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Popular Article

Significance of dry cow therapy to prevent mastitis

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Mastitis is considered one of the significant production's diseases of dairy animals of underdeveloped and developing countries. It is a common problem right after parturition as most of udder infections occur during dry period. Mastitis can be controlled by adopting modern techniques like teat dipping, use of vaccine, Somatic Cell Count at farm at individual level and dry cow therapy. Dry cow therapy is one of the most important and easy technique among the above-mentioned control measures. The aims of dry cow therapy include elimination of current infection and prevention from new infections. Recently, dry cow therapy is being practice via two different techniques *i.e.* use of intra mammary and systemic administration of antibiotics prior to calving (dry period). Systemic administration of antibiotics at drying off or some weeks before parturition looks to be nominal accompanying treatment for intra-mammary therapy, which may advisable for practice. Some animals are very sensitive and do not allow to touch their tear and udder. Such animals are good candidates for such kind of therapy. Systemic administration of antibiotics during dry period may be better alternate to the intra mammary therapy in animals like buffalo having tight teat sphincter.

Introduction

Mastitis continues to be a major constraint in the dairy industry worldwide and is associated with economic losses and changes in the udder (Gomes, *et al*., 2016). Several prevention and control practices that have been used to combating the disease in dairy farms. The dry period is an essential part of a cow's lactation cycle. During this time, the udder's lining can be repair and replaced, resulting in optimal milk production when lactation resumes. At least 45 to 60 days must pass without rain in order to achieve the best milk yield. The dry period is less than 45 days, milk production will be

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reduced. One of the preventative and control strategies is dry cow therapy (DCT), which is essential for treating mastitis that has not improved with traditional lactation treatment.

Physiology of the Dry Period

The udder's physiology during lactation and the non-lactating stage are very different. During lactation, the mammary gland's main function is to continuously synthesize and secrete huge quantities of milk. However, the mammary gland goes through three different stages throughout the dry period, which are as follows:

1. **Active involution**; - The dry period comes when daily milking ceases at the end of lactation, causing milk discharges to fluctuate before finally drying up. Keratin blocks the teat canal and the udder lining regresses (becomes smaller and less active). The duration of this period is approximately two weeks. The dramatic increase in lactoferrin, an iron-binding protein, is a prominent change in milk composition associated with active involution. This protein is thought to derived from milk-producing cells and neutrophils. Lactoferrin levels in normal milk during lactation range from 0.1 to 0.3 mg/ml; but, during active involution, concentrations rise significantly, rising from 0.4 mg/ml at drying off to 20 to 30 mg/ml by 30 days into the dry period. The involuting mammary gland's nonspecific defenses are partially attributed to lactoferrin, which is especially crucial for preventing coliform infections. Because lactoferrin may bind iron in mammary secretions, it prevents the growth of these bacteria that cause mastitis.
2. **Steady state involution:** The udder ceases to change after involution, and no product is actively secreted. When dairy cattle are managed well, their minimum dry periods of 45 to 60 days probably lead to the completion of the involution process right before the hormonally controlled colostrum generation stage. The udders of typical, pregnant dairy cows may only be kept in steady state involution for a very brief length of time because to their shorter dry periods. Mammary glands do however, go through a prolonged phase of steady state involution in non-pregnant cows or during dry seasons lasting 60 days or longer. In this phase, the amount of fluid is kept at extremely low levels, the concentration of milk components is significantly decreased, and the levels of lactoferrin and antibodies are increased.

   Methods of the overlapping of the two events may lead to a less-than-optimal hormone-mediated lactogenic response within the udder tissue. Thus, lactations following dry periods of less than 40 days may result in reduced milk yield. The incidence of new infections during this period of steady state involution is the lowest of any stage of the dry period. The degree to which the fully involuted udder can resist the establishment of new infection may vary depending on bacterial species and immune function of the cow. For example, the fully involuted gland is quite resistant to the establishment of coliform infection but is still susceptible to some streptococci.

