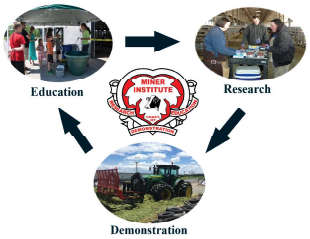
# FARM REPORT

**In This Issue:**



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# FROM THE PRESIDENT'S DESK: DON'T CROWD YOUR HEIFERS

Overcrowding research with growing heifers is still limited compared with lactating cows. Overcrowding growing heifer pens seems fairly common, and if not severe, it may have only a small or even unnoticeable impact on average growth response of a pen of heifers. But the variability among heifers within a pen may increase substantially.

Greater variability in eating time and body weight gain for heifers experiencing higher levels of competition for feed indicates that important differences exist among individuals in a pen regarding their ability to access feed and maintain dry matter intake. Dominant heifers consume excess feed while reducing the availability of feed to more subordinate heifers. Greater competition at the feed bunk also lowers rumen pH and elevates blood haptoglobin (a sign of stress), especially for the most subordinate heifers.

Greater variability in growth and body size creates a much greater management challenge. Common recommendations for feed bunk space for growing heifers is based on research from Penn State that found higher growth rates and more natural feeding behaviors with:

- 5.9 inches of bunk space for heifers 4 to 8 month of age;
- 12.2 inches of feed bunk space for heifers 11.5 to 15.5 month of age; and
- 18.5 inches of feed bunk space for heifers 17 to 21 months of age.

Reduction in feed bunk length 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 takeaway from 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.

Work from the University of Guelph found that heifers experiencing greater competition for feed had fewer meals and shorter feeding times – with the negative effect being most pronounced at times of peak feeding activity. They also had greater day-to-day variation in feeding time and meal size. On-farm studies from Colorado found that, as stocking rate went up within a pen, the measured weight gains on the heifers often declined. Although this wasn't controlled research, it's still compelling evidence of the potentially negative effects of overstocking heifer pens measured on a well-managed commercial heifer-grower operation.

We need more research on heifer management including stocking rate of the

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# RAPID EYE MOVEMENT SLEEP THROUGHOUT THE LACTATION CYCLE OF DAIRY COWS

As people, we understand how essential rest and sleep are to our physical and mental health. Surprisingly, there's little knowledge on sleep in dairy cows. However, the lack of sleep is becoming a more popular topic when discussing welfare problems in dairy herds. When we examine the daily time budgets of dairy cows, they spend 4 hours eating, 7 hours ruminating, and 10 to 12 hours lying down. Additional time is also included in cows' budget for the time they spend being milked and moving/waiting to be milked. The total amount of time spent doing each of these activities may be conflicting with the time cows should be resting and sleeping.

The first step towards better understanding sleep in dairy cows is quantifying the amount of time cows spend awake and asleep in different stages of lactation. Knowing this is essential as the sleep requirement for today's high-yielding dairy cows during their lactation and dry periods is not known. Although there is previous research on sleep in dairy cows, the methods used were invasive and most likely disruptive to cows' normal sleeping behavior. Researchers who conducted a study at the Swedish University of Agricultural Sciences (Ternman et al., 2018) developed a noninvasive method to record how rapid eye movement (REM) sleep time varies throughout the late dry period, one lactation period, and early the next dry period. REM sleep is a stage of sleep in which the eyes move rapidly from side to side. This stage is associated with dreaming and memory consolidation. Additionally, rumination time and other vigilance states when the cow may not have been ruminating (awake, drowsing, and non-rapid eye movement (NREM)) sleep were also scored. Amongst the states of interest, REM sleep is the only state in which rumination cannot occur.

Nineteen Swedish Red dairy cows around the age of 4.6 years of age were kept in individual pens with ad libitum access to feed and water. To collect the variation in the amount of time spent awake, drowsing, ruminating, and in REM or NREM sleep, electrophysiological recordings were collected on seven 24-hour sessions in weeks -2, 2, 7, 13, 22, 37, and 45 relative to calving. The recordings conducted on weeks -2 and 45 were during the dry period, while all others were during lactation. At least 36 hours before the recording began, the cows were fitted with a harness and a textile halter, and electrodes for the recordings were appropriately attached to the body.

