

SIGNIFICANCE OF CLINICAL MASTITIS IN DAIRY COWS

ZNAČAJ KLINIČKOG MASTITISA KOD MLEČNIH KRAVA

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ABSTACT

Mastitis represents one of the most significant health disorders in dairy cow herds. They can produce significant direct and indirect losses. In relation to the intensity of the changes that are present, mastitis can be marked as subclinical or clinical. Clinical forms of mastitis are accompanied by clear changes in the mammary gland tissue and secretion of the mammary gland and changes in the general condition of the animal. Often, if there is no adequate and timely therapy, they can have a fatal outcome. Because of this, it is necessary to approach the procedure of diagnosis and treatment of severe clinical forms of mastitis with special attention. This includes program of mastitis control with focus on clinical changes and emphasis on urgent therapy.

Keywords: cow, clinical mastitis, treatment

SAŽETAK

Mastitis predstavlja jedan od najznačajnijih zdravstvenih poremećaja u stadima muznih krava. Oni mogu proizvesti značajne direktne i indirektno gubitke. U odnosu na intenzitet prisutnih promena, mastitis se može označiti kao subklinički ili klinički. Kliničke forme mastitisa prate jasne promene u tkivu mlečne žlezde i sekreciji mlečne žlezde i promenama opšteg stanja životinje. Često, ako nema adekvatne i blagovremene terapije, mogu imati fatalan ishod. Zbog toga je potrebno sa posebnom pažnjom pristupiti postupku dijagnostike i lečenja teških kliničkih oblika mastitisa. Ovo uključuje program kontrole mastitisa sa fokusom na kliničke promene i naglaskom na hitnu terapiju.

Ključne reči: krave, klinički mastitis, terapija

INTRODUCTION

Mastitis occurs as a result of the penetration of microorganisms into the mammary gland, most often bacteria, and the establishment of an intramammary infection and, consequently, an inflammatory reaction. In addition to microorganisms, the etiology of mastitis includes the action of other harmful factors, physical, mechanical and chemical, which can freeze the tissue of the mammary gland and cause an inflammatory reaction. Therefore, mastitis is defined as inflammation of the mammary gland,

which, in addition to physical and chemical changes in the milk, is accompanied by pathological changes in the gland itself, as well as changes in the general health status (8). The form of clinical manifestation defines two types of mastitis, clinical and subclinical (12). In clinical mastitis, the signs of inflammation on the mammary gland are clearly manifested in the form of redness, swelling, soreness, temper, and it is often accompanied by a change in the general condition of the animal through an increase in body temperature, lethargy and loss of appetite (9). In addition to this, in clinical mastitis there are clearly

visible changes in the secretion of the mammary gland, both in appearance and in quantity, until the complete cessation of secretion. Subclinical mastitis is a form of the disease in which there are no noticeable clinical symptoms on the mammary gland or changes in the general condition. What is noticeable is the decrease in the amount of milk, and laboratory analysis can prove changes in the composition of milk (15,16). The most obvious indicator is a change in the number of somatic cells in the milk. Both forms of mastitis cause significant economic losses and therefore the importance of mastitis prevention is highlighted (8, 10). The existence and application of a mastitis control program on dairy cow farms has shown a good effect, especially in order to control specific udder pathogens (14). Nevertheless, the problem of mastitis still requires a wide application of antibiotics in order to treat and prevent mastitis. According to data from the literature, mastitis is the most common indication for the use of antibiotics in cattle (15, 18). This represents an additional problem because it promotes the development of resistance in bacterial causes of mastitis and increases the risk of antibiotic residues and resistant strains of microorganisms entering the human food chain. In addition to this, the economic aspect is also important in terms of the price of antibiotic therapy and the price of discarded milk due to the duration of the withdrawal period (11). What must certainly not be neglected is the issue of the welfare of dairy animals. Mastitis represents a very stressful and painful condition for the animal, milking in the case of clinical mastitis is very painful but necessary to promote healing (11). Etiology of mastitis About 140 species, subspecies and serotypes of microorganisms that can cause inflammation of the mammary gland were isolated from the mammary gland of cows. The causative agents of mastitis can be divided into infectious agents and opportunistic or environmental pathogens. Further classification can be divided into agents of high pathogenicity (those that cause the clinical form of mastitis) and agents of low pathogenicity (those that cause a subclinical form of mastitis or less often lead to a clinical form of mastitis (4). Infectious causative agents of cow mastitis are numerous. The most important species are *Staphylococcus aureus*, *Streptococcus agalactiae* and *Mycoplasma bovis* (4). The usual source of these pathogens is the infected mammary gland of cows that already suffer from mastitis. In addition to this source of infection, a

