TREATMENT OF SUBCLINICAL INTRAMAMMARY INFECTIONS IN SMALL RUMINANTS

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Abstract: The researches were effectuated on primipara sheep and goats originating from flocks in which somatic cell number in bulk collected milk was higher than 1,000,000 cells/ml. During lactation the number of somatic cells was determined through the rapid electronic flour optic method SR ISO 13366-3/2001. In the situations in which the limit of 750,000 somatic cells/ml was exceeded as well as at the end of lactation we gathered milk samples. These samples were used to verify through bacteriological examination if the animals had an infection and if so of which origin (Staphylococcus aureus, Staphilococi non aureus or other germs). In 126 sheep and 94 goats diagnosed with subclinical mastitis, after weaning, we performed a treatment with Orbenin Extra (600 mg Cloxacillin “Dynomilled”) administrates intramammary following the last milking. We administered a syringe for each half of the mammary gland, respecting the hygiene and administration rules, avoiding iatrogenic mastitis. In the following lactation we gathered milk samples (a mix from the two mammas) for the determination of somatic cells number and for the bacteriological exam, with diagnostic purpose. The results were compared to those obtained at the same number of sheep and goat (witness lot), selected on the same criteria, which were not treated. Healing percentage, in case of the treated animals, was of 78.57% in sheep and 70.21% in goats, and spontaneous healing percent in non treated animals was of 23.02% in sheep and 19.15 in goats.

INTRODUCTION

When deciding to start a treatment of clinical mastitis in ovine or goats, it has to be analyzed the economical profitability, as the expenses are quite high reported to the value of the animal and healing chances are not guaranteed. Nowadays there are no efficient control means to prove the effect of the antibiotic, clinical and bacteriological healing time of intramammary infections in ovine and goats.

In some areas, for the treatment of subclinical mastitis, administration of antibiotics at weaning is more and more used, especially in cases with increased number of somatic cells (5, 16). Treatment efficiency in case of subclinical mastitis, according to the data presented in different studies, is between 65 -95.8% in sheep (1, 6, 10, 12) and 50- 92.5% in goats (2, 9, 16) who have a shorter mammary repose period. Another study shows that the percent of bacteriological healing, following the treatment at weaning, is between 50 and 90% (14).

De Crémoux (1995) reveals a healing percent of 78% after treatment compared to 21% spontaneous recovery.

The majority of the published papers are based on clinical observations and/or recommendations and results obtained in cows, with few studies regarding specifically treatment of subclinical mastitis in small ruminants. More than that, due to the lack of specifically medication for sheep or goats (there are very few authorized medicines for specifically treatment of mastitis in goats and sheep), the medication authorized for cows. The waiting time for these medications is not established, therefore appears the risk that antibiotics residuuum appears in milk.
Natural defense means of the mammary tissue, during mammary repose period, allow spontaneous expulsion of an important amount of germs. Nevertheless, frequently, natural defense means are exceeded, and an antibiotic treatment after weaning is necessary.

MATERIAL AND METHODS

We collected milk samples (a mix from the two mammas) from primipara sheep and goats of 28 flocks (14 of sheep and 14 of goats) from Bistrița Năsăud County. The purpose was to determine the number of somatic cells and to perform a bacteriological exam. The first control of somatic cells number has been performed between the 8-th and 20-th lactation day (mean of 14 days), and the following controls at an interval of 30 days.

Numeric evaluation of somatic cells was performed using the rapid electronic flour optic method SR ISO 13366-3/2001. Bacteriological exam of milk samples was performed in the first 24 hours after their collection at L.S.V.S.A. Bistrița, the Institute of Diagnostic and Animal Health Bucharest and/or the Institute of Hygiene and Public Veterinary Health Bucharest.

Isolation and identification of bacterial species involved in the etiology of mammary infections was achieved through the following methods: O.I.E. 1.4 SR ISO 688-1/A1/2005, for the genus Staphilococcus and Micrococcus; OIE 1.24 for the genus Streptococcus spp.; SR EN ISO 7932/2005, for Bacillus cereus; SR ISO 16649-2/2002, for Escherichia coli; SR ISO21528-2/2004, for Enterobacteriaceae. Species of the genus Corynebacterium and Arcanobacterium were isolated on sheep blood agar in CO₂ atmosphere and confirmed through biochemical tests. For our study we considered only the cultures in which one or two types of colonies were isolated, of which one predominant.

In 126 sheep and 94 goats diagnosed with subclinical mastitis we carried out a treatment at weaning with Orbenin Extra (600 mg Cloxacillin “Dynomilled”) intramammary, following the last milking, a syringe for each half of the udder. As authorized medication for mammary gland in small ruminants is very rare, we utilized authorized medication for the treatment of mastitis in cows.

