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# The role of veterinarian in the monitoring programs of mastitis control

M Maletić<sup>1</sup>, V Magaš, J Maletić<sup>2</sup>

<sup>1</sup> Faculty of veterinary medicine, Department of obstetrics, sterility and A.I., Bld. Oslobođenja 18, 11000 Belgrade, Serbia

<sup>2</sup> Scientific Veterinary Institute "Novi Sad", Rumenački put 20, 21000 Novi Sad, Republic of Serbia

**Abstract.** Mastitis is the most common and the most expensive disease of dairy cows. It is followed by a large number of direct and indirect costs that burden the farm's budget and lead to major economic and health losses. The veterinarian at the farm plays a key role in implementing a protocol of biosecurity measures, a protocol of control, therapy, and the suppression of clinical and subclinical mastitis. In order to successfully implement these measures, a good communication between a veterinarian and a farm staff who performs milking procedures is necessary in order to detect and treat all cases of mastitis in time.

E-mail: maletic@vet.bg.ac.rs

## 1. Introduction

It is well known that mammary gland diseases can be controlled by preventing the emergence of new infections and by eliminating existing sources of infection through a "five-point plan":

- The udder disinfection before and after milking,
- All-encompassing dry off with antibiotics,
- Adequate treatment of clinical mastitis,
- Exclusion of cows with chronic disease,
- Correct milking equipment.

This approach proved to be very effective in the control of contagious mastitis [1].

Programs with the aim at improving the quality of milk are focused on the prevention of mastitis caused by agents from the environment of the animal, reduced use of antibiotics, etc. Veterinarian as a part of the chain of control of the health of herd, implements and controls the implementation of procedures for detection and identification of animals suspected on subclinical and clinical forms of mastitis in the herd. [2] Successful control of mastitis depends on the speed of detection, accurate diagnosis, selection of the best option for the treatment and introduction of preventive measures in order to reduce the exposure of cows to a specific pathogen [3]. An important role in the early detection of disorders of secretion of the mammary gland has the staff involved in the milking as they carry out on-the-spot checks on a dark media. Also, in monitoring the health of the udder, an important role has the good keeping of records of each cow in lactation.

At the beginning of the introduction of the system of records and identification of cows on the farm, the veterinarian must be sure that he can answer the following questions:

What is the incidence of clinical mastitis? How clearly are the symptoms of inflammation? Which is the most common cause of clinical and subclinical mastitis on a given farm? What are the most common protocols for treating these conditions? How many days is milk discarded due to ab treatment? How many percent of cows in lactation have less than 4 active mammary complexes? Which percentage of cows with problems of the mammary disease are excluded from production or died during one year? [4]



### 1.1 Monitoring of subclinical mastitis

It is known that for control any subclinical disease it is important to have a clear understanding of prevalence and a mechanism to monitor incidence. Prevalence of mastitis depends on incidence, development of new subclinical cases, and duration. In some herds, the prevalence of mastitis can be small due to the existence of a chronic infection by infectious pathogens, while in other prevalence mastitis are high due to the existence of certain environmental factors that lead to the occurrence of acute mastitis. Very important moment in monitoring subclinical mastitis is to ensure that SCC values are routinely obtained from all cows on a regular basis. So that a cow with SCC values >200 000 cells/ml are considering to have subclinical mastitis [4].

Experiences say that for assessments of subclinical mastitis, the veterinarians should start with the following questions: What is the prevalence of subclinical mastitis based on SCC? What is the incidence of subclinical mastitis based on SCC? What are the most common bacteria recovered from cows with SCC values >200 000 cells/ml? How many subclinical cases persist more than 2 months? Prevalence of subclinical mastitis by days in milk and parity? How many cows have subclinical mastitis at the first test and the last test? [4]

It is very important to monitor the SCC monthly at the herd level and the cow level. At the herd level, monthly monitoring of SCC could be very useful diagnostic tool for determining cows with subclinical mastitis. High prevalence of subclinical mastitis has the herd that has problems with environmental mastitis pathogens, and veterinarian should investigate housing conditions, udder hygiene and management of dry and periparturient cows. In the cases where contagious mastitis is a problem, prevalence increase as lactation progresses and as cow age because of more opportunities for exposure to infected milk. If we suspect on contagious mastitis, we should investigate the transmission of mastitis pathogens during milking. The existence of a large number of cows with chronically increased SCC, indicates that cows are infected with host adapted pathogens transmitted in a contagious manner. At the cow level, it is helpful to look at the list of individual cows sorted by SCC to identify cows that require individual therapy. Also, it is helpful to use of a rapid cowside quarter level SCC test [5].

