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Kentucky Dairy Notes

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Today's Management Practices Program Tomorrow's Milk Production

By Donna M. Amaral-Phillips

Feeding and management practices, as well as health of dairy cattle, not only impact today's performance, but also milk production and reproductive performance months from now. As our biological knowledge base continues to advance, we are learning how cells are "programmed" and how this programming impacts a dairy cow's ability to absorb nutrients from the digestive tract or alter a cell's function at a later time. This programming starts before birth and continues throughout the life of a dairy heifer and into her adult life. This article explores how management practices within the first two months of life, "program" her production once she enters the lactating dairy herd.

Colostrum Important for More Than Immunity

After birth, colostrum is important in not only immunity of the calf, but also the growth of tissues in the gastrointestinal tract and the colonization of beneficial, and not harmful, bacteria. Calves are born without antibodies against diseases and must receive antibodies through the timely intake of colostrum. Besides antibodies, colostrum contains various growth factors which are important in the growth of cells within the gastrointestinal tract. Growth of these cells is important for absorption of nutrients throughout life, especially after she calves. This programming starts at birth, not just after calving!!! Colostrum also coats the intestine, helping minimize the colonization of detrimental bacteria, i.e. *E. coli*. In addition, recent research has shown the enhanced colonization of beneficial bacteria when colostrum is fed within the first hour or few of life.

Implementation On-Farm: Feed 4 quarts of high-quality colostrum as soon as possible after birth, but within 4 to 6 hours of life, which was harvested in clean, sanitized equipment and from a properly prepped cow shortly after calving. Within 6 to 8 hours of the calf's life, another 2 quarts of colostrum should be fed.

Reward: Large breed calves fed 4 quarts of colostrum at birth produce 2500+ lbs more milk in their first lactation.

Higher Plane of Nutrition from 2 Weeks of Age

In calves, greater growth rates occur when higher planes of nutrition are fed. Under conventional feeding programs where 2 quarts of milk or reconstituted milk replacer are fed twice daily, growth rates were generally around 1 lb or less per day. On this feeding program, calves are expected to consume calf starter to make up the deficit in energy not provided by their milk. With accelerated feeding programs, more milk, 8 quarts or more, is fed from approximately 2 weeks of age until stepped-down just before weaning at 8 weeks of age. In addition to this increased milk intake, water and calf starter starting at day 3 of life should be offered. Calves gain more weight than those on conventional feeding programs. These improved growth rates have been associated with improved milk production after calving. Currently, the recommendation is to double a dairy heifer's birth weight within the first 60 days of life. For Holsteins (birth weight 90 lbs), this equates to a growth rate of approximately 1.5 lbs daily over this 60-day period.

Implementation on farm: Use of "accelerated" milk feeding programs where calves are fed more milk compared to a conventional feeding program, improves weight gain. If reconstituted milk replacer is fed, the replacer powder contains 27-28% crude protein, to better match protein needs associated with the higher growth rates. Calves generally are fed 2.5-3 quarts of milk twice daily for the first week or two of life. Then until weaning, calves are fed 8 quarts or more of milk daily either 2 to 3 times daily or through an automatic feeder. In *ad lib* feeding programs, calves can consume as much milk as they prefer, usually up to 12 quarts or 3 gallons of milk daily and are fed using an automatic calf feeding system where calves

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consume multiple small meals over the day. Within 1 to 2 weeks before weaning, the amount of milk fed is stepped down with the expectation that calf starter intake will increase to replace the amount of energy lost by the decreasing intake of milk.

Reward: Calves which gain more than 1.1 lbs daily, gave more milk as first-calf heifers. In another compilation of research trials, scientists estimated that for each pound of gain within the first 2 months of life, calves gave 1540 lbs more milk within the first lactation or 6000 lbs more milk over the first 3 lactations. Also during this time period, calves are very efficient at gaining lean tissue or muscle versus fat. Although hard to document, calves fed more energy may be better able to fight off disease challenges.

Consistent Feeding Times and Milk Composition

Calves, like dairy cows, like consistency in their feeding regimes, be it feeding times or feed composition.

Implementation on farm: By weighing the amount of milk replacer or having a consistent source of milk (i.e. not mixing colostrum, transition milk or whole milk), the milk solution offered to the calves will contain a more consistent amount of solids and needed nutrients for growth. Many portable scales can be purchased to weigh the amount of powder and water used when mixing milk replacer which are both accurate and economical.