As the first study to assess sleep distribution during the lactation cycle, this study discovered that the total duration of REM sleep varies per stage of lactation. The cows spent the least amount of time in REM sleep two weeks after calving (early lactation) and the most amount of time in REM sleep two weeks before calving (late dry period). The same tendency was also observed for the total duration of NREM sleep. In comparison to the late dry period, the total duration of drowsing was the shortest during early and post-peak lactation. There were no significant effects of the stage of lactation on the duration of time spent awake or ruminating. Although recorded during both the day and night, throughout all stages of lactation, REM sleep and rumination mostly occurred during the night. This is indicative of the role time of day and lighting play in sleep quality and rumination time.

When moving forward in studying sleep in dairy cows, we now know that the stage of lactation plays a significant role. When it pertains to this study, I believe all cows should have been kept in the same research facility throughout the duration of the study. Eight cows were recorded at an older facility (farm 1), while eleven cows were recorded at the newer facility (farm 2). Although the cows were managed similarly at both locations, the differences in barn conditions, such as noise, barn light hours, and average milking and waiting time could have affected the results. For a potential future study, it would be interesting to observe how sleep is affected for cows housed in group pens versus individual pens. Cows are naturally gregarious animals that prefer to spend their time with other cows. Knowing this, how normal sleep patterns could potentially be affected by housing style should be considered. However, putting the cows in group pens could be challenging as the electrodes are more likely to be tampered with by the cow or other cows. As more information is discovered, I think researchers should use their findings to establish the optimal management practices that prioritize good quality sleep for cows. This focus will address welfare concerns, which in turn could potentially increase productivity.

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# CLEARING THE AIR ABOUT CALF HOUSING CHOICES

Each farm's approach to calf housing is unique based on environmental, spatial, and management aspects. It's important to consider both the interior and exterior factors of the environment where the calf will spend the preweaning period. A shelter is more than just a shield from the elements; there's interplay between geographical climate and the microclimate created within the calf housing itself. In terms of what makes ideal calf housing, cleanliness, proper drainage, and good airflow often first come to mind. While these elements are certainly critical, temperature, particulate matter (PM), air quality, and humidity are also parameters within the environment that can have direct effects on calf health and development.

Temperature and humidity of the housing environment can be affected by factors such as stocking density, drainage, and ventilation. The thermoneutral zone of calves (the range where no energy is required to maintain core body temperature) is typically between 15-25°C (59-77°F) during the first month of life, and 8-26°C (46-80°F) from one month to weaning. Higher temperatures within the calf environment can not only increase the temperature-humidity index (THI), resulting in heat-stressed calves, it can also encourage wet bedding fermentation and production of ammonia from urine. Humidity is also maintained through proper drainage and ventilation; if these are compromised, generation of aerosols can occur, which can propagate the spread of airborne pathogens between animals. While ventilation is important, so is limiting drafts at the calf level to avoid development of respiratory disease. Feed, bedding, and the calves themselves release PM into the air, which can affect both calf and human respiratory status. With the knowledge of how these internal environmental parameters can affect health and growth, does housing type have any influence on quality of living conditions?

Researchers in the United Kingdom compared three types of calf housing: shed (or barn), hutches, or polytunnel (similar to a hoop barn) to determine how much the internal environment was affected by each type. The study was conducted in both winter and summer months. Of 10 farms evaluated, 5 group-housed calves in a shed, 4 pair or group-housed calves in hutches, and one farm group-housed calves in a polytunnel. All farms used straw bedding, and pen area per calf exceeded the minimum UK recommendation of 1.5 $m^2$/calf (approximately 16 sq ft). Three of the sheds were mechanically ventilated, and all but two farms provided artificial lighting. The maximum number of calves housed in one pen was 11. A temperature and relative humidity data logger was placed in the center of each single pen or hutch, and an additional logger was placed outside in the shade in a representative location to collect environmental temperature and humidity readings. Light, ammonia, air speed, PM, and airborne bacteria levels were also measured.

