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Influence of mastitis on milk quality and production in cattle A Review

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Abstract: Mastitis is an inflammatory response of the mammary glandular tissue caused mainly by bacterial pathogens. Considered one of the most serious diseases of the udder, mastitis causes animal welfare problems and is a major food safety and security concern, creating a serious economic problem in the dairy industry due to decreased milk production and milk quality. In addition to the increase in the number of somatic cells, which is the key parameter, from a normative point of view, in many countries of the Globe in the evaluation of milk quality, a number of other components, such as proteins, fats, lactose, milk sugar, the level of calcium ions and potassium, undergoes a series of changes. Thus, the five important milk proteins: κ - casein; α - casein; β - casein; β - lactoglobulin and α - lactalbumin show decreases in concentration directly proportional to the degree of advancement of the infection. The decrease in the level of casein, the main milk protein, is accompanied by the increase in the level of low-quality whey proteins, which affects the flavor and composition of the milk.

Introduction

Milk is a product with important compositional and nutritional characteristics, being one of the most consumed products worldwide. However, cattle mastitis, especially subclinical mastitis, has a negative impact on its quality, causing a series of changes that result in the impossibility of its use in the dairy industry. Cattle mastitis is the main condition in these species, generated by the inflammation of the parenchyma of the glandular tissue of the udder, caused by multiple factors including high temperatures, trauma to the mammary gland, allergies and, last but not least, infections caused by a series of pathogenic microorganisms. Regardless of form of presentation, the condition causes serious economic losses in the animal husbandry sector, due to the decrease in milk production and the deterioration of its quality, the application of expensive sanitary-veterinary treatments and diagnostic tests, but also the premature slaughter of infested animals. In addition to the negative effect on dairy cattle, mastitis also poses a threat to human health due to the risk of transmission of some zoonotic pathogens, either through direct contact with the infested animal or through the ingestion of pathogenic bacteria present in contaminated milk and dairy products. For these reasons, the early diagnosis of this condition is required, both by applying traditional methods and by using high-precision alternative methods, in order to establish control and prevent the spread of this condition.



Severe case of cattle mastitis

Subclinical mastitis

In subclinical infections, there are no visible changes on visual inspection of the udder or milk because both appear normal, but milk production decreases and its composition changes. In general, pathogenic germs enter the udder by traversing the papillary duct and reach the intramammary by engorgement milk during milking, as a result of fluctuations in the vacuum pressure of the milking installation. Pathogens can thus be transmitted from the infected to the uninfected dairy quarter in the same animal or between different cows via the milking machine or the contaminated hands and gloves of the milkers. The invasion of pathogens in the internal tissues of the mammary gland stimulates the traffic of different types of cells of the immune system to the site of inflammation, which causes the increase in the number of somatic cells in the secreted milk. It is noted that approximately 80% of milk production losses are due to subclinical mastitis, which occurs with a frequency 20-50 times higher than clinical mastitis.

Clinical mastitis

Clinical mastitis is characterized by the presence of visible inflammatory changes in the breast tissue (redness, swelling, pain), abnormal coloring of the milk (watery, reddish, bloody), changes in its consistency (formation of lumps and clots), but also systemic symptoms and behavioral changes including fever, anorexia, mastitis is one of the most important intramammary infections in cattle, with substantial economic losses for the farmer; more than in depression, lethargy. Clinical the case of other forms of mastitis, due to the dramatic decrease in milk production and quality, which can sometimes lead to the slaughter of females, due to the pathology the mammary gland, as a result of the persistence of inflammation in the breast tissue.

Conclusions

Mastitis is a silent, extremely serious condition that causes a decrease in the speed of milk synthesis and a change in its chemical composition, especially casein, the main milk protein, causing an increase in the level of low-quality whey proteins, which affects the quality and the flavor of milk. The latest generation technologies and the development of new immunotherapies, which do not involve the use of antibiotics, allow the early detection of this condition and minimize the impact that its onset can have on humans, animals, milk production and, implicitly, the economy.