Reward: Calf gain will be more consistent with less digestive upsets.

Minimize Disease and Potential Use of Antibiotics

A Cornell University study investigated whether a relationship existed between calves treated or not treated with antibiotics and their subsequent milk production as first-calf heifers. Calves not treated with antibiotics gave 1085 lbs more milk as first-calf heifers than those treated. Researchers did not find an association between calves with and without scours and subsequent decrease in milk production. They concluded that the decrease in milk production was most likely associated with the illness itself and the diversion of energy away from growth.

Implementation on Farm: Prevention, prevention, and prevention is key. Prevention starts with adequate and appropriate ventilation, timely feeding of colostrum, and feeding an appropriate amount of milk, calf starter and water. Early detection of disease is critical, especially within the first 2 weeks of life.

Reward: Minimizing disease incidence results in better growth and increased production later in life as well as a more "care-free" calf.

Heat Abatement for Dry Cows Impacts Their Offspring

Heat stress affects not only the cow herself, but also the fetus she is carrying. Effects on the fetus last her lifetime. Calves born to heat stressed dams are 10 to 15 lbs lighter at birth, are lighter the first 12 months of age, have a lower calf survival rate, and give less milk once they calve. These calves have a lower antibody absorption rate and, as a result, an immune system less able to combat disease early in life. Unfortunately, feeding colostrum from a non-heat stressed dam, i.e. frozen colostrum or colostrum replacer, cannot overcome the reduced antibody absorption rates seen in these calves.

Implementation on farm: If possible, house dry cows in a facility that provides fans and sprinklers to reduce heat stress. If housed outside in the summer, rotate shade trees to prevent mastitis. Shade can help and should be provided, but does not alleviate the total effects of heat stress.

Rewards: Improved milk production of the dam and fetus and improved survival of newborn calves.

On-Farm Management Practices Impact Incidence Rates for Lameness

Management Action	Why is this practice important?
Scrap lots to minimize cows' hooves coming in contact with manure and urine	Increased exposure of hooves and feet to manure and urine can increase the incidence of foot rot and other infectious foot problems. Also, moist hooves are softer and may be more susceptible to injury from small stones found in lanes used to move cows to and from barn lots.
Trim feet regularly	Make sure cows can distribute their weight evenly over the claw
Proper and routine use of footbaths	Prevent infectious diseases of the hoof
Minimize standing time on concrete surfaces	Provide comfortable, well-bedded, and properly-designed freestalls for cows to lie down and chew their cuds. Do not overcrowd the freestall barn- enough stalls are needed so that the timid heifer can "find her own stall"
After feeding, the majority of the herd should be able to lie down in stalls and chewing their cuds	If cows are not using the stalls properly, investigate how to improve their usage (Are the stalls the proper length? Do cows have adequate lunge space to get up and to lie down? Are the stalls comfortable?)
Prevent hock lesions	Adequate bedding is needed in the rear of the stall to prevent lesions. (With mattresses, 1 inch of bedding should cover the back of the stall.)

Do Your Dairy Calves Need a Buddy?

By Donna M. Amaral-Phillips

As with all aspects of dairy husbandry, how we raise dairy calves has evolved over time as we learn more about the biology behind common management practices. These changes/modifications have included the amount of milk fed, composition of calf starter mixes, weaning age and method, and health procedures. How we house and manage dairy calves has also changed over time. Housing calves in small groups, known as group housing, is becoming more commonplace. Group housing can occur when as few as 2 calves are paired together in 2 hutches with a common "yard" or in barns with pens holding small groups of 10 to 30 calves. Group housing of dairy calves does not fit everyone's management style, but can be one option for many farms.

Benefits of a Buddy

Studies have demonstrated that calves raised in pairs or small groups learn from each other. They may be better able to deal with socialization and novel situations at an earlier age. Pair-fed calves have been shown to have higher solid feed intakes (starter) than individually raised calves. Essentially, paired calves have a "buddy" to explore their surroundings, try novel feeds, i.e. calf starter, deal with the stresses associated with changes, and are more accustomed to interacting with others in a grouping situation.

