

Texas Dairy Matters

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DRY COW MASTITIS AND IMMUNOTHERAPY: THE USE OF NATURAL BODY DEFENSES

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Mastitis in dairy cattle is very common during the dry period and early lactation. Intramammary infections (IMI) observed during the dry period can be due to a subclinical infection (presence of bacteria without signs of inflammation) carried into the dry period from the previous lactation (pre-existing infections), or those acquired during the period between drying off and calving (new infections). Mastitis during the dry period leads to a decrease in milk production, poor milk composition and high susceptibility to clinical mastitis in the subsequent lactation; all of which dramatically impact dairy economics and animal health.

During the transition from a lactating to a completely non-lactating dry udder, the mammary gland undergoes a series of changes that influence the cow's resistance to bacterial infection. With the cessation of milk removal, accumulation of milk into the udder will increase the



pressure in the gland, causing the streak canal to widen and teat orifice to dilate, allowing bacteria into the gland. Once inside the gland, the milk acts as a rich environment for bacteria to multiply.

The mammary gland responds to an infection by increasing the influx of immune cells (somatic cells) that help to fight the infection. These cells migrate into the gland and release cytokines, which are proteins that initiate and regulate inflammation, immunity, and play an important role in mammary gland defenses. The successful elimination of the infectious agent or establishment of an infection will depend on the degree of the inflammatory response, which is extremely variable among cows.

A common practice to control and prevent intramammary infections during the dry period is the infusion of antibiotics into the udder at drying-off (dry cow therapy - DCT). The withdrawal time is different among the diverse DCT antibiotics, varying from hours to days after treatment.

However, there are increased concerns of public health and food safety regarding the use of antimicrobial drugs in food animals. One particular issue is that antimicrobial drug residues in milk and dairy products could lead to antimicrobial resistance and selection of drug-resistant food borne pathogens. Public health officials express a need to reduce the use of both preventive and curative antimicrobials in food animal production.

Alternatives to antimicrobial therapy to control mastitis, such as immunotherapy, have been an active area of investigation. Immunotherapy consists of the manipulation of the host's immune system, for example, production of specific cytokines could be stimulated in order to strengthen natural host defenses against infections. Enhancing a diminished mammary gland defense system may provide an effective barrier against new intramammary infections during periods of increased susceptibility to disease .

Several studies have shown promising results in using immunotherapy treatments. In a study from Ohio State University researchers found that addition of a specific cytokine, Interleukin 2, to a regular dry cow antibiotic targeting *Staphylococcus aureus*, enhanced the effectiveness of the treatment. However, abortion was observed in 7.5 % of the cows that received this particular cytokine. Further research is required to identify specific cytokines that can induce similar levels of benefit without the side-effects.

A group of USDA researchers in Iowa stimulated the immune system of bovine mammary glands by infusing an extract of the yeast *Saccharomyces cerevisiae* during the dry period. The results showed an increase in the activity of immune cells, and suggested that this immune stimulation was similar to that of vaccination, sensitizing the immune cells in the gland so they were prepared to respond immediately in case of a new infection. This treatment could minimize the risk of a new IMI during the periparturient period.

The use of immune stimulating substances such as cytokines and *Saccharomyces cerevisiae* extracts are some examples of immunotherapy that could be a potential alternative to the current dry cow therapy. Research is still in development; but soon methods of immunotherapy may be available for the dairy industry and will be safe for both animals and humans. Always remember to seek the advice of your veterinarian before using any new product at your dairy.

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