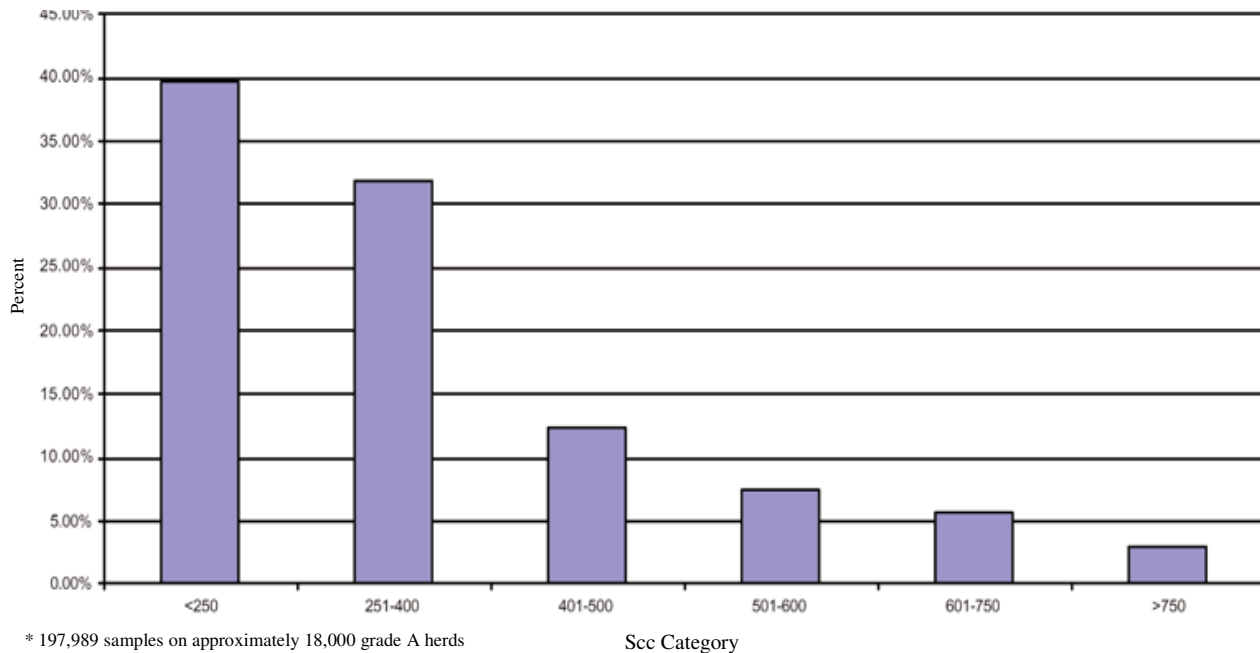


The Seven Habits of Highly Successful Milking Routines

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The efficient production and harvest of high quality milk is the goal of most dairy farmers. High quality milk consists of milk that is visually appealing, free of adulteration and meets specific quality standards for somatic cell count (SCC), and bacteria. The highest quality milk usually has a SCC of less than 200,000/ml. Many Wisconsin dairy farms are producing high quality milk. In 1998, approximately 40% of Wisconsin grade A dairy producers had an average SCC of <250,000 for the year (Figure 1).

Figure 1: Average Somatic Cell Counts for Grade A Wisconsin Dairy Herds Jan-Nov. 1998*



Producers of high quality milk know that a consistent method of pre-milking udder hygiene and the uniform attachment of properly functioning milking machines are important. The objective of milking management is to ensure that teat cups are applied to visibly clean, well stimulated teats, milk is rapidly and efficiently harvested and milking units are removed when milking is completed. A number of milking routines are used on dairy farms. A survey of 278 Wisconsin dairy producers identified 28 different pre-milking routines that Wisconsin dairy producers are using. The "one size fits all" approach doesn't apply to milking routines, but there are seven principles of highly successful cow-preps that contribute to the production of high quality milk.