To make "group" raising of calves work well, certain principles and management practices need to be practiced in order to avoid disasters. Grouping of calves can occur when calves are housed together in pairs or as small groups being fed through a mob or automatic milk-feeder. This article summarizes some key components when raising calves, irrespective of how calves are housed.

Place to Start

Before transitioning to group housing, one should evaluate how well your calf feeding program is working and fix any weak links before moving to a group housing system. Sound colostrum feeding practices need to be in place where 4 quarts (not 2—or a small bottle) of clean, high quality colostrum is fed to calves (Jerseys- 3 quarts) within 4 hours of birth. Disease issues should be at a minimum before undertaking group feeding and housing. Calf starter and free choice water must be available starting by 3 days of age and fresh feed and water provided daily.

Managing calves in a group setting does take a different skill set and you will have a learning curve. Those in charge of managing these calves must have excellent observational skills and be able to detect calves getting sick early in the disease process. One possible misconception when using an automatic calf feeder is that the software in the feeder will detect <u>all</u> calves that are sick and alert the user. Yes, this is a positive management tool, but one must still observe calves to see which calves need attention. Calf managers should walk the calf pens first, before checking the output from the automatic calf feeder. Changing the order forces one to check all the calves in the pen, not just those identified by the computer software as needing attention.

One fear is that calves fed and housed in a group will result in more cross-sucking and its possible associated problems. Feeding and management practices can increase or decrease the chances of calves sucking one another. To prevent cross-sucking with group housed calves, more milk needs to be fed with at least 8 quarts fed daily to keep calves satisfied. Calves fed lower quantities of milk are more inclined to suck one another. In addition, more cross sucking is seen in large groups of calves and when calves are weaned at 6 weeks (early weaning) versus weaning at 8 to 10 weeks of age.

Group Housing

Pair-housing systems: For smaller sized herds (less than 5 to 10 calves monthly), the benefits of group housing can be realized by pair (2 calves per pair) feeding and housing calves. Facilities for these calves could be as simple as 2 hutches placed side by side with a common outside area enclosed with fencing. At least 8 quarts (2 large bottles per day) of milk needs to be supplied to prevent cross sucking. Group hutches are also available or can be constructed where small groups of heifers are raised together. Milk can be supplied through buckets with multiple nipples. The key is sanitation of these milk feeding stations. Attention to detail is critical when washing these feeders after each feeding to prevent disease issues.

Calf Barns with calves grouped in pens: Most people associate group housing for calves with specially designed calf barns, which contain group pens and milk is fed through computer-controlled feeding stations. These "automatic" feeding stations provide milk to calves 24/7 and can provide higher amounts of milk daily. Calves allowed ad lib access to milk can drink on average 10 to 12 quarts of milk daily at peak consumption with some calves consuming 16 to 17 quarts (15-16 liters) and others as little as 7 quarts. Sanitation in these milk feeding stations is critical to prevent disease.

Calves are housed in small, STABLE groups (maximum of 12 to 15 calves per nipple) with no more than 3 to 4 weeks difference in age. Pens are sized such that 40 square feet of resting space per calf is provided. Space needed for the feeding station, waterer and calf starter feeder is in addition to the resting space needs. Adequate dry bedding needs to be provided to keep calves clean and dry.

To break a potential disease cycle, facilities should be designed such that a pen is left vacant for 15 to 20 days after being emptied and cleaned out. This concept is referred to as "all in and all out". Thus, facilities are designed with at least 3 pens. One pen houses the youngest calves for the first 3 to 4 weeks of life, and calves are not older than 4 to 5 weeks of age. Ideally, calves should have no more than a 2 to 3 week spread in age. A second pen would house calves 4 weeks of age thru weaning. Calves are weaned at 8 to 10 weeks of age in pairs or as a group (Calves need a buddy!). A vacant pen (vacant for 15-20 days) allows one to break a potential disease cycle. Building a facility which contains this vacant pen does increase barn costs, but does provide insurance if problems do

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arise or times when more cows are calving than normal.