In the summer months the sheds remained cooler than both hutches and the polytunnel, with a maximum internal temperature of 31°C (88°F) recorded. For this study, a THI threshold of 72 was used to indicate point of heat stress. Mean summer THI in all types of housing was greater than in the external environment, with the polytunnel exhibiting the greatest mean THI of 64.3 (range 48.1-84.6) followed by hutches with a mean of 62.4 (range 40.7-82.5). Humidity was lowest in the polytunnel compared to sheds and hutches; hutches recorded a maximum humidity of 99.5% in the winter months, resulting in condensation on the walls and the calf's hair coat. This makes it difficult for the calf to maintain body heat, because heat is removed by evaporation as the calf's coat dries. Even though hutches provided the most protection from drafts, calves in hutches spent 85.7% of the winter period in cold stress compared to those in sheds (74.7%) and the polytunnel (62.3%). The highest levels of PM (0.97 ± 3.75 mg/$m^3$) and airborne bacteria (8,017 ± 2,141 cfu/$m^3$) were observed in sheds, followed by hutches (0.37 ± 0.44 mg/$m^3$ and 6,870 ± 2,084 cfu/$m^3$, respectively), and there was a positive correlation with season.

While there are advantages and disadvantages to each type of housing, and no one type of housing proves superior to another for overall internal conditions, the common factor to maintaining a quality living situation for calves still lies in management. With each approach, designing and situating calf housing to allow for optimal ventilation, drainage, humidity, and airflow can help counteract any potential structural compromise. Understanding how housing choice may influence the calf's living conditions can allow for better management decisions to be made, as well as suggest areas of focus for housing improvement.

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# DIP, STRIP, WIPE – KEYS TO EFFICIENT MILK HARVEST

Dip, strip, and wipe. Those are the three things that milkers do to every single cow that walks into the parlor before the milking machine is attached. And those three somewhat simple tasks are incredibly important when it comes to efficiently harvesting milk.

I recently attended the Western Dairy Management Conference where I listened to Dr. Paul Virkler from Cornell University speak about factors that influence milk flow. The goal when cows enter the parlor is to harvest milk quickly and calmly from a cow with a clean, dry, and well-stimulated udder. To do this, pre-milking udder preparation includes dipping the teat with a disinfectant and then stimulating the teats with a tactile stimulus, like stripping. Udder stimulation is so important because it is responsible and necessary for 80% of the milk yield. Just prior to milking, milk is present in two major areas in the udder: the cisternal and alveolar fractions. The cisternal fraction is responsible for about 20% of milk yield and doesn't require stimulation to be let down, rather it's removed by simply opening the teat canal. When a cow is leaking milk, she's leaking milk from the cisternal fraction. The alveolar fraction on the other hand isn't released until the teat is stimulated causing a release of oxytocin that will make its way to the udder and cause a muscle contraction that releases milk. The alveolar fraction is responsible for 80% of milk yield, hence why tactile stimulation of teats is such an important part of the milking procedure. A sufficient pre-milking udder preparation routine includes dipping the teat with a disinfectant like iodine, physically stimulating the teats by stripping out streams of milk, wiping the disinfectant dip off, and then placing the machine on the cow. Not only is each step of the pre-milking procedure important, but the timing of and between each step is important for milk letdown. From the time of first stimulation (dipping or stripping) there must be a lag time of 90 to 180 seconds before the machine is attached. This lag time is necessary to allow time for oxytocin released from the brain to travel to the udder after the teat is first stimulated.