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The marked reduction in new infection during steady state involution may relate partially to the high levels of antibacterial factors such as antibodies in the secretion, but may also suggest a reduced rate of bacterial penetration through the teat canal. The latter occurs as a result of: the development of a keratin plug within the teat canal; and a substantially lower level of exposure of teat ends to potential mastitis pathogens. Spontaneous elimination of infection is a frequent event and acute clinical cases of mastitis are seldom observed in the fully involuted udder.

3. **Colostrum formation** - the machinery of lactation is switched on, the udder starts to enlarge and the lining becomes active. This period lasts around two weeks. The physiology of the gland during the late dry period is again characterized by transition. In contrast to the active involution of milk-producing tissue of the early dry period, the changes occurring during this time are constructive as the gland prepares to produce milk. In addition, the changes are hormonally mediated. A major function of the mammary gland during this period is the formation and accumulation of colostrum. A unique feature of colostrum is the high concentration of antibodies, which are necessary for the newborn calf. The concentration of milk components begins to increase approximately two weeks prior to parturition, with marked increases in milk fat, casein, and lactose occurring in the five days preceding parturition. The volume of fluid in the gland cistern increases slowly over the last two weeks and then increases dramatically at one to three days prepartum, with the onset of copious secretion. At approximately two weeks prepartum, the concentration of lactoferrin declines, which suggests a loss of the antimicrobial properties, particularly with regard to coliform bacteria. The concentration of antibodies, in particular IgG, begins to increase two to three weeks prepartum, and maximum concentration of all antibody classes is achieved approximately five to ten days prepartum. Concentrations decline as fluid accumulates in the gland with the onset of copious milk secretion. However, antibody concentrations in colostrum are approximately 80 times those in milk.

Based on a 60-day dry period, the period of active involution begins with the termination of regular milking, and is completed by approximately three to four weeks into the dry period. The period of steady state involution does not have a distinct beginning or end but represents the period of time during which the udder is maintained in the resting or nonlactating phase. The length of this stage will increase or decrease proportionally with the length of the dry period. Colostrum formation begins one to three weeks prepartum and is characterized by development of milk-producing cells, accumulation of antibodies and onset of copious milk secretion.

Thus, at both the beginning and end of the dry period, the mammary gland is undergoing transition either from or to a state of active milk synthesis and secretion. These periods of transition from one stage to another are periods of heightened susceptibility to new intramammary infection.

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Risk Factors for Mastitis occurrence during the dry period

1. **Physiological factors**: The mammary gland is more susceptible to new intra mammary infection during the dry period: the first 2-3 weeks after dry off (active phase) and the last 2 weeks before calving (Bradley and Green, 2004). During the second risk phase, colostrogenesis, the mammary tissues grow and the secretory function is increased. Additionally, the intramammary pressure increases, which can lead to break down of the keratin plug and leaking of colostrum. The combination of all of these physiological factors increases the cow's susceptibility for new infections during the dry period.
2. **Metabolic state:** Some common diseases that occur after calving include hypocalcemia, ketosis, and abomasal displacement. Concomitant infectious diseases can also occur, such as endometritis and mastitis. The immune suppressive condition plays an important role on the high risk of mastitis development during the late dry period and also on the high clinical mastitis incidence during the first 30 days in milk (Erskine, 2001).
3. **Infections present at dry off**: - Pathogens isolated at dry off can be classified as major or minor. Major pathogens generally are of greater concern to the dairy farmer since they are considered more virulent and damaging to the udder (Reyher *et al.,* 2012) and responsible for most of the clinical cases (Hassan, 2009). Infections caused by major pathogens are usually associated with a higher chance for the quarter to develop a new infection after the dry period. The environment affects the amount and type of bacteria that are in contact with the cow's teat ends during the dry period. For this reason, the environment should be clean, dry, cool and comfortable (Bradley and Green, 2004), bedding material is as an important determinant: inorganic material such as sand is inert and does not support bacterial growth, while organic materials such as straw, sawdust, shavings and recycled manure are organic and support bacterial growth.