In order to avoid the risk for the apparition of clinical mastitis (Pseudomonas aeruginosa or Aspergillus fumigatus) and the presence of antibiotic residuum in milk, the following rules were respected:
- previous disinfection of the mammilla, the distal end
- introduction of the syringe end partially and non traumatically
- injection of a complete syringe into each mammilla
- mammilla antisepsis through immersion in the decontaminant solution

In the following lactation, we collected and examined milk samples using the same techniques from the treated sheep and goats as well as from a whiteness lot (the animals were diagnosed with subclinical mastitis at the end of first lactation), formed from the same number of animals. The results were than compared in order to see which are the differences regarding the new infection at the two categories of animals (treated and untreated).

RESULTS AND DISCUSSIONS

In order to correlate the advantage of antibiotic therapy with economical efficiency, a selective treatment of the sheep and goats, according to the number of somatic cells, can be performed. Somatic cell count (picture 1) shows that: 42.06% of the animals had a somatic cells number lower than 750,000 cells/ml over the entire lactation; 29.37% had more than
750,000 somatic cells/ml in at least two controls; 17.46% had more than 750,000 somatic cells/ml only at the end of lactation; 11.11% had more than 1,750,000 cells/ml over the entire lactation period and expressed clinical mastitis with mammary gland changes.

Through somatic cells count in goats (picture 2), the following results were obtained: 32.98% of the goats had less than 750,000 cells/ml over the entire lactation; 42.55% of the goats had less than 750,000 cells/ml in at least two controls; 17.02% of the goats had more than 750,000 cells/ml only at the end of lactation; 7.45% of the goats had more than 1,750,000 cells/ml over the entire lactation and presented changes at the mammary gland with clinical expression.

Examination of the mammary gland health status, through somatic cells count, and the presumption of mammary gland health status (table 1) are necessary for detecting the animals that need antibiotic therapy. It is recommended to treat especially the sheep and goats infected with major pathogens. Number limitation of the treated animals allows a decrease of total costs, a decrease of the risks due to antibiotic administration and a diminution of iatrogenic risks.

![Picture 1. Percentage repartition of the primipara sheep according to the somatic cells/ml.](image1.png)

![Picture 2. Percentage repartition of the primipara goats according to the somatic cells/ml.](image2.png)

Table 1 Goats repartition according to the presumed infectious status of the mammary gland and the number of somatic cells (after R. de Crémoux, 1995).

<table>
<thead>
<tr>
<th>Presumed infectious status</th>
<th>&lt;750,000 cells/ml</th>
<th>750,000 – 1,750,000 cells/ml</th>
<th>&gt;1,750,000 cells/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy goats</td>
<td>68%</td>
<td>20%</td>
<td>12%</td>
</tr>
<tr>
<td>Goats infected with minor pathogens</td>
<td>37%</td>
<td>39%</td>
<td>24%</td>
</tr>
<tr>
<td>Goats infected with major pathogens</td>
<td>9%</td>
<td>27%</td>
<td>64%</td>
</tr>
</tbody>
</table>

Table 2 Somatic cells count (arithmetical and geometrical mean) from bulk milk of 14 sheep flocks and 14 goat flocks.

<table>
<thead>
<tr>
<th>Species</th>
<th>No. of examined samples</th>
<th>Arithmetic mean</th>
<th>Geometric mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovine</td>
<td>168</td>
<td>1,127,000</td>
<td>1,023,000</td>
</tr>
<tr>
<td>Goats</td>
<td>168</td>
<td>1,403,333</td>
<td>1,344,830</td>
</tr>
</tbody>
</table>

Geometrical mean of somatic cells from bulk milk, calculated for 14 sheep flocks and 14 goat flocks, presented in table 2, was of 1,023,000 cells/ml in sheep and 1,344,830 cells/ml
in goats. In these flocks, at the end of lactation, the percentage of sheep diagnosed with intramammary infections was of 79.37% respectively of 70.21% for goats.

Unfortunately, to this date, the studies on somatic cells number from bulk milk don’t allow us to analyze (only to estimate) the level of mammary infections in a flock of sheep and goats. We recommend that a treatment is performed at weaning, following the last milking, at the entire effective of milking animals, anytime the geometrical mean passes 750,000 cells/ml in sheep and 1,000,000 cells/ml in goats. In the situation when in there are animals in the flock earlier weaned, the treatment should be performed parenteral, as mammary administration would eliminate the keratin cork which closes the papillary channel, creating the risk of infection. For the breeders with large flocks, intramuscular therapy is an alternative, as the administration is much easier and the risk of iatrogenic infections is eliminated.