Ventilation in these facilities is CRITICAL to decrease the concentration of ammonia and prevent disease, especially respiratory issues. As calves are fed more milk, they produce more urine, which increases the amount of ammonia that needs to be ventilated. Ventilation in calf barns presents new challenges especially during the wintertime and during still days. Calves do not produce enough heat to move air through a naturally ventilated barn. In a barn for mature cows, the heat produced generates a chimney effect for air movement up through the ridge vent. Thus, different ventilation systems must be utilized. Often times, retrofitting existing barns does not work, especially if adequate ventilation for younger calves cannot be achieved.

Bottom Line

Raising dairy calves in groups, as pairs or in small stable groups, can be very effective in improving social skills and performance. However, managers of these systems need to realize they are no longer just calf feeders, but calf managers. Attention to details and keen observational skills are critical to their success. Collecting and reviewing hip height and weight gains can help further evaluate whether this system is working and point to changes that may be needed. As with any system, the key is whether this system of feeding and managing dairy calves fits your resources, management skills, and business goals.

Practice the 5 C's of Dairy Calf Management

By Donna M. Amaral-Phillips

Colostrum: Calves should be **fed 4 quarts** of high-quality (>22 with brix refractometer) colostrum (Jerseys- 3 quarts) within 4 to 6 hours of birth and an additional 2 quarts within 6 to 8 hours of the first feeding. Calves fed 4 versus 2 quarts of colostrum give 2500+ lbs more milk that first lactation!! Calves are born with an immature immune system and have to acquire immunity to disease from the antibodies found in this first milk. The absorption of antibodies by the newborn calf decreases with time and is non-existent by 24 hours of age. Thus, the recommendation to feed newborn calves quickly after birth. Besides antibodies, colostrum also contains various growth and nutritional factors which increase growth of tissues in the intestines and their ability to absorb nutrients throughout their life.

Calories: Energy or calories come from both the intake of milk and starter grain mix. Both are important in raising healthy, productive calves. Recommendations are to feed daily at least 6 quarts of milk or reconstituted milk replacer to Holstein calves. Starter should be available along with free-choice water starting at 3 days of age. Small amounts (a handful in a clean bucket) of starter are provided early in life—day 3 of age-- and needs to be changed out daily so that fresh starter is always available. The amount of starter consumed increases with age, especially as calves are being weaned from milk. Free-choice water is necessary to provide moisture in the rumen for rumen development. Remember that milk goes directly into the abomasum or true stomach, not into the rumen. For the best rumen development, free-choice water is needed. To prevent pens from getting wet when calves spill their water buckets, consider placing water bucket directly outside the pen in a container that minimizes the calf's ability to easily spill the bucket.

Cleanliness: Limiting exposure to disease-causing organisms helps get calves off to a good start. Cleanliness in both the calving pen and housing after calving are important. Leaving a cleaned calf pen vacant for 10 to 14 days can help break potential disease cycles. Feeding equipment (bottles, pails, tube feeder) needs to be cleaned identical to procedures used when cleaning milking equipment—warm water rinse, washed with hot water and soap using a brush, and acid rinse). Automatic feeders need to be cleaned daily (if automatically cleaned, checked that they are cleaning properly) and milk hoses replaced routinely. Calves that are sick should be cared for and fed last to decrease spread of disease.

Consistency: Just like their mature cohorts, calves require consistency in feeding and handling routines (i.e. fed same time each day) as well as consistency in the composition of feeds they consume. Milk replacer, if source of milk, needs to be reconstituted according to the label's directions and an identical amount of powder and water fed at each feeding. To accomplish this, weighing out the powder and water decreases the inconsistencies between feeders and from day to day.

Comfort: Calves need a dry and draft-free area to rest. During the first week of life calves spend 80% of their time lying down and this decreases to only 75% by week 2 of life. Ventilation is also critical! Air movement, not down on but just above calves, is needed to move bacterial laden air away from calves. In the winter, air should turn over 4 times per hour and increase during the summer (up to 60 times/hour). Calves are born with very little body fat, thus environmental temperatures influence their comfort and ability to stay warm. Calves in the first 3 weeks of life are most comfortable when temperatures are between 60 to 75ºF and when temperatures drop below 60ºF, need to use energy they could have used for growth to stay warm. Calves over 3 weeks of age have a wider comfort zone with the lower end at 40ºF. Heat stress on calves decreases their immunity and their ability to fight off disease. Calf hutches can be well over 100ºF in the summer if they are not shaded from the sun. Placing hutches under shade cloth or trees help reduce the temperatures inside hutches and can help improve the immunity of calves. Remember that calves will drink more water when environmental temperatures increase.

