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Analysis of the microbial population that most often causes *mastitis* in dairy cows

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ABSTRACT

Mastitis is the most important disease of dairy cows, affecting the major economic losses of milk producers and the dairy industry around the world. In the work on the basis of data from the laboratory dairy plants analyzed the occurrence of microorganisms causing *mastitis*. Based on microbiological studies, 1462 milk samples taken from quarters of the cows' udders showed that the most common cause of inflammation was *Streptococcus agalactiae*, whose strains occurred in 27.77% of *mastitis* cows. In 18.13% of cows mastitis was caused by *Staphylococcus aureus*, 14.91% by *Escherichia Coli*, 8.55% by *Streptococcus uberis*, and 8.82% did not show bacterial growth during microbiological tests. In order to reduce the occurrence of *mastitis*, appropriate hygiene should be followed during milking of cows and, in the case of disease, cows udder milk should be tested to identify the microorganism causing inflammation and prepare appropriate antibiotic therapy.

Keywords: mastitis, dairy cows, microbial population, milk

1. INTRODUCTION

Mastitis, as defined herein is inflammation of the mammary gland due to bacteria, fungi, viruses or algae. Treatment of mastitis is a long-term process and often fails to eradicate the disease despite the use of therapy. Complications may be symptomatic, and we are dealing with a clinical form or asymptotically a subclinical form. Clinical changes in the mammary gland include: redness and edema, as well as changes in color, taste and consistency of milk. This form of the disease is easy to identify and treat. However,

subclinical mastitis occurs without visible changes in the gland and is difficult to cure. Bacterial vaginosis that causes mammary gland inflammation in cows is classified as infectious or environmental pathogens, depending on the epidemiological link with the disease (Rossito et al 2002, 132-138). Contagious pathogens include *Staphylococcus aureus* and *Streptococcus agalactiae* that have the ability to survive and raise somatic cells in an infected mammary gland (Bradley, 2002, 1-13). Environmental pathogens, however, are not adapted to survival in the animal body and are present in the immediate environment of cows. *Streptococcus uberis*, *Enterococcus* spp, *Streptococcus dysgalactiae*, *Klebsiella*, *Enterobacter* and *Escherichia coli* (Schröder et al., 393-398). Diagnosis of mastitis is carried out by means of antibiograms and tests aimed at detecting microorganisms contained in milk. Lactation in cows causes a decrease in casein, fat, lactose, vitamins and minerals. At the same time, the pH of the milk increases, which significantly diminishes the possibility of using such milk in processing. Primary prevention of mastitis is to reduce the level of infection in the herd and to limit the incidence of new infections (Unakal et al., 2010, 65-67). In recent years there has been an increase in the resistance to antibiotics of pathogens causing mastitis. One of the reasons for this phenomenon is the abuse of antibiotics in the treatment of the animals, so often alternative therapies for the treatment of lymphoma should be sought (Tenhagen et al., 2006, 1999-2008). The aim of the study is to present the most common bacterial strains that cause mastitis in dairy cows.

2. MATERIAL AND METHODS

The material for bacteriological testing was a quadrant sample taken from cows with symptoms of mastitis. Samples were tested in the laboratory of the Dairy Cooperative located in south-eastern Poland. In total, 1462 milk samples were tested in 2016. The microorganisms were isolated from milk samples and identified according to the PIWet method in Pulawy. [Malinowski and Kłossowska, 2002].

3. RESULTS

Table 1. Frequency of microbial isolation from macaque sample in one year and quarters without microbial growth

Isolated microorganisms n = 1462	Quantity	Percent
Strep. agalactiae	406	27,77%
Staph aureus	165	18,13%
Strep. uberis	125	8,55%
E. coli	218	14,91%
Fungi	40	2,74%

