Potential of the novel Siberian antiseptic “Anavidin” for prophylaxis of mastitis of cows

Abstract. The most effective method of prevention of purulent process is rational usage of antiseptics and disinfectants with prophylaxis aim. The aim of this study was to evaluate the effectiveness of the antibacterial activity of the antiseptic Anavidin when exposed to various objects on farms. As research objects of the external environment of the farm (operating tables, sinks, walls, lamps, faucets, equipment, door handles). Processing objects of external farm facilities as the zone of high risk to communicate infection by 1% water solution of anavidin has shown the reducing of the percentage of inoculation 4 times (p =0.001) for certain. Has been discovered utter disappearance of sanitary significant species from 32.6% to zero. Processing by 1% water solution of anavidin for wet cleaning farm facilities and equipment contacted with udder allow to decrease semination of the examined objects. That processing is effective method of decontamination of prophylaxis mastitis. Bacteriological study of semination of the teat cups after processing by 1% water solution of anavidin has shown reducing the contamination of microorganisms from 60% to 0. Water solution of anavidin doesn’t damage products made of metal, plastic and rubber. Substantially reduce time of sterilization.

1 Introduction

Mastitis (inflammation inside the breast) caused by infectious pathogens is still considered a devastating disease of dairy animals, affecting the welfare of animals, as well as economically causing huge losses to the dairy industry due to a decrease in production indicators and an increase in culling rates [1-2]. Milk production and milk composition can be affected by a more or less severe short-term depression, and in the absence of a cure, a long-term effect, and sometimes an overlapping effect on the next lactation. Cumulative milk production losses in the literature have been suggested at 375 kg per case (5% at lactation level) and 0.5 kg per 2-fold increase in raw BMS of the cow. Due to the withdrawal period after treatment, the change in the composition of milk in economic calculations can be practically neglected. Mortality in clinical mastitis is on average very low, while expected culling occurs more often after clinical and subclinical mastitis (relative risk 1.5 to 5.0). The economics of mastitis needs to be addressed at the farm level and is itself dependent on local and regional epidemiological, management and economic conditions [3].

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The prevalence of this disease in about 30% of African countries, with the highest prevalence found in Ethiopia. This is despite the wide distribution of cattle in Africa and the largest number of dairy farms and herds in countries such as South Africa, Kenya and Uganda [4].

The analysis of isolated bacteria were 29.5% Staphylococcus aureus (S. aureus) and 9.3% Streptococcus agalactiae (Str. agalactae). In a study of risk factors, cows from farms with poor hygiene, higher age and stage of lactation had a higher chance of subclinical mastitis. Of the isolated bacterial species, 75.7% and 71.4% of S. aureus isolates were resistant to penicillin and ampicillin, respectively. Streptococcus agalactiae were resistant to oxytetracycline (76.9%), streptomycin (61.5%) and cloxacillin (53.8%). While the majority of S. aureus (98.6%) and Str. agalactiae (88.5%) were susceptible to gentamicin and clindamycin, respectively. Thus, subclinical mastitis has a high prevalence and associated risk factors with pathogens resistant to commonly used antimicrobials [5].

For example, in an analysis of fifteen large dairy farms in twelve major dairy provinces in China, 1,153 milk samples for mastitis were collected and processed. The most commonly isolated pathogens were Staphylococcus spp. (39.03%), Streptococcus spp. (11.01%), Bacillus spp. (8.24%), Aerococcus viridans (6.76%) and Acinetobacter spp. (3.38%) and most of these pathogens were environmental bacteria (67.53%). Tactics of prophylaxis and treating purulent-necrotic processes including mastitis belongs to important division of veterinary medicine, because this pathology do a great economic damage to particularized and large-scale farms [6-7].

Antibiotics are considered the first choice drugs in the treatment of the disease. First-line therapy is penicillins (alone or in combination with aminoglycosides), macrolides and lincosamides, fluoroquinolones, and tetracyclines [8-9]. Antibiotics are widely used in the dairy industry to fight diseases and improve animal productivity. Antibiotics such as penicillin, cephalosporins, streptomycin and tetracycline are used to treat and prevent diseases of dairy cows caused by various gram-positive and gram-negative bacteria.

Antibiotics are often regularly prescribed to the entire herd to prevent mastitis during the dry season. The increase in morbidity in the herd, as a rule, leads to an increase in the use of antimicrobials, which, in turn, increases the likelihood of residual amounts of antibiotics in milk and the possibility of increasing the resistance of bacteria to antimicrobials [10]. The prudent use of antibiotics in the dairy industry is important, appropriate and necessary. The use of antibiotics at a time when animals are susceptible to a new infection, such as during dry periods, is a prudent management decision and prudent use of antibiotics on the farm. Strategies for the prudent use of antibiotics for treatment include identification of the causative agent of infection, determination of susceptibility/resistance to select the most appropriate antibiotic for treatment, and sufficient duration of treatment to provide effective antibiotic concentrations to eliminate infection. At the beginning efficiency of antibiotics was high, but later on wide application of them resulted in appearance of antibiotic resistant strain [11-12]. This problem points to the necessity of re-assessing monopolistic position of antibiotics and turning to more substantiated strategy and tactics of treating purulent-septic infections, search for alternative methods of mastitis treatment [13], including interest in forgotten group of antibacterial preparations – antiseptics. In recent publications the information about novel Siberian effective antiseptic “Anavidin” synthesized at the Irkutsk
2 Materials and methods