Post-Weaning Period Critical Time for Dairy Heifers

By Donna M. Amaral-Phillips

When managing young dairy heifers, much emphasis has traditionally been directed toward feeding and management protocols from birth through the first two months of life whilst they are being fed milk, and rightfully so. However, we also understand that feeding and management programs at and shortly after weaning are critical to the growth and overall health of these young dairy heifers. Some researchers have suggested that average daily gain at and shortly after weaning, as well as prior to weaning, may be positively correlated with later milk production of this heifer. Growth slumps after weaning definitely impact rearing costs as they can impact age of puberty, breeding, and thus, age at calving. A smooth transition from milk feeding to feeding programs composed of grains and small amounts of forage is very important and, as such, requires careful management oversight for the best outcome for both the heifer and dairy owner.

Post-Weaned Heifers Efficiently Convert Feed into Muscle and Skeleton

Two- to four-month old heifers are more efficient at converting feed into gain than older heifers. Feed efficiency for a 3-month old heifer is approximately 30% versus 9% for a 15-month old heifer. Weight gain of younger heifers contains a higher percentage of lean muscle than fat. Cost per pound of gain is the lowest in this age group of heifers, thus behooving managers to make the most of growth during this age. We also know that 50% of the skeletal growth occurs before 6 months of age, thus protein intake is important to capitalize on skeletal growth.

Weaned Heifer's Rumen Still Developing

Feeding and management programs for recently weaned heifers need to take into consideration that these calves still have a developing rumen and associated rumen fermentation. They do not have the digestive capacity and ability to use nutrients that older heifers and cows possess. For example, nutritionists do not use urea in grain mixes for young heifers (less than 400 lbs heifers - large breeds). Digestion of feeds within the rumen generates microbial protein (protein used by the heifer) and volatile fatty acids. Volatile fatty acids (known as VFAs), most notable example is butyrate, are important in rumen papillae development (where VFA's are absorbed) and provide energy for the heifer and cow. These VFA's are produced in the largest quantity from the digestion of grains, not forage. Grain intake is important as it provides energy and protein needed for maintenance and growth of heifers. When hay is added to these diets, the amount fed is still a small percentage of the total diet consumed by these very young, recently weaned heifers.

Suboptimum intakes of grain prior to, at, and shortly after weaning can make this transition difficult for these calves which results in reduced growth around the time of weaning. For the first 2 to 3 weeks of life, milk-fed calves rely on their milk intake to provide the energy and protein needed. Providing starter is still important at this very young age as the small quantity along with water helps "start" rumen development. As they get older, both starter and milk provide the nutrients needed. After weaning, all of the energy and protein must be provided from solid feeds consumed. Calves need to be managed such that they are eating adequate amounts of grain, thus the reason weaning should be based on starter intake and not age. Today's calves may do best if they are weaned around 8 weeks of age and not younger. All calves are individuals and some may even do best if weaned at 10 vs 8 weeks; again dependent on their starter intake.

Management Practices Important for Smooth Transition

Attention to details around the time of weaning is critical for as smooth of a transition for these dairy heifers as is possible. As managers, we need to "listen to these calves". Not all calves will and should follow a set protocol regarding timing and procedures to accomplish weaning. Some calves may do best if they are weaned at a slightly later age. Regardless of the timing, some common threads exist regarding weaning management and feeding practices. These include the following, to name just a few.

