of somatic cells when using pihtoin ointment in the experimental group did not change and amounted to 420 thousand in 1 $cm^3$ of milk at a rate of 400 thousand in 1 $cm^3$.

The use of the trauma-gel preparation in the treatment of subclinical mastitis of cows led to a decrease in the content of microorganisms by 13%. At the same time, QMAFAnM amounted to 410 thousand CFU/$cm^3$, which exceeds the norm. The somatic cell count in the milk of cows of the experimental groups decreased by 2.4% and amounted to 400 thousand in 1 $cm^3$, which corresponds to the requirements.

The combined use of pihtoin ointment and trauma-gel preparation in the treatment of subclinical mastitis of cows reduced QMAFAnM (the quantity of mesophilic aerobic and facultative anaerobic microorganisms) by 2.6 times. The somatic cell count in milk decreased by 1.3 times. The use of the combined treatment of animals of the third experimental group contributed to a significant decline in SCC in the cow's milk.

When comparing the damage caused by mastitis and the cost of measures to eliminate it, it was established that the amount of damage is several times higher than the costs necessary for a successful struggle with clinical mastitis of cows.

The economic damage from mastitis consists of the following factors:

- in cows that have undergone mastitis, milk production goes down to 300 kg from 1 cow per year;
- irreversible changes in mammary tissue occur (proliferation of connective tissue) and the previous milk yield is not restored;
- animals of high value for breeding and productive relations are prematurely rejected due to the atrophy of udder quarters;
- increases the incidence of calves and their mortality.

The use of milk with a high content of somatic cells reduces the quality of dairy products (butter, cheese, sour cream, kefir). The possibility of expanding the range of products, which in turn leads to a decline in the purchase price for milk from dairy processing enterprises, is also decreasing.

In addition to the economic damage, mastitis is a direct source of contamination of milk with microbes, their metabolic products, and toxins, which cause various intestinal and respiratory infections in people, especially in children, i.e. reduced milk safety indicator.

Thus, with the combined use of pihtoin ointment and the trauma-gel preparation, the treatment expense for one cow is reduced by 3.8 times. There is no damage from the rejection of milk, which is available during treatment with antibiotics.

**Conclusion** The veterinary and sanitary examination has established that the milk of cows from the integrated agricultural production center - the collective farm named after Lenin on the mass fraction of protein and fat, acidity and density meets the requirements of the technical regulations of the Customs Union “On the safety of milk and dairy products” (TR CU 033/2013). Bacterial contamination and the somatic cell count exceed the requirements.

It was found that in cows, subclinical mastitis during lactation period develops when the rules for milking are violated. Measures taken to eliminate these violations in milking cows allowed to reduce the bacterial contamination of the milk of CDF 1 cows by 1.8 times, of CDF 2 - by 4.6 times. The quantity of mesophilic aerobic and facultative anaerobic microorganisms in the milk of cows in CDF 1 and CDF 2 averaged 250 and 80 thousand CFU/$cm^3$, respectively, at a norm for milk not more than 100 thousand CFU/$cm^3$.

The somatic cell count in the milk of cows of CDF 1 and CDF 2 decreased by 100 thousand/$cm^3$ and amounted to 500 and 400 thousand/$cm^3$, respectively.

Carrying out veterinary and sanitary measures at CDF 2 contributed to the improvement of milk quality up to the requirements of TR CU 033/2013.

It was established that subclinical mastitis in cows during lactation often develops in spring and summer and is 16 and 32%, respectively.

The use of pihtoin ointment in the treatment of sick cows with subclinical mastitis led to a decrease in the quantity of mesophilic aerobic and facultative anaerobic microorganisms in milk by 1.56 times, and the use of trauma-gel preparation - by 1.15 times.

The trauma-gel helped reduce the number of somatic cells in milk to 400 thousand in 1 $cm^3$.

**Conclusions.** The combined use of pihtoin ointment and trauma-gel preparation in the treatment of subclinical mastitis of cows contributed to the recovery of 100% of cows and caused a decrease in the quantity of mesophilic aerobic and facultative anaerobic microorganisms in milk by 2.6 times and amounted to 180 thousand CFU/$cm^3$.

The somatic cell count in the milk of cows declined by 1.3 times and amounted to 320 thousand in 1 $cm^3$, which meets the requirements of the TR CU 033/2013.

The combined use of pihtoin ointment and the trauma-gel with subclinical mastitis of cows reduced the cost of treatment by 3.8 times.

Plant basis preparations have excluded the damage from milk rejection, which is present in the treatment with antibiotics.In the treatment of subclinical mastitis of cows during the lactation period, we recommend the combined use of plant preparations - pihtoin ointment and trauma-gel 2 times a day with an interval of 12 hours during 5 days.