A good indicator of a proper milking routine is "two-minute milk", which is defined as the amount of milk harvested in the first two minutes after attachment of the milking machine. According to Dr. Virkler, for a farm that milks 3x/day, a good goal is to harvest >15 lbs. in the first two minutes and for a farm that milks 2x/day the goal is to harvest >18 lbs. in the first two minutes. When a machine is placed on the udder too soon following initial stimulation, two-minute milk is normally decreased. In addition, flow rate during that first two minutes will not be consistent and may result in bimodal milk let down. Insufficient udder preparation can increase the time an individual cow has low flow rate, which is defined as seconds spent below 2.2 lbs. per minute. Bimodal milk letdown occurs when there is delayed milk ejection at the beginning of the milking. In other words, once the machine is put on the cow milk flows from the cisternal fraction, but because the machine was put on too early and oxytocin has not yet reached the udder, there is a delay of letdown from the alveolar fraction. Dr. Ron Erskine et al. published an article in the Journal of Dairy Science where they estimated that 46% of the cows had delayed milk ejection and 98% of those cows with delayed ejection had bimodal flow. Dr. Erskine mentioned that their study did have a higher occurrence of delayed milk ejection compared to other studies conducted in Michigan and Northern Italy that estimated that 25 and 35% of cows had delayed ejection respectively. Dr. Erskine and the other researchers mentioned that the reason they thought their study had a higher occurrence of delayed milk ejection was due to the milking protocols. To explain, the total stimulation time for cows in that study was averaging 10 seconds, while other studies have observed that at least 90 seconds of stimulation is needed for udder with small amounts of milk, while 20 seconds is needed for well-filled udders. Therefore, cows on the study were not receiving proper stimulation.

At the Western Dairy Management Conference Dr. Virkler indicated that every minute delay in milk ejection can result in 7 lbs. of milk left in the cow. When comparing a cow with normal milk ejection and flow to a cow that has delayed ejection and bimodal flow, it will take longer for the cow with delayed ejection to produce or let down the same amount of milk as the cow with normal letdown. This can create poor milking efficiency, and if this is occurring in a significant portion of your cows the longer milkings are going to start adding up. Dr. Virkler discussed how improper letdown and flow can affect vacuum pressure of the machine and placement of the teat barrel. To explain, when milk flow is low or absent, for example when a cow has bimodal flow, vacuum pressure tends to be higher than if flow was normal. The longer that high vacuum pressure is experienced due to poor letdown, the more likely it is for the liner to creep up towards the base of the teat and have a tighter seal near the annular fold, which in turn restricts milk

See **MILK**, page 7

# CORN ROOTWORM CONTROL IN 2023

Some of the following information was gleaned from a webinar, "Corn Rootworm Management: Insecticide and Plant Trait Use/Resistance Considerations in the Transgenic Era" by Dr. Lance Meinke from the University of Nebraska. Allen Wilder's excellent article on corn insect control in last month's *Farm Report* focused on Bt traits while this article mentions several other prevention/control options.

The webinar focused on the Western corn rootworm, the predominant rootworm species in the Corn Belt, and which has become the most common rootworm species in much of NY State. However, the Northern corn rootworm may still be more common in Northern NY and New England. This is an important difference since the Western species is much more damaging, sort of the Northern corn rootworm's big bad brother.

There are four ways to control corn rootworms: Crop rotation, Bt rootworm traits, seed pretreatments and soil insecticides. The surest means of control is crop rotation since one year of an alternative crop eliminates residual rootworm populations. Soybeans are the most common crop option in the Corn Belt, but one or more years of a small grain or hay crop will have a similar beneficial effect. Bt rootworm traits have been marketed for about 20 years, but rootworms have developed resistance to one or more of the four Bt proteins that provide protection. For this reason entomologists recommend "pyramids" of two or more Bt proteins, which are sold by various trade names.

The higher rates of seed pretreatments (Poncho, Cruiser, VOTIVO) work well unless rootworm pressure is very high, and may be less effective with the larger, more voracious Western corn rootworm. That's why farmer experience in our region, where Northern corn rootworms are more often the problem, has been more positive than in the Corn Belt. Using untraited corn hybrids plus a seed pretreatment in second (and perhaps third) year corn may be a good option from both a cost and convenience basis. After the third year of continuous corn, if corn rootworm populations have become high enough to warrant additional control measures, the options are a Bt-rootworm pyramid or a soil insecticide.

Note the underlined "or" in the previous sentence. That's because Corn Belt research found no yield advantage from using a hybrid with a Bt pyramid and also a soil insecticide—in this case, Aztec. Of the two, the Bt pyramid resulted in higher yield. Farmers with soil insecticide boxes on their corn planter may want to use a granular insecticide either in-furrow or as a T-band. There's never been an incidence of corn rootworms developing resistance to soil insecticides. That's because the insecticide only kills rootworm larvae near where it's applied: Rootworm larvae feeding on corn roots near the middle of the corn row aren't killed by the insecticide so they complete their normal life cycle.

