

# Motivating Cows: Creating the Right Environment

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## How Do You Motivate Cows?

Have you ever considered what it takes to motivate cows to do their best work? It's an odd question to ask, especially when directed at bovines. It puzzled me at first, until I simply pulled out a dictionary and looked up the definition of the word "motivate." Motivate means "to provide someone (or, in this case a cow) with a motive." A motive is "a need (in this case let's assume a behavioral need) that causes a person (or even a cow) to act (produce milk and stay healthy)." So, when we say we want to "motivate" cows, we are really just saying: let's provide the cow with an environment that satisfies her behavioral needs and allows her to be as healthy and productive as possible. Sounds easy and obvious, but as you well know, there are numerous factors that all contribute significantly to creating the proper environment that nurtures a cow's natural behavioral routines and allows her to be a highly productive animal that can still maintain her health and reproduce.

For the sake of simplicity, I want to focus on just a few major factors that we know are critical for enabling a cow to be the highly productive ruminant her genetics predict. The overall best way to motivate a cow is to allow adequate access to critical resources: feed, water, and comfortable stalls. With unhindered access to these resources, she will be able to satisfy her natural requirements for resting and eating. In addition, researchers are questioning the impact of too much standing time (in the alleys or stalls) on her health and productivity.

Major factors to consider are:

- Stocking density based on stalls and manger space
- Grouping strategies that build self-confidence, especially for first-calf heifers
- Feeding system design and management
- Time spent outside the pen and away from resources that cuts into time available for eating and resting
- Stall design and maintenance that allow 12 to 14 h/d of comfortable rest
- Flooring traction, compressibility, and hoof health

There is good, recent research in each of these areas. Let's begin with a discussion of what is natural and desirable behavior in dairy cattle – and then discuss how we motivate cows to practice these beneficial behaviors.

## The Motivational Goal: Natural Resting and Feeding Behavior

### *Cows have a strong motivation to rest*

A key concept is that feeding and resting behavior are linked in dairy cattle. Numerous studies show that management factors that interfere with resting inevitably reduce feeding behavior as well. A classic paper published by Metz (1985) evaluated what cows would do when access to either rest (stalls) or feed (manger) was prohibited. Following a period when cows could neither eat nor lie down, when access to both stalls and manger was reestablished, cows chose to rest rather than eat. Recently, Jensen et al. (2004) demonstrated



that cows have a very strong motivation to rest, and that this motivation to rest increases as the length of rest deprivation becomes greater. In fact, lying behavior (as in resting, not untruthfulness) has a high priority for cattle after relatively short periods of lying deprivation. Cows have a definite requirement for resting (lying down) that they attempt to achieve, even if it means giving up some feeding time! Batchelder (2000) observed that cows experiencing 130% stocking density spent more time standing in alleys waiting for a place to lie down than eating at the feed manger. We have observed similar responses in dairy cows in a recent study here at Miner Institute at 130% and 145% stocking density (C. Hill, 2005, unpublished).

Resting and feeding behavior are even linked during the transition period. First-calf heifers and mature cows that had greater lying and ruminating activity on days -2 and -6 prepartum also had greater feed intake and milk yield during days 1 to 14 postpartum (Daniels et al., 2003). This relationship raises an important question: how do we motivate cows to rest and ruminate during the close-up period?

Cows require 12 to 14 hours/day of rest (lying down). Benefits of resting include: potentially greater milk synthesis due to greater blood flow through the udder, greater blood flow to the uterus during late lactation, increased rumination effectiveness, less stress on the hoof and less lameness, less fatigue stress, and greater feed intake. Grant (2004) has proposed that each additional one hour of resting time translates into 2 to 3.5 more pounds of milk per cow daily.

The bottom line is that lying has a higher priority than eating and social interactions for both early and late lactation dairy cows, and that cows compensate for reduced access to resting by spending less time eating to free up time for making up lost resting activity (Munksgaard et al., 2005). Interestingly, although little time is allocated to social contact with other cows, under conditions of lim-

ited access to feed and stalls, cows still defend their ability to have some social interactions – showing that they are social creatures. Lost eating time often results in accelerated rates of feed consumption – i.e. “slug feeding.” In fact, it is common for cows to exhibit signs of acidosis as a result of slug feeding when eating or resting time is restricted by management and (or) facilities.

