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Role of Molecular diagnostic technique , improving management and hygiene in Control of Subclinical Mastitis in diary Cattles

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Abstract

Sub clinical mastitis is a common disease caused by lack of good management and biosecurity of dairy cattle which cause expensive losses due to decrease milk production effect on the quality efficiency of milk losses in livestock production. the study designed to review the researcher's study to detect important strategies controlling of subclinical mastitis resulting from environmental & contagious pathogens such *as E.coli, k.pneumonia, proteus spp.,Enterobacter spp., Staphylococcus aureus , Streptococcus agalactia* and *mycoplasma pyogenes*, also other microorganism in dairy cow. A wide range of genetic diagnostic methods can be using for investigation of mastitis such as RT-PCR and MPCR methods.Further accurate improving hygiene and improve management considerable for controlling of the disease in dairy cattle they are commitment of hygiene procedure as milking, animal condition and floor that incorporated management strategies. Regard to dry period of cattle the usage of antibiotic treatment , supplements foods ,optimization of animal body condition ,scientific management of milk procedure and ventilation are considered important factor to control of bovine mastitis. on the other hand,this review provides the role using advance diagnostic technologies of this disease. and can provide safeguard of dairy animals as well as improving hygiene as a good controlling of mastitis pathogens..

Keywords: Bovine mastitis , Genotype, strategies, hygiene , dairy cow, control

Introduction

Mastitis is an economic disease that affects dairy cattle on a large scale in many countries resulting in reduction of milk production.

Mastitis defined as an inflammation of udder regardless of etiology which include clinical and subclinical forms,characterized by physical and chemical milk variation as

well as pathologic change in udder tissue [2].

Approximately predominant causes of mastitis caused by contagious pathogen as *staphylococcus ureus,* coagulative negative staphylococci.,streptococcus species and environmental pathogens as *E.coli, K.pneumonia ,Proteus spp., Enterobacter spp.s,* high effort should be focused on prevention and controlling of these pathogens [3]. Most infectious agents persist and are not detectable by routine test methods if the bovine mastitis control programs are to make a significant impact on the population of heifers, programs likely to find an acceptance among diary framers must be economical, practical, an effective under most managements conditions and reduce the incidence and prevalence of clinical mastitis[4]. This review aims to clarify advance technologies controlling programs using for investigation of disease, improving management and hygiene must be apply. For sustainability of animal production as reduce consumption of milk contaminated with antibiotic residues that negatively impact human health [5,6]. This article focuses on researcher's findings published in recent years and discusses the implications of these studies and application in the future. Although many strategies have been used through the previous years to limit mastitis, further mono therapeutic using resulting lest the efficacy to eliminate etiological agent [7]. The current review elucidate related Incidence & common pathogens, in addition advance technological investigation and hygiene improvement to control of mastitis.

1.1 Incidence and common pathogens of Mastitis in cows :

Mastitis incidence depends on causative agent and predisposing factors. Typically, virulence of bacteria or, the persistence of the availability of pathogen and their ability to form biofilms **[8].**Coagulate negative staphylococci (CNS) consider as predominant pathogens causing bovine mastitis [9]**.** Globally, *staphylococcus spp*. are the common causes of mastitis in cows, buffaloes, ewes, does and even woman followed by *Streptococcus spp.* and *E. coli* . Recently (17-19%) of environmental mastitis caused by *E.coli* [10], in additional current problem bacterial antibiotic and higher incidence of sub clinical bovine mastitis records in dairy cow was (27.81%) in Madhya Jabalpur [11].

1.2 Predisposing factors:

Different factors have a role in the incidence of sub clinical mastitis of dairy cattle that related with the environment and characteristic virulence of bacterial pathogens [10 &11]. More variation in weather causes increased the exposure of animal to infective agent. reported by [11]; animal, pathogens udder hygiene, poor teat condition, large herd size, bad hygiene, Vitamins and mineral deficiency have a role in incidence of mastitis[12].

In a report by [13] who revealed *Streptococcus dysgalactia* was a significant causative agent about (50%) isolated from sub-clinical condition, followed by *S.aureus* and others causative agent. On the other hand a high prevalence of both contagious and environmental mastitis is associated with poor adoption of good husbandry practices (GHP) and available mastitis control technologies [14]. Mastitis greatest impact to milk production globally. Studies have shown

incidence of subclinical mastitis (SCM) in Africa and Asia more than 50% [15].