Dry Cow Therapy

Dry cow therapy is an intra-mammary treatment of udder or systemic treatment with an antibiotic administered during dry period. The use of antibiotic dry cow therapy and the treatment of intramammary infection at drying off has been a basis for mastitis management and control. Dry cow therapy eliminates existing intra-mammary infections (IMI) and in preventing new IMIs; a fundamental part of a successful mastitis control programme. Dry cow therapy (DCT)is a procedure recommended by the National Mastitis Council (NMC)as a mastitis control practice, for the purpose of curing existing subclinical infections and preventing new infections that could be acquired during the early dry period. Because it is administered at dry off, advantages of using DCT include avoidance of milk discarded during the lactation period, use of larger doses of antibiotic (so that concentrations can stay above minimum inhibitory concentration for longer periods of time) and reduction in risk for

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antibiotic residues in the milk. Dry cow therapy (DCT) eliminates the existing infections by 70-98%. Cure rate varies according to organism for coagulase-negative staphylococcus over 95% and S. aureus 85.2% Prolong use of DCT eliminates S. agalactiae by 90-100%. Dry cow therapy reduces the incidence of new IMI by 50-75%.

Advantages of Dry Cow Therapy

When dry-cow therapy is used, clinical mastitis is usually less likely throughout the dry period and after calving. Stronger treatment concentrations can be used, damaged tissue may regenerate prior to calving, the incidence of clinical mastitis at caving is reduced, the cure rate is higher during the dry period than during lactation, and new intramammary infections can be reduced. Compared to lactation, it is easier to eradicate infection with an antibiotic during the dry period because the medication is not milked away and a higher and more stable concentration of medicines is retained in the udder. Additionally, discarding milk that contains antibiotics does not result in any monetary losses. Dry period therapy has been proposed as an effective treatment for IMI caused by Staphylococcus aureus and Streptococcus agalactiae. Therapy at drying off tends to effectively manage mastitic pathogens because the absence of regular milking during the dry phase reduces the exposure of pathogens to the mammary gland.

According to various kinds of studies, infectious pathogens particularly Staphylococcus aureus created new infections in herds after drying out. According to Soback *et al* (1990), giving antibiotics at drying off reduced the incidence of clinical mastitis during the dry period. The mastitis pathogens were lower in the quarters receiving antibiotic infusion during calving. A dry cow antibiotic's ability to prevent Streptococcus uberis was examined by Williamson (Schukken et al., 1993). The incidence of mastitic infections was significantly reduced by this treatment both throughout the dry season and following calving. Treatment with dry cow antibiotics is more cost-effective than lactational therapy.

Method of dry cow therapy

1. **Blanket dry cow therapy (BDCT): -** Treating all quarters of cows with a long-acting antibiotic at dry off is a common procedure used by dairy farmers that dates back many years. By doing this, it is possible to prevent the development of new intramammary infections (IMI) during dry off and to increase the elimination of existing IMI. In fact, persistent and novel IMI during the dry period may lead to the development of clinical mastitis (CM) early in the succeeding two to four lactations.
2. **Selective dry cow therapy**: - It is only appropriate for herds having clinical mastitis records, full milk recording records, and a bulk tank average herd SCC < 200,000. Blanket therapy is recommended for all other cattle. Under the SDCT approach, antimicrobial treatment is given to cows or quarters suspected of having an IMI; uninfected cows and quarters are usually not

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given antimicrobial treatment. As a result, SDCT may be able to avoid the use of antibiotics as a preventative measure without negatively altering udder health metrics.

Administering Dry Cow Therapy

Two essential elements that must be included are hygiene and records. When working with cows, the individuals wear clean gloves and to use teat wipes to clean the teat ends. Ascertain that the DCT tubes are kept sterile; immediately after treatment, dip each teat in clean teat disinfection until it is completely covered; and ensure that cows are let out into hygienic paddocks and yards after drying off. Another element is recording the cows should be marked and their tag numbers noted before treatment to reduce the chance of unintentional milking after treatment.

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