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- Starting time for the weaning process should be decided by starter intake and the performance and health of individual calves; not on a calendar or days/weeks from birth. Some calves may be ready to be weaned at 8 weeks of age whereas others are best weaned at 10 weeks of age.
- Starter intake prior to weaning impacts how well calves can navigate the weaning process. As milk intake is reduced, a higher proportion of the energy needed by the calf must come from starter. The amount of starter calves should eat prior to the beginning of the weaning process is not always agreed upon by dairy calf researchers. Amounts range from 1.5 lbs to over 4 lbs daily. Obviously, the more starter calves are eating at weaning and the week after weaning, the more energy they are consuming to maintain growth as milk consumption decreases. Thus, management programs that stimulate starter intake before, at, and the week after weaning are important. Energy shortages at and within the first 2 weeks post-weaning can increase a calf's susceptibility to disease.
- The type of milk feeding program (6 quarts vs 10+ quarts daily) impacts starter intake prior to the start of weaning. Calves on higher feeding rates of milk (as fed through automatic feeders- 10+ quarts/day) eat less starter and need more time to increase their starter intake. Decreasing milk intake over 10 to 14 days helps the calf more slowly adjust to the decreased amount of energy from decreased intakes of milk. Starter intake should increase as the amount of milk is reduced. Calves fed higher amounts of milk pre-weaning may do better with starters around the time of weaning that contain more starch to supply additional energy at a lower starter intake.
- During the weaning process, the amount of milk being fed should be reduced over time generally occurring over 5 to 14 days depending on the milk feeding protocols and other management related factors. Starter and water intake increases quickly as milk is removed from the diet.
- Forage intake after weaning is important, but it should make up a small proportion of the weaned heifer's diet at around 10 to 15% of the total intake of weaned calves. Thus, hay intake should be around 1 to 2 lbs daily in the recently weaned calf. Hay should not be offered in large amounts free choice, as they may consume hay at the expense of starter needed to maintain energy intakes. Weaned calves still do not have a fully functional rumen and need to be fed as such. Remember, intake of starter is important!!
- Weaning time is very stressful on calves. To minimize stresses on these calves, management and feeding changes should be made one at a time over an extended period of time, not all at once. Feeding and management changes include, but are not limited to, changes in grouping, housing, and grain formulation (transition from starter to grower grain mix) from that fed during the milk feeding period. Disbudding and vaccinations should be avoided during the weaning period and immediately post-weaning.

Sound Fresh Dairy Cow Nutrition Practices Necessary to Get Cows Off to a Good Start

By Donna M. Amaral-Phillips

Feeding and management practices for early lactation dairy cows, especially fresh cows, can have a substantial impact on a cow's health, well-being, future milk production, and reproductive performance. All of these directly impact a dairy cow's potential profitability. When managing fresh cows, it is imperative that they get off to a good start after calving. Early lactation cows, especially just after they freshen, need to be managed so that they eat well in addition to being fed and managed well before calving to avoid metabolic diseases or disorders such as milk fever, displaced abomasums (DA's), or retained placentas around calving time.

Feeding and Management Programs for Fresh Cows

One of the key points in managing fresh dairy cows is to spend time observing these cows. Carefully observing these cows goes a long way in detecting problems early so that you can intervene at the early stages of a disease. Fresh cows need to be observed and monitored (1) to make sure they are chewing their cuds, (2) to see that they are eating their feed, and (3) to make sure that their body temperature, rumen movements, and uterine discharge are normal. Fresh cows should NOT be housed with sick animals. To ensure the best possible scenario, cow comfort and plenty of fresh feed in bunks with plenty of feed bunk space and easy access to clean, cool water are critical.

This is not the time for overcrowding at the feedbunk or in resting areas. Reduction of heat stress is also very critical for this group of dairy cows as well as maintaining a clean housing environment to prevent mastitis. Remember that dairy cows have a weaker immune system approximately 10 days before and after calving.

Preventing Fresh Cow Diseases

The second key point when managing fresh cows is to prevent metabolic diseases. Metabolic diseases in fresh cows have been estimated to cost dairy farmers between $150 and $350 per incidence—which represents a large portion of a cow's potential profit assuming she only succumbs to one disease or disorder. Unfortunately, health problems around calving usually display the domino effect, where one disease or disorder leads to others

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Training Self-Motivated, Independent "Cow" Employees

By Donna M. Amaral-Phillips

Much has been written and discussed regarding the keys to transitioning dairy cows from the dry lot to the milking herd. Scientists, dairy farmers, and allied industry personnel alike agree that this time frame is critical in determining the success or failures seen during the next lactation. Gone are the days where "she is placed in the back lot" and managed and fed as cows were in years' past. Diets, feeding management, and housing have changed to reflect our improved understanding of the processes that naturally occur during this timeframe and how we can help dairy cows best cope with these natural changes associated with the initiation of lactation. Some, including myself, have made the statement that the next lactation starts, not at calving or even just before calving, but as early as the later stages of the previous lactation.