1. Cows are Calm and Clean before Milking.

Cow cleanliness is a major determinant of both milking efficiency and the rate of intra-mammary infection. It is estimated that cows that enter parlors dirty, double cow prep time and reduce parlor throughput. A French study demonstrated that teat cleanliness is a good predictor of herd average somatic cell count. Environmental pathogens are often the major source of mastitis in herds that have controlled contagious mastitis pathogens. Environmental bacteria (such as E.coli and the environmental streptococci) are often present in organic bedding sources and wet, muddy pens. Management practices that reduce teat end exposure to these organisms will reduce the risk of developing mastitis. Bedding sources that are clean, dry and comfortable will minimize pathogen growth. Inorganic bedding such as sand is often the best choice for reducing pathogen numbers. It is important to recognize that all sand is not created equal and sand must be groomed daily. When rubber filled mattresses are used for cushioning stalls, it is important to adequately bed the stalls to ensure that they remain dry. Further improvements in cow cleanliness can be made through removal of udder hair. It is a good practice to routinely remove udder hair once a month or more often if necessary. Cow handling is an important determinant of milking time efficiency. The release of adrenaline within 30 minutes of milking can interfere with milk letdown and prolong unit on-time. Calm cows enter the milking parlor readily and do not generally defecate in the milking parlor. Personnel working with and moving cows are quiet and gentle. If a number of cows are refusing to enter the parlor or are defecating frequently in the milking parlor, **operator** and **parlor performance** should be examined.

2. Cows are Grouped

There are at least two non-nutritional reasons to group cows. Minimizing exposure to cows known to be infected with subclinical mastitis is necessary to control the new infections rate. In freestall-parlor operations, uninfected cows should be grouped together and milked first. Cows of unknown infection status are milked next and the infected cows are milked last. Sometimes it is necessary to manually sanitize units between cows. To achieve adequate pathogen reduction, units should be rinsed, exposed to 25-50ppm iodine for at least 30 seconds, rinsed and then allowed to dry. In parlor operations, cow grouping is an important element of parlor performance.

3. A Consistent Premilking Cow Prep is Used

Cows **love** routine and will reward operators that provide it. Research has documented a 5.5 % increase in lactational milk yield when a standardized milking routine was used compared to a variable milking routine. Achieving consistency can become a challenge when a number of different people are milking cows on an individual dairy each month. With so many different people milking cows, explicit milking routine instruction and training are a necessary component of quality milk production. Pre-milking preparation is a balance between speed (efficiency) and completion of the required steps to clean udders and stimulate milk let down. Milk is stored primarily in the secretory tissue of the udder (the alveoli) and the efficient removal of milk is hastened by coordinating unit attachment with milk letdown. Milk letdown is a combination of both oxytocin (from the pituitary gland) and stimuli from the local nervous system providing feedback to the muscles surrounding the alveoli to release the milk into the ductal and cisternal system for harvest. Selection for high yield and the need for increased cow throughput in parlor operations has led to debate about the necessity of manual stimulation prior to unit attachment. A summary of six studies that compared no stimulation (unit attachment only) to optimal stimulation (at least 20 seconds manual stimulation and unit attachment within 60 seconds) demonstrates the advantage of manual stimulation (Table 4).

Table 4: Summary of six studies on the effect of stimulation on milking.

	No Stimulation	Optimal Stimulation
Milk Yield (lb - kg / milking)	22.9 / 10.4	23.8 / 10.8
Milk Flow rate (lb - kg / min)	3.9 / 1.8	4.7 / 2.1
Machine on time	6.3	5.5

Forestripping is a method to encourage milk letdown, eliminate microorganisms in cisternal milk and to allow the detection of clinical mastitis. Forestripping is adequate if 2-3 streams of milk are expressed. . In parlors, cows can be forestripped onto the floor. Bulk milk SCC problems cannot be solved without the incorporation of forestripping into the milking routine. The most dangerous bacteria reside at the teat end. Teat end disinfection is important in reducing the number of bacteria. It is well established that proper teat end disinfection, can reduce teat surface bacteria by 75%. Reduction in teat end bacteria numbers reduces the rate of mastitis. There is a considerable amount of confusion regarding how to best accomplish teat end disinfection. Wisconsin dairy farmers vary considerably in their practice of teat disinfection depending upon facility type. Predipping is most effective in the control of environmental pathogens (E. coli and environmental streptococci) and has been shown to have limited effectiveness against coagulase negative staphylococci. A minimum contact time of 20-30 seconds is needed for effective disinfection.