### ***Cows have an aggressive feeding drive***

The naturally aggressive feeding drive of lactating dairy cows was best described by Dado and Allen (1994) when they concluded that higher producing (and typically older cows) eat more feed, eat larger meals more quickly, ruminate more efficiently, and drink more water more quickly than lower producing (and typically younger cows). Some competition for feed is inevitable with dairy cows. Even with unlimited access to feed, cows interact in ways that give some cows an advantage over others. A study conducted in 1998 provides the best illustration of the dairy cow’s naturally aggressive feeding drive. In this study (Hansen and Pallesen, 1998) researchers measured the force applied to the feed barrier during eating. They observed that cows willingly exert greater than 500 pounds of force against the feed barrier in an attempt to reach as much feed in the bunk as possible. Pressure in excess of 225 pounds is sufficient to cause acute tissue damage – so cows will exert enough pressure to cause injury when trying to reach feed! To me, that is a very good definition of the dairy cow’s aggressive feeding drive. We need to manage the feeding area and feed delivery system so that the cow does not need to exert these levels of force against the feed barrier.

### **Stocking Density, Cow Behavior, and Productivity**

Research published during the past year illustrates the importance of creating the right environment for the transition cows in order to motivate them to be productive and healthy herd members. A major factor to consider is the stocking rate of the close-up and fresh cow pens.



Researchers at the University of Wisconsin Veterinary School evaluated the effect of overcrowding on the prefresh, close-up pen. In their study, the pens contained both first-calf heifers and older cows. When stocking density was greater than 80% of stalls in the prefresh group of mixed cows and heifers, milk yield was reduced for the heifers during the first 83 days in milk following calving. In fact, for each 10% increase in prefresh stocking density above 80%, there was a 1.6-pound per day reduction in milk yield for the first-calf heifers. These data need to be compared with older research that evaluated the impact of headlock stocking density on feed intake during the close-up period. In this 1999 study in Minnesota, feed intake was markedly reduced at any manger stocking density greater than 90%. Also, remember that earlier this year I shared with you on-farm data from Idaho that showed a strong negative relationship between headlock stocking density in the close-up pen and incidence of abomasal displacements after calving. Whenever headlock stocking density was greater than 90%, then the incidence of DA's went up sharply. Clearly, the take-home message of this research is that stocking density greater than 80 to 90% in the prefresh or close-up pen will result in lost milk production and greater fresh-cow health problems.

In the fresh-cow pen, there is less research, but still an indication that stocking densities less than 100% for both stalls and manger space will result in better feed intake, milk yield, and fewer health problems. Also, keeping first-calf heifers grouped separately from older cows in both the prefresh and postfresh pens will help to ensure better health and productivity of the first-lactation animals.

For the transition period, monitoring milk yield can be a useful indicator of the overall effectiveness of the management system. Useful targets for both first-calf and mature cows for milk yield are:

- First lactation animals: target would be to observe an 8% increase in milk per day for the

first 18 days of lactation. A problem exists if there is no increase in milk or milk yield is less than 65 pounds per day at 30 days in milk.

- For second and greater lactation animals, there should be a 10% increase in milk yield per day during the first 14 days of lactation. A problem exists if there is no increase in milk yield or if milk production is less than 85 pounds per day at 30 days in milk.

The bottom line is that stocking density of the transition pens is a key part of the management strategy. We have suspected this for a long while and now we have good evidence that we lose milk and suffer more health problems when we overstock the close-up and fresh cow pens. In fact, even 100% stocking rate is too high!

For cows beyond the fresh group, there is not as much information, but the data definitely show that beyond 120% overstocking of stalls that resting behavior usually drops off substantially. No doubt, there is considerable variability among farms, but if we are stocking pens beyond 120%, then red flags need to be raised that a problem is much more likely.