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## СИЫРЛАРДЫҢ СУБКЛИНИКАЛЫҚ ЖЕЛІНСАУ КЕЗІНДЕГІ СҮТТІҢ ҚАУІПСІЗДІГІНІҢ САПАСЫН ЖОҒАРЛАТУДАҒЫ КӨКӨНІСТІ ПРЕПАРАТТАРДЫҢ МАҢЫЗЫ

**Аннотация.** Қауіпсіз және жоғары сапалы сүт өндіру өзекті мәселе,егер сиыр желінсаумен ауыратын болса. Сүт өндіруде ветеринар-санитарлық және технологиялық ережелерін қатаң түрде сақтау керек, субклиникалық желінсау кезінде уақтылы диагностикалауды және емдеуді жүзеге асыру қажет. Чуваш Республикасы жағдайында сүт безінің төрттен бір бөлігінің зақымдану себептеріне талдау жүргізілді және сиырдың субклиникалық желінсауды уақтылы диагностикалау мен алдын алудың негізгі бағыттары анықталды. Лактация кезеңі кезінде емшектегі сүт безінің төрттен бір бөлігінің зақымдану динамикасы анықталды және оң нәтиже көрсеткендей, сиырдың субклиникалық желінсауын емдеуге, аралас шипалы шөптік препараттарды - пихтажақпа майы және «травма-гель» заттарды қолданылуы өнімнің сапасы мен қауіпсіздігін қамтамасыз ететіні тексерілді.

Сиырларды субклиникалық желінсауды емдеу кезінде пихтажақпа майын қолданғанда, сиырлардың 16,7%-ы қалпына келтірілді. Сүттегі мезофильді аэробты және қосымша анаэробты микроорганизмдердің саны 1,6 есеге азайды.

Сиырларды субклиникалық желінсауды емдеуде кезінде «травма-гель» пайдалану арқылы сиырлардың 63,2%-ы қалпына келтірілді. Сүт құрамындағы микроорганизмдердің саны 13%-ға төмендеді.

Сиыр сүтінің сапасына зерттеудің нәтижелері көрсеткендей пихтажақпа майы мен «травма-гель» препараттарын араластырып пайдаланудың әсері, субклиникалық желінсауды араластырып емдеу кезінде барлық 14 ауру сиырды 100% қалпына келтірілгенін көрсетті.

Лактация кезеңінде сиырдың субклиникалық желінсауын араластырып емдеу препараттарымен - пихта жақпа майы және «травма -гель» күніне 2 реттен 5 күн бойы 12 сағаттық интервалмен пайдалануды ұсынамыз.

Сиырларды емдеуге арналған пихта жақпа майы және «травма-гель» препаратын қолдану соматикалық клеткалардың санын ғана емес, сүттің сапасын жақсартуға мүмкіндік берді, сонымен бірге емделу құны 3,8 есеге азайған.

Көкөніс препараттар, негізі сүттің зақымдануын жойды, антибиотиктермен емдеу кезінде сүттің зақымдануы қол жетімді болған.

**Түйін сөздер:** сүт қауіпсіздігі, субклиникалық желінсау, соматикалық жасушалар, микроорганизмдер, «травма-гель», пихта жақпа майы.

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## РОЛЬ ПРЕПАРАТОВ РАСТИТЕЛЬНОГО ПРОИСХОЖДЕНИЯ В ПОВЫШЕНИИ БЕЗОПАСНОСТИ И КАЧЕСТВА МОЛОКА ПРИ СУБКЛИНИЧЕСКОМ МАСТИТЕ КОРОВ

**Аннотация.** Производство безопасного и высокого качества молока при заболевании коров маститом является актуальной задачей. В производстве молока необходимо строго соблюдать технологию и ветеринарно-санитарные правила доения, осуществлять своевременную диагностику и лечение коров при субклиническом мастите. В условиях Чувашской Республики проведён анализ причин поражения четвертей молочной железы и установлены основные направления по своевременной диагностике и профилактике субклинического мастита коров. Определена динамика поражения четвертей вымени маститом в лактационный период и с положительным эффектом апробировано комбинированное применение препаратов на растительной основе – пихтоиновой мази и травма-геля для лечения субклинического мастита коров, что обеспечивает безопасность и высокое качество продукции.

Использование пихтоиновой мази в лечении коров, больных субклиническим маститом, привело к выздоровлению вымени 16,7% коров. Количество мезофильных аэробных и факультативно анаэробных микроорганизмов в молоке снизилось в 1,6 раза.

Использование препарата травма-гель в лечении субклинического мастита коров во привело к выздоровлению вымени 63,2% больных коров. Содержание микроорганизмов в молоке снизилось на 13%.

Результаты изучения влияния комбинированного применения пихтоиновой мази и препарата травма-гель на качество молока коров показали, что при комбинированном лечении субклинического мастита выздоровели все 14 больных коров, что составило 100%.

В лечении субклинического мастита коров в лактационный период рекомендуем комбинированное применение препаратов на растительной основе – пихтоиновой мази и травма-геля 2 раза в сутки с интервалом 12 часов в течение 5 суток. Комбинированное применение пихтоиновой мази и препарата травма-гель для лечения коров позволило снизить не только количество соматических клеток и повысить качество молока, но и затраты на лечение в 3,8 раза.

Препараты на растительной основе исключили ущерб от браковки молока, имеющийся при лечении антибиотиками.

**Ключевые слова:** безопасность молока, субклинический мастит, соматические клетки, микроорганизмы, травма-гель, пихтоиновая мазь.

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