4. Teats are Dry

The most important portion of the teat disinfection process is thorough drying of teat ends. Air drying is not a satisfactory substitute for manual drying with an individual cloth or paper towel. Wet teats allow skin bacteria easy access into the gland and reduces friction between the teat and the liner. Cloth towels have the advantage of being more absorbent than paper. When cloth towels are used they should be disinfected by washing with bleach or very hot water and drying at high temperature in an automatic dryer. These methods have been demonstrated to significantly reduce pathogen numbers. Additionally, the use of latex or nitrile gloves by milkers can help reduce pathogen transfer. Gloves both protect milkers skin and reduce the contamination of teats from milker's skin. Gloves can be easily changed between groups, further reducing the likelihood of pathogen transfer. To check the effectiveness of teat disinfection and drying, a clean swab can be rubbed across the end of the teat prior to unit attachment. A swab from a properly prepared teat will remain clean. A dirty swab indicates that teat preparation methods should be improved.

5. Units are Properly Attached

An important element of the attachment process is timing. The time from the beginning of the cow preparation process until unit attachment is referred to as the "prep-lag" time. To maximize milking efficiency, units should be attached within one minute from the beginning of stimulation. A range of 45 seconds to 1 minute is acceptable. Prep-lag times >2 minutes have been shown to result in more residual milk and lower milk yields. A large flow of milk will be visible within a few seconds of unit attachment if prep-lag times have been optimized. A primary decision in pre-milking routine, is deciding how many cows each operator will prep prior to unit attachment. Several common routines have been developed that utilize groups of 3, 4, or 5 cows to ensure that prep-lag times and pre-dip contact time are optimized. A standardized process of unit attachment should be followed. During the process of individual teatcup attachment, the teatcups are raised toward the teat, straightening the liner and minimizing air admission. Units should be adjusted and aligned so that cluster weight is evenly distributed. Units should be aligned so that the claw outlet is pointed at the head of the cow (conventional parlors) or directly between the legs in parallel parlors. Proper unit adjustment results in fewer liner slips.

6. Units are Properly Removed

Milking is completed when the available milk is fully harvested. Undermilking occurs when all the milk is not removed ("not milked out") and overmilking occurs when teatcups are attached to teats but milk is not flowing. The biggest danger of undermilking is financial. The biggest danger of overmilking is damage to teat ends resulting in mastitis. A Danish experiment demonstrated that when the threshold setting on the ATO (automatic take off) was raised from .44 to .90 lb/minutes the average unit on-time was reduced by 0.5 minutes and teat condition improved. Additional time savings can be gained by changing the detacher delay time after the threshold is reached from 20-30 sec to 10 seconds. To avoid milk yield loss, changes in detacher delays should be made gradually in three second intervals. High threshold settings and short detacher delays will apply to 3X herds with a good cow prep, resulting in improved teat condition and milking speed.

The completeness of milk-out can be estimated by **occasionally** checking the amount of milk that can be hand stripped from a cow after milking is completed. Left-over milk that can be expressed by hand milking is termed strip-yield. Cows can be considered to be fully "milked out" if <0.20 liters of milk per quarter can be hand stripped post-milking. Hand stripping should **not** be practiced routinely.

7. Cows are Managed Post-Milking

Post-milking teat antisepsis was initially developed to reduce the transmission of contagious mastitis pathogens and has been widely accepted. To evaluate the adequacy of teat spraying, a paper towel can be wrapped around the teat after dipping. A properly dipped teat will have teat dip completely around the towel. Finally, the last step in an effective milking routine is to ensure that the cows remain standing for at least 30 minutes after milking is completed. Most producers provide fresh feed to encourage this behavior.

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