#### ***Recent study at Miner Institute on stocking rate***

We have just finished a study at Miner Institute that evaluated the effect of 100, 115, 130, or 145% stocking density of stalls and manger space on production and behavior. The various stocking densities were obtained by chaining off stalls or closing headlocks. So, alley space remained constant which may have softened the effect of overstocking that we observed. Overall, we observed that lying time was reduced by 1.1 hours/day when stocking density increased from 100 to 145%. At the same time, milk yield dropped numerically from 94.6 to 91.3 pounds/day. Interestingly, this 3.3 lb/day difference in milk yield agreed well with a large data set that we had pulled together last year from behavior research here at Miner where found that each one-hour change in resting time was associated with a 3.5 pound/day change in



milk yield. Of course, it could all be coincidence, but I really believe that the relationship between resting and milk yield is real.

As stocking rate increased, standing time in the alleys increased and time spent ruminating while lying decreased. Interestingly, total feeding time was unaffected and averaged about 5 hours/day. What we couldn't measure in our study was rate of eating, and I suspect that this increased as stocking rate increased.

Things became even more interesting when we looked at the differential response of first-lactation versus older cows and lame versus sound cows. As stocking density increased, the difference in milk yield between younger and older cows grew from 6 pounds/day at 100% stocking rate up to nearly 15 pounds/day at higher stocking rates.

As stocking rate increased, the milk yield of lame cows was markedly reduced compared with sound cows. From 100% up to 130% stocking rate, the difference between sound and lame cows in milk yield increased by 26 pounds/day. At 145% stocking rate, the difference between sound and lame cows narrowed because the milk yield of sound cows suffered at this higher degree of stocking. As stocking rate increased to 145%, lying time of lame cows was reduced by one hour and ruminating time was reduced by nearly one hour as well.

With some assumptions and measures from our Institute herd, I made a rough calculation of margin per cow based on the results observed in this study. Even though they are tentative, the calculations point out an interesting trend which I believe would track well with the real-world situation. The margin per cow was similar between 100 and 115% stocking rate (actually it was very slightly greater at 115%), it dropped off substantially at 130%, and really nose-dived at 145%. Obviously, this response will differ by farm and the management practices employed. But, these data do agree extremely well with the handful of reported stud-

ies that indicate that things become interesting somewhere around 120% stocking rate.

### **Stocking Density for Heifers**

Overcrowding research in growing heifers is non-existent at this point. There is just beginning to be some good work that documents behavioral and productive responses to overcrowding during the transition period and later stages of lactation. One paper that you should read, if you haven't already, is the review published last year by the University of Wisconsin veterinary group (Cook et al., 2004) on grouping and behavioral issues associated with the transition cow and first-calf heifer.

One paper from Penn State evaluated the effect of reducing feed bunk length on growing heifer response (Longenbach et al., 1999). Based on higher growth rates and maintenance of natural feeding behaviors, they concluded:

- 15-cm feed bunk space is appropriate for heifers 4 to 8 months of age;
- 31-cm feed bunk space for heifers 11.5 to 15.5 months of age;
- 47-cm feed bunk space for heifers 17 to 21 months of age.

Reduction in feed bunk length significantly affected feeding behavior for all three age categories with increased competition for feed, less stable group social structure, and greater variation in live weight gains with greater overcrowding of the feed bunk. A key point of the study was that overcrowding the bunk did not necessarily impact overall pen growth rate, but it did affect individual animal growth rates with subordinate heifers gaining less than the more dominant heifers. In the authors words "At these (recommended) feed bunk lengths, the heifers are in a more harmonious group housing environment that allows them to achieve the body weight gains and skeletal growth necessary to achieve calving at 22 to 24 months of age."



Other than this study, I don't know of any other controlled research studies. There is some field evidence that feeding behaviors learned as a growing heifer (such as slug feeding under conditions of limited feed availability and excessive competition) may carry over into the lactation period where it could be very detrimental to her health. Solid research evidence is lacking for this idea, but it is definitely possible on some farms.

## Summary

Taking advantage of natural dairy cow behavior is critical. Eating and resting behavior comprise ~70% of the cow's day – so, if you get these right then the herd will be healthy and productive, but if you impair natural eating and resting, then the herd is destined for problems. Stocking density has been a subject of much recent research, and guidelines for the transition period and throughout lactation are becoming clearer. The bottom line is that transition cows require less than 90% stocking, and 120% stocking rate for lactating cows is a critical point where negative effects of overcrowding will begin to show up on many farms.

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