Antiseptic “Anavidin” was used as a 1% aqueous solution. The bacteriological research of external farm facilities and milking machines for all kinds of bacterium before and after processing by new Siberian antiseptic “Anavidin” was directional done. The type, biochemical profile of the isolated microorganisms, determination of the resistance of microorganisms to various antibacterial drugs (serial dilution method) was carried out using automated bacteriological analyzers Autosceptor (Becton Dickinson, USA) and ATB Expression by Biomerieux (France) in accordance with the operating instructions supplied with the analyzers. Back analyzers determine more than 800 types of microorganisms and more than 9000 of their biochemical profiles (most of them are not available for determination by classical methods). Data found as median with lower and upper quartiles (25th and 75th percentiles). With a normal distribution in the sample, the data are presented in mean values with a mean square error. Values expressed as percentages show up in the text with a percentage error. The assessment of income from large incomes (p) in comparison with the samples was carried out according to the Mann-Whitney (U), Wilcoxon (W) criteria. Correlation analysis of data in samples with non-normal distribution is carried out using the non-parametric Spearman correlation coefficient (Rs). The critical level of perception during registration indicates the presence of experience in the use of power 0.05. Statistical processing of the results was carried out with a statistical software package.

3 Results and discussion

Table 1. Microbiological semination of dairy farm facilities

<table>
<thead>
<tr>
<th>The objects</th>
<th>The number of tests</th>
<th>Positive results, %</th>
<th>Sanitary significant species, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The farm facilities</td>
<td>48</td>
<td>33 (68.7)</td>
<td>7 (35)</td>
</tr>
<tr>
<td>2. The chuns</td>
<td>20</td>
<td>10</td>
<td>6 (60)</td>
</tr>
<tr>
<td>3. The teet cups</td>
<td>16</td>
<td>16</td>
<td>2 (25)</td>
</tr>
</tbody>
</table>
obtained, because they directly contact with udder and additional contamination is able to result in additional diseases of mastitis with wound infection of udder.

The results of microbial contamination of environmental objects in the premises of the farm are shown in the diagram 1.

Fig. 1. The results of microbial contamination of environmental objects in the premises of the farm

The results of the study show that the most often searched out microorganisms are Staphylococcus spp. 35.3%, 9.9% of them - Staphylococcus simulans, 1.1% of them - β-lactam neg.; Micrococcus luteus to 16.1%, among them Micrococcus luteus β-lactam positiv.; 1.1%; gram+bacillus - 4.4%; Candida - 4.4%; Bacillus - 2.2%; Escherichia coli - 7.7%; Enterobacter aerogenes - 6.6%; Klebsiella oxytoca - 2.2%; Acinetobacter lwoffii - 3.8%; Acinetobacter baumanii - 11.1%.

It was detected that from 180 detailed causative agents in microbe scenery of external farm facilities gramm-positive microflora is dominated (65.5%), the level of gramm-negative is essentially lower (34.5%) (pM-W = 0.001).

In bacteriological tests of semination of available materials from components of milking machines (the teet cups) microflora’s inoculation was 60%. That will be able to cause contamination during the machine milking.

S. epidermidis (25%), S. aureus (10%), Micrococcus luteus (20%), gram+bacillus (5%), Escherichia coli (25%), Streptococcus viridans (5%), Klebsiella oxytoca (5%), Acinetobacter baumanii (5%) were separated.

The study of influence of new siberian antiseptic “Anavidin” on the bacteriological semination of the farm facilities, milking machines was done. The results of antimicrobial activity of anavidin in the farm facilities was shown in the table 2.

Table 2. The results of antimicrobial activity of anavidin in the farm facilities

<table>
<thead>
<tr>
<th>The number of species</th>
<th>The number of positive results (%±S_p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum total</td>
<td>Sanitary significant species</td>
</tr>
<tr>
<td>The objects</td>
<td>Before and after the processing</td>
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</table>
4 Conclusion

After treatment with 1% aqueous solution of "Anavidin" of the objects of the external environment of the farm, as the zone of the highest risk of infection transmission, it was shown that, in general, in the examined premises, the percentage of microorganism inoculation significantly decreased by 4 times (p = 0.001). The complete disappearance of sanitary indicative microorganisms from 32.6% to zero values was revealed. The use of a 1% aqueous solution of "Anavidin" for wet cleaning of farm premises and equipment in contact with the udder of a cow can reduce the contamination of the examined items, which is an effective method of decontamination for the prevention of mastitis. In a bacteriological study of contamination of milking cups after treatment with 1% "Anavidin", it was possible to reduce the contamination of microorganisms from 60% to zero values. Aqueous solutions of "Anavidin" do not damage products made of metals, plastics and rubber. Significantly reduce sterilization time.

Water solution of anavidin doesn’t damage products made from metal, plastic and rubber and substantially reduces time of sterilization.

References