Continuing these discussions along with the correct implementation of key practices on-farm for transitioning dairy cows are critical to achieving a profitable next lactation. In short, well designed and implemented transition cow programs "produce invisible milking cows". These invisible milking cows go about their "jobs", needing little supervision or special attention from their owners. They eat, rest, rebreed, and milk well without drawing special attention to themselves. To achieve a herd of mostly invisible dairy cows, scientists point to the successful implementation of protocols associated with 5 different areas. Reviewing these areas on your farm is critical to ensure that these hard working, "cow employees" can do their jobs efficiently.

#1. Cow Comfort

The guiding principles associated with cow comfort apply to not only the milking herd, but also cows housed in dry cow facilities. Dr. Jim Drackley put it best in a symposium on transition dairy cows; improving cow comfort entails not only managing the facilities themselves, but more importantly "managing cows through that facility". Management of facilities as well as cows through that facility, be it a barn or pasture lot, should strive to minimize potential stresses during all phases of the dry period, post dry off as well as pre-fresh. These stresses can be associated with overcrowding in resting or feeding areas, repeated movement of cows between groups, and/or heat or mud-related stresses. In recent years, the negative impacts of heat stress have been studied. Heat stress impacts production of the cow herself, as well as future production of her calf and future calves of the heat-stressed fetus. When feasible, dry cow barns or pens should use fans and sprinklers in operation throughout the day, when temperatures warrant, providing cooling for these cows throughout the dry period. Overcrowding can become an issue when larger numbers of cows are expected to calve within a set timeframe and housed in a facility designed for fewer cows. Dr. Nigel Cook from the University of Wisconsin – School of Veterinary Medicine noted that we should be promoting the 3 S's as they relate to managing transitioning cow facilities:

Softness- providing a comfortable place to lie down

Space—providing adequate bunk space (at least 30 inches/cow) to maximize intake

Screen- to identify cows, which are failing. Protocols utilizing technology definitely have a place in the management of transition cows. However, they cannot replace the need for a "cow person" to walk around, observe cows, and implement protocols. This serves as a reminder that people with good cow sense and who pay attention to details are invaluable in avoiding potential disasters.

#2. Body Condition at Calving

The current recommendation is to calve cows at a body condition score of 3.0, thinner than the previous recommendation of 3.5. Higher body conditioned cows have more difficulty transitioning back into the milking herd. Overconditioned cows often are associated with a higher incidence of metabolic diseases and lose more condition after calving. We now have data showing that not all cows lose body condition during the first 30 days after calving. In a study in 2 Wisconsin herds representing 1,887 cows, 42% of the cows lost body condition, 36% maintained body condition, and 22% gained body condition. Energy corrected milk the first 3 weeks after calving was not different between the 3 groups of cows. However, the number of pregnancies per AI at 60 days after breeding was higher in the group of cows that either maintained or gained condition. Cows that maintain or gain body condition after calving have greater conception rates, less pregnancy losses, and were healthier than cows who lost body condition within the first month after calving. Cows with longer calving intervals the previous lactation, i.e. breeding issues, carried more body condition at dry off and at calving and lost body condition during the first 30 days after calving. Thus, pointing to the importance of getting cows pregnant in a timely manner (researchers in Wisconsin suggest targeting cows being pregnant by 130 DIM) and feeding late lactation cows such that they do not gain too much body condition prior to dry off.

#3. Do Not Overfeed Energy to Dry Cows

Far-off dry cows overfed energy have more problems transitioning back into the milking herd after calving, eat less during the pre-fresh and fresh period, and have increased number of days to pregnancy. The current recommendations are to balance the energy density of far-off dry cow diets at 0.60 to 0.62 Mcal NEL/lb DM. To achieve this energy density, far-off dry cows must be fed a limited amount of corn silage (often less than 20-25 lbs as fed) along with higher NDF forages, such

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as straw or more mature forage. These diets still need to contain adequate amounts of metabolizable protein and minerals and vitamins. With these diets, feeding behavior of cows needs to be observed to ensure cows are not excessively sorting their TMR. Diets for close-up dry cows generally are intermediate in energy density between those for far-off dry cows and fresh cows. In close-up dry cow diets, the same amount (concentration adjusted for difference in intakes) of NDF should be fed as will be fed in the fresh cow diets and vice versa.