Others	279	19,08%
No growth	129	8,82%

Streptococcus agalactiae is a bacterium that most commonly causes inflammation of the herd in herds. These bacterial strains caused mastitis in 27.77% of cows. *Streptococcus agalactiae* causes acute, chronic and subclinical inflammation and is classified as infectious (Keefe 1997, p. 429). Bacteria strains have the ability to adhere to the walls of the mammary tissue, which allows growth and development of microorganisms. The virulence of strains is associated with differences in adherence to the glandular walls (Wanger et al. 1984, pp. 2441-2445). Transfer of *Streptococcus agalactiae* takes place during milking, and in the case of poor hygiene exchange the pathogen spreads very rapidly in the herd. This bacterium is present in large quantities in an infected quadrant of the mammary gland. In the infected quadrant, somatic cells grow to more than 10 million / ml. Milk also changes color, is diluted and there are admixtures of tufts and flakes (Malinowski et al., 2002, pp. 295-299). *Streptococcus uberis* is a widely spread pathogen causing inflammation of the udder in dairy cows. It is most common in New Zealand, the United Kingdom and the United States (Zadoks et al 2001, p. 590-599). In Eastern Poland flocks, this pathogen causes inflammation in 8,55% of cows.

Staphylococcus aureus has caused inflammation in 18.13% of cows. In many countries, this bacterium is predominant in mastitis-causing pathogens. In Poland, there were variations in 82 populations of *Staphylococcus aureus* (Jakubczak et al. 2010, p. 115-120). *Staphylococcus aureus* is the most difficult to control pathogen causing mastitis in cows (Fijałkowski et al 2008, 497-501). Due to the way it spreads in the herd (between cows), it is classified as infectious microorganisms. *Staphylococcus aureus* infections are chronic and their course is often asymptomatic. The pathogenicity of gold staphylococci is due to the expression of many virulence factors, leading to adhesion, escape from the body's immune response and proliferation in the body (Hata et al., 2006, pp. 165-170.) Most strains produce enzymes and cytotoxins such as haemolysin, Protease, lipase, hyaluronidase, and collagenase, are the most common types of antibiotic therapy in the lactating period, which are caused by the *staphylococcus aureus*, which surrounds the growth of bacteria. Cervical tissue impairs the spread of antibiotics in a quadrant and protects against staphylococci. As a result, antibiotics do not come in contact with the bacteria and infection is established. other animals.

E. coli is a bacterium whose strains cause inflammation in 14.91% of cows. It is a bacterium belonging to environmental pathogens and is responsible for most clinical cases of swollen glands, whose course is acute (Hogan et al., 2002, p. 507-519). They are used in manure, litter, soil and contaminated water. Infections usually occur at the beginning and at the end of the dry cow, but there are also cases of infection during labor. Chronic form of colimastitis develops in cases where initial inflammatory reaction and leukocyte infiltration is unable to remove all bacteria or the therapy is ineffective. This form is characterized by periodic exacerbations, which can be effective enough to eliminate all bacteria, but this lasts for several months. Recently, chronic and even subclinical primary infections have been observed, which is a threat to the presence of human strains in the milk (Kibet, et al, Sumińska, et al. 2017).

Sharp figures are more common in the summer months when animals are affected by thermal stress. Cows with higher yield are more susceptible to infection. Approximately 10% of cases of colimastitis are characterized by acute course of severe manifestations (fever, convulsions, loss of appetite, paralysis) and localized, which often results in restriction of milk secretion or even death of the animal (Corbellini et al., 194-195).

Mastitis caused by fungi occurred in 2, 74% of cows, over 19% had inflammation caused by, among others. *Crassoproteins*, *Corynebacterium spp.*, *Bacillus cereus*, *Pseudomonas aeruginosa*, *Klebsiella spp.* In 8,82% of milk samples, bacterial growth was not observed during microbiological tests.

4. CONCLUSIONS

Mastitis is an increasing economic and social problem all over world. Particular attention should be paid to cases of mastitis caused by *Streptococcus agalactiae*, *Streptococcus uberis*, *Staphylococcus aureus* and *Escherichia coli*. The reasons for the increasing number of inflammatory diseases include the increase of ill-considered antibiotic therapy without testing and antibiotics. Care should be taken to ensure proper hygiene of the milk, which is the primary factor in the transmission of mastitis between cows in the herd.

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