very significant source of infection are the hands of milkers, on which *Staphylococcus aureus* can be found. These pathogens spread from infected neighborhoods to non-infected ones. Environmental pathogens are those species that are normally found in the animal's environment and on the skin of the mammary gland, but do not cause infection (19). The frequency of infection caused by these pathogens is increasing, especially in herds where the most important pathogens, the causative agents of mastitis, are controlled. The most important pathogens from this group are coagulase-negative staphylococci, which cause infections of the mammary gland through the ascending route. Pathogens of environmental origin that can lead to mastitis are numerous. For easier systematization, they are divided into three main groups. These are coliform microorganisms that include *Escherichia coli*, *Klebsiella spp.* and *Enterobacter spp.* then bacteria from the genus *Streptococcus* (*Streptococcus uberis*, *Streptococcus dysgalactiae* which have a higher prevalence and *Streptococcus equinus* or *Streptococcus bovis* which have a lower prevalence) and *Corynebacterium pyogenes* (4). Risk factors Risk factors are very important for the occurrence of mastitis. They allow infectious agents to quickly and easily lead to inflammation of the mammary gland. They can be related to the animal, then to milk production, and finally to the quality of accommodation and hygiene of the mammary gland itself. The age of animals and the number of lactations increase the risk of mastitis, and the maximum is reached at 7 years. Surveys on the prevalence of intramammary infection in heifers, a few days before the first parturition, show that 4% are infected (13). The prevalence of new infections ranges between 29% and 75% of affected quarters before calving and from 12% to over 57% of infected quarters (6). The stage of lactation also plays a significant role in the development of mastitis. Most of the newly infected occur in the early stage of drying and in the first two months of lactation. In heifers, a high prevalence of intramammary infection occurs in the last trimester of pregnancy and a few days after parturition, and milk production visibly decreases. In heifers, infection in the peripartum period is mainly related to pathogens of lesser pathogenicity, but some studies also show infections with pathogens of high pathogenicity (6). The relationship between the season and occurrence of mastitis depends on geographical and climatic conditions. In subtropical

and tropical regions, mastitis occurs more often in winter or spring, most likely due to high humidity. In temperate regions and controlled conditions, the period during which mastitis most often occurs is summer, probably due to the higher temperature in the facility, which facilitates and contributes to the growth and development of bacteria in the mat (4,5). The morphology and structure of the teat can influence the occurrence of mastitis in cows. The very end of the teat represents the first barrier that prevents the penetration of bacteria (19). Damage to this part can lead to intramammary infection. The thickness of the teat can help assess the condition of the tissue. Depending on the characteristics, the milking machine can cause the teat thickness to decrease or increase after milking. There is an association between hyperkeratosis and a higher microbial burden of the mammary gland, especially for the two common environmental pathogens *Escherichia coli* and *Streptococcus uberis*, but not for *Staphylococcus aureus* (13, 17). Nipple hyperkeratosis is associated with an increased risk of clinical mastitis (2). Udder hygiene is also a very important risk factor for mastitis. Dirty udders are associated with an increased prevalence of intramammary infections caused by pathogens from the external environment (3).

Colimastitis

Colimastitis represents a very severe form of parenchymatous mastitis caused by pathogenic coliform microorganisms. This form of mastitis occurs in some animals in the period of high lactation and develops very quickly. It is also called mastitis paralytica because the affected animals often cannot get up, they usually lie down for up to 48 hours. The affected quarter swells up a lot, dries up and becomes painful to the touch. The infection is not directly transmitted from cow to cow. The causative agents of colimastitis are enterobacteria, and the primary causative agent is *E. coli*. Therefore, the term colimastitis is generally used for all udder inflammations caused by enterobacteria. Apart from *E. coli*, *Klebsiella pneumoniae*, *Enterobacter agglomerans*, *Enterobacter cloacae*, *Citrobacter diversus*, *Serratia marcescens*, *Serratia odorifera* are also important causative agents. The natural intestinal flora includes a large number of representatives of the Enterobacteriaceae family, especially *Escherichia. E. coli*, as the causative

agent, is represented in the highest percentage compared to other gram-negative bacteria (1,2,4), they claim that it accounts for 66.0%.

Gangrenous mastitis

It represents severe clinical mastitis with an often fatal outcome. (6,9, 20). Regressive processes that spread rapidly, as well as circulation and permeability disorders, are in the first place in the development of diseases. Interlobular inflammatory edema, high-grade hyperemia or perialveolar capillary and diapedesic hemorrhages lead to softening of the parenchyma of the mammary gland. The blood vessels of the intraalveolar and interlobular tissue also show fibrinoid wall necrosis and partial or total blockages due to fibrin thrombi. Edema formation, fibrin deposition and lymphatic vessel thrombosis were found in the interlobular cavity. The clinical findings on the udder indicate a change in the color of the tissue to dark purple, the tissue is cold to the touch and the secretion is bloody. The etiology is complex, primarily *Staphylococcus aureus*, *Escherichia coli*, *Clostridium perfringens*, but also other causative agents can lead to gangrenous changes on the udder.

Mycoplasma mastitis

Mycoplasma bovis, previously designated as *Mycoplasma agalactiae* var. *bovis* and *Mycoplasma bovimastidis* is considered the most important causative agent of mycoplasma mastitis of cattle in the countries of Western Europe. These mastitis in the herd are enzootic - often 20% or more cows in the herd are affected - and manifest in a severe clinical form (4). In mastitis caused by *Mycoplasma bovis*, the most severe forms of clinical inflammation of the udder occur. Animals in all stages of lactation, including dry cows, are affected. The frequency and intensity of mastitis can be observed in the prenatal and postpartum period. The sudden, rapid onset of mastitis is characteristic, associated with a rapid decrease in the amount of milk, up to 10% between two milkings, and after 3-5 days it is reduced to only a few milliliters (6). The affected quarters are initially swollen, but there is no local pain or increased warmth of the quarters. The disease is often progressive and after about 3-4 weeks there is atrophy of the udder parenchyma.

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