

Management of the Dry Cow to Prevent Mastitis

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As we move to a new era of lower acceptable somatic cell levels, the prevention and control of mastitis takes on new importance. For many years, the contagious mastitis pathogens including *Staphylococcus aureus*, *Streptococcus agalactiae* and *Mycoplasma bovis* were the focus of control measures primarily implemented in the milking parlor to stop the spread of these organisms from cow-to-cow. These contagious organisms often cause high individual somatic cell counts and ultimately high bulk tank somatic cell counts. As these high somatic cell count cows have been culled due to milk marketing regulations, the contagious pathogens are decreasing in prevalence and importance. Meanwhile, the environmental mastitis pathogens are becoming more important in many herds as the cause of clinical mastitis (“clinical”=visibly abnormal milk including the presence of clots, heat, pain, or swelling of a gland), especially in the first 100 days of lactation. Prevention of infection by these “environmental” organisms including the coliforms (*Escherichia coli*, *Klebsiella spp.*, *Enterobacter spp.*) and environmental streptococci (*Streptococcus uberis*, *Streptococcus dysgalactiae*) begins with the dry cow. Studies have shown that over 60% of new intramammary infections occur during the dry period and an overwhelming majority of these are due to environmental bacteria.

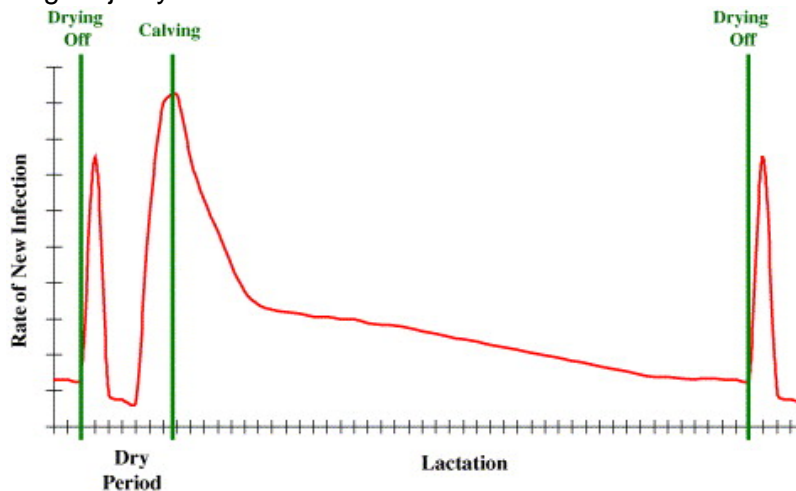


Illustration of the incidence of new intramammary infection during the lactation cycle. The peak in new infection rate, after drying off, is higher in cows not receiving any form of dry cow therapy. (Data from Bradley AJ, Green MJ. The importance of the nonlactating period in the epidemiology of intramammary infection and strategies for prevention. *Vet Clin Food Anim* 2004;20:547-568.)

The dry period is a time of change for many body systems including the mammary gland. Generally speaking, there are three phases of change in the mammary gland during the dry period, two of which are periods of increased susceptibility to infection. The first of these occurs immediately following dry off in the first 3 weeks of the dry period (involution) and the second period is immediately prior to and just after calving (colostrogenesis).

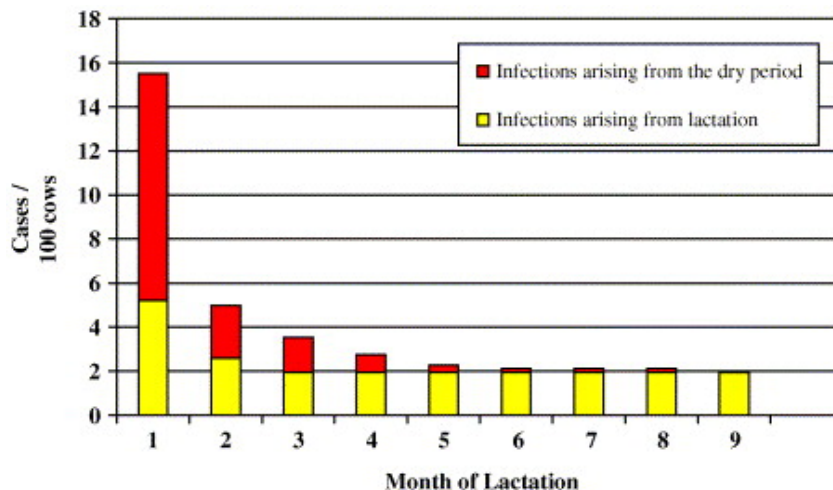
1. Involution-This is the first transition that prepares the gland for stopping the production of milk. Milk accumulates in the udder causing increased pressure, decreased secretory

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activity, and changes in the structures and secretions in the gland. There is an increased risk of infection because there is no flushing of bacteria from the streak canal, no teat dip protection, and there is leakage of milk. Development of the keratin plug to seal the streak canal is crucial in preventing entry of bacteria into the gland but studies have shown that 50% of quarters are still open at 10 days post dry-off and 5% are still open at 60 days. For most cows, involution is considered complete and the udder is resistant to infection after 21-30 days into the dry period.