1.3Molecular diagnostic tools :

Gold trendy for the analysis of bovine mastitis in cows is bacterial dairy tradition selective bacteriological checking out serves to minimize the charge of sizable sample collection and could provide poorer areas undertake mastitis manipulate package .[16]

However, in spite of the quintessential the bacteriological examination the subclinical pathogens stays un detected due to the fact of low range interest of pathogen[17]. Molecular methods are specific, consequently confirmatory for diagnosis, Rather than advance technique however precise and confirmatory diagnosis , advanced technological interventions and nucleotide sequencing . the molecular equipment grew specific method of mastitis detection in final few years rather than gene encoding antibiotic resistance detection[18]. Recently molecular tools which used as a common diagnostic technique depends on detect either RNA or DNA of pathogens as well as the genes encoding antibiotic resistance and virulence detection can help in therapeutic programms. [20]

1.4 Strategies to control bovine mastitis in dairy cattle:

Significant finding that showed multiple strategies related in subclinical bovine mastitis based on dry cattle therapeutic and improving management (table-1) and dairy cows mastitis improving management strategies by (table 2), Advance molecular diagnostic tools strategies (table 3).Development of new diagnostic tool, used of vaccines, dry cow protocols, sterilization eat disinfection, housing, and feeding [21&22]. These include using of nanotechnology, cell technology and laser treat as well as traditional herbal plants using, antimicrobial peptides and probiotics as alternatives to antibiotics[23].

The study by researchers indicated a technology training package development for controlling bovine mastitis in dairy cows in Nepal. once knowledge gaps were identified, a technological package was implemented including of (1) development of good breeding practices, implementing of technologies for detection and controlling of mastitis and (2) training of technicians and farmers [25]. characterization of S. aureus gene and its enterotoxins genes helpful in designing and immunity measures of *S. aureus* infection.[24]Rather than select of breed cattle and therapeutic strategies associated with Flemish dairy herd usually avoid mastitis occurred in future in herds promising with applying sanitary conditions [26].

Table-1: Lactating cow's antibiotic treatment strategies

No	Reference	Year	Noted
1-	Ruegg	**2017**	Selective antibiotic using and feeding supplements allow to heal spontaneously .[27]

2-	Paul *et al.*	2020	At calving Improve can developed udder healthy [28]
3-	Constable *et al.*	2017	Positive effects of oral vitamins A and E and selenium during the pregnancy and lactation interpretation [20]
4-	Kumar *et al.*	2018	supplement of tri sodium citrate during lactation was found to decrease of subclinical mastitis [12]
5-	Singh et al.	2020	Nutrition improving during dry periods due to increase of level immunity and improving management during hot weather lead to healthy animal .[12]
6-	Kumar et al.	2019	Sealent teat preparation used through dry period provide prevention and controlling from any infection. [29]
7-	Kumar et al.	2020	Management improvement as housing, feeding , and higher hygiene as well as ventilation may be decrease of mastitis [30]

Table (2) Role of Molecular diagnosis in controlling of BM:

No.	Mastitis pathogen	Reference	Genetic markers for diagnosis	Noted
	E.coli, S,aureus, *S.epidrmidis*	Ashraf,et al.2017	phoA, 16S rRNA,rdr	This novel molecular technique can be used to monitor udder health and ensure the bacteriological safety of milk, and conduct epidemiological studies[18]
1-	E. coli, S. aureus, S. dysgalactia and S. agalactia.	Abd El-Tawab, et al.	S. aureus-F S. aureus-R ECO-f ECO-R C-1 C-2 GSag-S GSag-AS 16S rRNA GSub-S GSub-AS	m-PCR highly specific to a few picogram amounts of DNA, sufficient to identify the microorganism.[21]

3-	K.pneumonia, E.coli, S aureus	*Gangwal and Kashyap SK., 2017*	*16S rRNA, SSKP1, ECO223* ,	molecular methods specifically multiplex PCR can be used as an effective tool for one-time detection of pathogens with high accuracy and short time [31]
2-	S,aureus, & CNS .	Hiitio 2018	*BLaZ*	Periodic diagnostic by MPCR & RT-PCR assays provide fast in formation of mastitis results in 2.5-3 hours and can be raises concerns sample [32].

Table-3: improving hygiene & management strategies 0f dairy cows

No	Reference	Year	Noted
1-	Singh et al.	2020	Feeding and environment improving can help decrease the inflammation cells and premise udder healthy. [20]
2-	Britt .et al	2021	The use of development and technologic in management and removal of waste from large fields contributed to the reduction of mastitis[33]
3-	Zigo et al	2016	Adding antioxidants to the animal nutrients such as selenium and vitamin keep tissue cells from damage because Se mainly components of glutathion enzyme essential in protecting of cells. [34]
4-	Bradelly et al.	2018	Cleaning of animal grazing environment important to improve udder health and premise hygiene as milking good cooling programmer can help. from main effects on the hazards and risks it[35]
5-	Mihajlović	2022	significant improvement in barn hygienic , milking processing lead to clean and healthy milk[36]

Conclusion:

This article shows the role of using advance diagnostic technologies diagnosis of subclinical and can provide safeguard of dairy animals as well as improving hygiene and good management as a good controlling of sub clinical mastitis rather than feeding improving during dry period

which can help in controlling of this disease.

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it comes first in terms of economic importance and cultivated area in Iraq and the world, as the total production for the winter season of 2021 is estimated at about

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