#4. Routinely Use Anionic Salts in Pre-fresh Diets

For the most part, cases of clinical milk fever, also known as hypocalcemia (low blood calcium), have been eliminated. However, controlling and minimizing the effects of subclinical milk fever still needs to be addressed on many farms. With subclinical milk fever, the classic symptoms are not seen and can only be diagnosed through timely, post-fresh blood samples analyzed for calcium concentration. Subclinical milk fever has been linked to the increased incidence of other diseases in fresh cows, decreased feed intake, and suboptimal immune function and rumen motility; all potentially contributing to suboptimum performance in early lactation. With the initiation of lactation, a drop in blood calcium is normal just after calving because large amounts of calcium are needed to support milk synthesis. Calcium must be reabsorbed from bone to meet these metabolic demands at this time. Fresh cows that can successfully *recover quickly* within a couple of days from lower blood calcium levels have fewer metabolic issues during early lactation. Feeding the correct amount of anionic salts for 21 days prior to expected calving date helps "prime" the body to be ready to more quickly reabsorb calcium from the bone needed for the onset of milk synthesis. To ensure the correct (adequate, but not excessive) amounts of anionic salts are fed, urine pH must be checked. More recently, feeding anionic salts has shown positive responses related to reproduction. More research is needed to better understand the role of anionic salts and the amount of calcium needed in these pre-fresh diets and their effects on reproduction.

#5. Dry Cow Diets and Additives Impact Performance

Besides controlling energy intake, feeding sufficient amounts of metabolizable protein (especially heifers), macro and trace minerals, and vitamins have beneficial effects post-calving. Trace minerals and vitamins need to be fed in the appropriate amounts throughout the dry period, not just pre-fresh since they need time to have their beneficial effects. Feed additives are beneficial during the pre-fresh period as well as in the post-fresh cow. We are learning that feeding ruminally protected (rumen bacteria degrade them if not protected) methionine (an amino acid) and choline are beneficial along with monensin and yeast supplements in the close-up dry cow. Scientists are learning more about how various nutrients regulate biological functions through the regulation of gene expression. In addition, certain nutrients act as nutraceuticals and positively impact performance. As such, we will continue to modify recommendations to better match the needs of these cows.

Take-away Messages

In summary, we have learned how to better manage dry cows so they are best able to enter the milking string, "do their jobs unsupervised", and become invisible cows. Now the challenge is to successfully implement these key management areas on-farm and to constantly re-evaluate their effectiveness. By practicing these concepts, one can have a herd of mostly invisible dairy cows. As we look to the next frontier in research area to put our attention on, improvements in fresh cow management will be on the horizon. However, the foundation laid down when cows are between lactations will be critical in the successes in the fresh period.

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which, in turn, continue to lead to other diseases or disorders. For example, cows with milk fever, either clinical or subclinical (where you do not see the outward signs of the disease), have an increased the incidence of dystocia or difficult birth by 4.2 times and double the likelihood she will have a retained placenta. In turn, a retained placenta increases the likelihood of metritis or uterine infections by almost 6 times. The bottom line is that we need to prevent these problems to get these cows off to a good start.

Feeding and management programs before calving can help prevent many of these diseases or disorders.

Providing plenty of bunk and resting space to minimize competition (stocking rates at 80% of capacity) can help decrease stress and increase feed intake before calving just like after calving with fresh cows. Studies have shown improving feed intake before calving can improve the transition after calving. Cows that eat better after calving generally milk better and have fewer health problems. Feeding programs before calving need to provide adequate, but not excessive amounts of fiber, and should contain the proper mineral balance to prevent milk fever. Low potassium diets have been shown to decrease the incidence of milk fever. Corn silage is a low potassium forage and thus, the reason for including corn silage in diets for cows 3 weeks before calving. Generally, the amount of grain is increased slightly to allow for adaptations to begin in the rumen (elongation of the rumen papillae to absorb volatile fatty acids) to prevent rumen acidosis after calving. Essentially, these close-up cows need a specially formulated diet containing anionic salts to help them transition into the milking herd and prevent health problems around calving.

Providing separate facilities and feeding programs for dairy cows 3 weeks before calving and special care just after calving can pay dividends by getting these cows to eat well after calving, prevent post-calving health problems and improve the likelihood they be profitable.