2. Steady state involution (involved)-Once fully involuted, the mammary gland is very resistant to infection. There are several protective factors during this time that inhibit bacterial growth and the physical barrier of the keratin plug effectively seals the streak canal.
3. Colostrogenesis (transition)-As calving approaches, the second transition in the mammary gland occurs as the udder prepares for milk synthesis. These changes are essentially opposite of involution as there is growth of mammary tissue and increased secretory activity in the last two weeks of gestation. Susceptibility to infection increases as the keratin plug breaks down, leukocyte function is impaired (the protective white blood cells do not work as well) and leakage of colostrum often occurs. By this point in time, the dry cow treatment is usually no longer effective.

The ultimate goal of the dry period is to have as few quarters infected with bacteria as possible at calving. Attainment of this goal goes a long way towards maximum production of low somatic cell count milk during the next lactation. To attain this goal, there must be an emphasis on: 1) prevention of new infections caused by environmental organisms and 2) infections already present at dry off must be eliminated. It is reported that 95% of all new intramammary infections in the dry period are caused by environmental pathogens and most are acquired in the last 2-3 weeks of gestation. These infections are not noticeable during the dry period but cause clinical mastitis early in the next lactation. To prevent new infection in the dry period, it is important to decrease the bacteria in the environment and increase the cow's defenses to infection.



Data showing the origin of infection (dry period or lactation) in cases of clinical mastitis. (Data from Green MJ, Green LE, Medley GF, Schukken YH, Bradley AJ. Influence of dry period bacterial intramammary infection on clinical mastitis in dairy cows. J Dairy Sci 2002;85(10):2589-99.)

Keys to Prevention of New Infections in the Dry Period

1. Antibiotic dry cow therapy (DCT) -The use of long-acting intramammary antibiotics administered to all quarters of all cows after the last milking of lactation is the key step in mastitis control in dry cows. It is estimated that 70-98% of infections present at dry off can be eliminated with DCT except in the case of *Staphylococcus aureus* which is much more difficult to cure (See UK Extension Publication ID-190: *Staphylococcus aureus* Mastitis). The reduction of new infections has been estimated at 50-80% with DCT. Other benefits include reduced somatic cell count, reduced incidence of clinical mastitis, and increased milk yield in the next lactation. However, there are some issues with the effectiveness of dry cow therapy against environmental organisms. Most dry cow products are formulated for treatment of Gram (+) organisms (*Staphylococcus spp.* and *Streptococcus spp.*) and not Gram (-) organisms such as *E.coli*. New products with a broader spectrum of coverage are available but it is important to know what organisms are causing problems in your herd. Talk with your veterinarian about culturing for mastitis organisms and proper antibiotic selection.
2. Teat Sealants- Many of the dry cow formulations do not persist late into the dry period and leave the udder unprotected in the period of time just before calving, especially if the dry period is long. A 2007 study comparing the use of the internal teat sealant OrbeSeal combined with dry cow therapy versus dry cow therapy alone found a significant reduction in new infections at calving in the combination treatment group compared with the antibiotic alone treatment (3.7% vs. 7.3%). Perhaps more importantly, the incidence of clinical mastitis in the first 100 days of lactation was significantly lower for the combination treatment group than for the antibiotic treatment alone.
3. Environmental Management- Keeping dry cows clean, dry, cool, and comfortable is critical in terms of udder health. Cows lay down 12-14 hours a day and their teats are in direct contact with the material where they rest. Populations of bacteria in bedding are related to the number of bacteria on teat ends and rates of infection. These bacterial numbers increase in the environment as the outside temperature and moisture levels increase.
4. Nutrition-Dry matter intake, energy balance, and mineral supplementation are all important considerations during the transition period to reduce clinical episodes of production diseases including mastitis, ketosis, retained placenta, and left displaced abomasum.
5. Vaccination-J5 core antigen vaccines (J-5, J-Vac®) are not associated with a reduction in the number of new dry period infections but they do decrease the clinical effects of the infection. These vaccines are able to reduce bacterial counts in milk, resulting in fewer clinical symptoms by enhancing the ability of white blood cells to destroy the bacteria. Clinical mastitis caused by environmental pathogens varies from mild, local signs (abnormal milk, swollen gland) to systemic signs and death. Only about 10% of clinical coliform cases result in systemic signs such as fever, anorexia (off feed), altered respiration (rapid breathing), and possibly death. In these severe cases, vaccination will decrease the incidence of these symptoms of mastitis and will decrease culling losses, especially in the first 2-3 months of lactation.

The dry period is of great importance when it comes to overall health and productivity in the next lactation. Many changes occur to the mammary gland during this time which must be taken into consideration when developing a health management program. The goal of the dry period is to have as few quarters infected with bacteria as possible at calving. Keeping dry cows cool, dry, and comfortable and administration of dry cow therapy to all quarters of all cows at the end of lactation will go a long way towards achieving this goal.