## 2. The treatment of mastitis

The success of the treatment of mastitis depends on a number of factors, such as accurate diagnosis, proper antibiotic selection [6], early onset therapy, udder physiology and pathology, supportive therapies and elimination of predisposing factors [7], as well as factors of pathogenicity of the microorganism itself.

The goal of antibiotic therapy is to destroy pathogenic microorganisms without damaging tissue of the mammary gland. Therapy of subclinical mastitis is not indicated except in cases where the causative agents of mastitis *Staphylococcus aureus* or *Streptococcus agalactiae*. Therapy is then administered immediately after the diagnosis is made and should not wait the dry moment. The general principle of subacute mastitis therapy involves intramammary application of the preparation four times during 12 hours for fast-absorbed medicines or three times during 24 h for drugs that are slowly absorbed. Treatment should be continued at least 24 hours after clinical symptoms stop [9]. In peracute and acute mastitis, intramammary therapy is administered 3-5 days, twice a day, and depending on the severity of the clinical symptoms of the disease, antibiotics can be administered and parenterally with compulsory supportive therapy [9].

Four large groups of factors can lead to the failure of the treatment of mastitis:

- Management and iatrogenic factors
- Factors related to the microorganisms themselves
- Factors related to the application of the drug and damaging the mammary gland
- Factors related to the choice and method of application of the drug

Many management failures as well as iatrogenic factors can cause failure in therapy. The literature states the following factors: incorrect diagnosis [incorrectly take samples for microbiological analysis, some microorganisms require special conditions for cultivation and cannot be isolated in standard cultivation], delayed start of therapy, inadequate supportive therapy, duration of treatment, inadequate dose of the drug, improper use of the drug, introduction of new intramammary infections of the over-ester injectors, super infections, reinfection, as well as completely clinical but not microbiological cure [7,11,12].

A large number of different drug-related factors can lead to failure of therapy [7, 8, 12], such as: inadequate drug choice, short drug half-life, inadequate concentration of the drug locally in the mammary tissue, adverse effects of the drug, low level of pharmacokinetic utilization, poor drug resorption through blood-milk barrier, high degree of binding of milk and serum proteins and combination of mzcocide and mycostatic antimicrobial agents [7].

### 3. Preventing the emergence of antibiotic residues in milk

Wrong and inadequate antibiotic therapy in the treatment of mastitis entails a large number of potential risks. Antibiotic residues adversely affect fermentation processes that are unavoidable in the production of cheese and yogurt. Residue of antibiotics can cause allergy in susceptible individuals, as well as the occurrence of resistance in some pathogenic microorganisms. The main causes of the persistence of antibiotic residues in milk are the administration of not recommended drugs whose pharmacokinetics is not completely established, excess dose administration, lack of compliance with the milk discard period in the case of treated animals, identification errors of treated animals, and confusion of milk after milking treated animals [13,14]. Also, the big problem on smaller farms is the self-inducing and inefficient application of the injector by irresponsible farmers. Special attention should be paid to veterinarians to monitor the antibiotic withdrawal period due to other therapeutic indications. Such cows must be separately labeled and separated from each healthy mature cow. Milk treated cows must be destroyed in a special way, and in any case, such calves are fed calves or used for other purposes.

In July 2017, Codex Alimentarius Commission prescribed new legislation “Maximum residue limits [MRLs] and risk management recommendations [RMRs] for residues of veterinary drugs in foods” [15]. But in Serbia, according to legislation on the quality of raw milk, the minimum allowed concentrations of residues in milk are not clearly defined [16].

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