When the treatment is performed in the mammary repose period, we face the risk that antibiotic residuum are present in milk after birth, a seven days waiting time being necessary. The presence of residuum in milk can be due to inobservance of the indicated time, use of products authorized for cows (waiting time for sheep and goats is not known) or wrong use of the product (4, 7, 11, 15). If the mammary repose period is lower than two months, a waiting period of 14 days is recommended before the use of milk for human consumption (4, 5).

In order to increase the efficiency of the preventive antibiotic treatment administered at weaning, the following measures should also be respected: shelter hygiene and ventilation; bedding hygiene; annual control of the installation and milking material; milking hygiene and a good milking technique.

Analyzing the results of bacteriological exam from the end of lactation depending on the cellular profile of sheep and goats, presented in table 3, we see that in 26 sheep (20.63%) the mammary gland was healthy at the end of lactation, in 69 sheep (54.74%) the mammary gland was infected with *Staphylococcus non aureus*, in 12 sheep (9.52%) with *Staphylococcus aureus* and in 19 sheep (15.08%) with other germs, in 28 goats (29.79%) the mammary gland was healthy at the end of lactation, in 53 goats (56.38%) the mammary gland was infected with *Staphylococcus non aureus*, in 7 goats (7.44%) with *Staphylococcus aureus* and in 6 goats (6.38%) with other germs than *Staphylococcus*.

<table>
<thead>
<tr>
<th>Species</th>
<th>Lack of germs</th>
<th><em>Staphylococcus non aureus</em></th>
<th><em>Staphylococcus aureus</em></th>
<th>Other germs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Ovine</td>
<td>26</td>
<td>20.63</td>
<td>69</td>
<td>54.75</td>
<td>12</td>
</tr>
<tr>
<td>Goats</td>
<td>28</td>
<td>29.76</td>
<td>53</td>
<td>56.38</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 3

Results of the bacteriological exam performed at the end of lactation period depending on the cellular profile of sheep and goats.

Bacteriological analysis from the samples of sheep and goats treated with Orbenin Extra, given intramammary at weaning following the last milking, are presented in tables 4 and 5. These results show that the healing percentage was of 78.57% in treated sheep and of 70.21% in treated goats, towards 23.02% in sheep and 19.15% in goats who were not treated. Through the treatment from the mammary repose period, a new infection is prevented and the incidence of subclinical mastitis is reduced as well as the milk production losses, estimated between 7 and 17% in the affected animals.
Results of the analysis performed in the sheep treated with Orbenin Extra administered intramammary at weaning, after the last milking, compared to the untreated, depending on the presence or absence of mammary infections.

<table>
<thead>
<tr>
<th>Sheep with subclinical mammary infections treated in the mammary repose period</th>
<th>Sheep with subclinical mammary infections untreated in the mammary repose period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Health status of the mammary gland in the following lactation</td>
</tr>
<tr>
<td></td>
<td>Without mammary infection</td>
</tr>
<tr>
<td>126</td>
<td>99</td>
</tr>
</tbody>
</table>

Rezultatele Results of the analysis performed in the goats treated with Orbenin Extra administered intramammary at weaning, after the last milking, compared to the untreated, depending on the presence or absence of mammary infections.

<table>
<thead>
<tr>
<th>Goats with subclinical mammary infections treated in the mammary repose period</th>
<th>Goats with subclinical mammary infections untreated in the mammary repose period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Health status of the mammary gland in the following lactation</td>
</tr>
<tr>
<td></td>
<td>Without mammary infection</td>
</tr>
<tr>
<td>94</td>
<td>66</td>
</tr>
</tbody>
</table>

CONCLUSIONS

- The healing percentage in the animals which were subjected to intramammary treatment at weaning with Orbenin Extra was of 78.57% in sheep and 70.21% in goats.
- Spontaneous healing in sheep and goats diagnosed with intramammary infections occurred in 23.02% sheep and 19.15% goats.
- The efficiency of the intramammary treatment following the last milking was higher in case of infection produced by coagulazo-negative Staphylococcus compared to those produced by Staphylococcus aureus.
- In the case when presumably infected sheep and/or goats represent the majority (>750,000 cells/ml in sheep and >1,000,000 cells/ml in goats) the treatment of all animals in the flock is recommended, inside the mammary repose period.
- Antibiotic treatment at weaning is not a miraculous solution, being efficient only if the conditions of maintenance, milking and weaning are respected and applied.
- The product chosen to be used for the treatment has to follow an antibiogram.
- Mastitis in ovine and goats represent a group problem in which individual treatment of lactation animals has to be reduced to minimum due to the risk of finding antibiotic residuum in milk.