When I was managing the crop operation at Miner Institute and we were moving up from a 4-row to a 6-row corn planter I decided that since using Bt hybrids would solve all our corn rootworm problems we'd save money and buy a corn planter without granular insecticide boxes. Soon after that we started seeing reports of Bt-resistant rootworms. Hmm…maybe that wasn't one of my better decisions. Nor does the Institute's current—and larger—corn planter have insecticide boxes, so if rootworms develop resistance to the Bt pyramids and seed corn treatments are banned (as has been threatened) I'm not sure what will be Plan B. Or C…

Finally, as Allen noted last month, there's been progress in a commercially-viable system of corn rootworm control through the field application of beneficial nematodes. These bio-control efforts, led by entomologist Elson Shields (who recently retired from Cornell University and moved to Colorado), initially were aimed at controlling the Alfalfa Snout Beetle but are now being adapted for rootworm control. It appears that about 10,000 acres of corn in NY will be nematode-treated this year, with thousands more acres of corn in the Midwest treated as well. This is in addition to nematode treatment of about 40,000 acres of N.Y. alfalfa in the areas where snout beetles are a problem.

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## 2023 Dairy Nutrition and Management Shortcourse

## • June 5 - 8, 2023

## Miner Institute Chazy, NY

This course is limited to 75 participants and will fill quickly!
Pre-registration online is required to reserve a spot in the course.
For more information and to register, visit https://cals.cornell.edu/animal-science/events/dairy-nutrition-shortcourse

# WHAT'S HAPPENING ON THE FARM?

With spring on the way, we are seeing a little bit of temperature fluctuations which has led to some respiratory issues in our animals. With the up-and-down weather that we had throughout February, we saw quite a lot of pneumonia in our cows, especially our 1st lactation animals. We saw a lot of coughing and many runny noses, along with a sharp decrease in milk production from the sick animals. Within a few days of treatment the cows improved and their milk production increased. However, we are past that now and the cows are doing much better. We had some pneumonia in the new transition heifer barn. Overall, the calves are doing quite well in the new barn, as they have adjusted to the new facility.

We have been working with our hoof trimmer these past few months to catch up on trimming, and finally, by mid-March, we were all caught up. Ideally, the cows are trimmed mid-lactation and again at dry-off.

Our crop crew is getting all the equipment ready for planting this spring. They are keeping busy doing regular maintenance and repairs on some of the equipment. We are hoping for a great crop year.

We hit a bit of a lull in calving, however we are starting to pick back up. Our cows have been calving in very healthy which we are very thankful for, with only a few issues in the transition period,. After a cow calves, she's kept in our fresh cow pen for 10-14 days, and if she has no issues she moves to one of our high cow diet pens. If she has issues in the transition period, she is treated and taken care of accordingly.

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# HEIFERS, Continued from Page 1

bunk, stall, or pen. Even though we need to learn more, the best advice is that you are likely sacrificing some aspect of heifer performance or health if you manage heifer pens significantly above 100% stocking rate of headlocks.

In addition, it's reasonable to predict that heifers require adequate access to stalls or other resting space and substantially overstocking the resting area could also impair some aspect of heifer performance. The bottom line is that heifers require adequate access to feed, water, and stalls. So, the management system on a dairy farm must ensure adequate accessibility regardless of stocking rate.

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# AGE VS. WISDOM *Editorial comment*

As the insurance company ad claims, "We know a lot of stuff because we've seen a lot of stuff." I thought I knew a lot right after graduating from ag college since I'd driven a tractor, milked a cow, handled hay and worked two summers as an Assistant County Extension Agent. Then I took a job as an Extension Agricultural Agent and learned a lot more, a fair amount by trial and error. As Will Rogers said, "Ignorance lies not in the things you don't know, but in the things you know that ain't so." I'm now 80 (how did that happen?) so over these many years I've certainly seen a lot of stuff, though while age should bring wisdom sometime age comes alone…

Things changed a lot when I started managing the Miner Institute crop operation beginning in the summer of 1979. For the first time I had to start living with the results of my crop recommendations, and since I was also signing crop input invoices I started realizing what some of this stuff cost. My experiences in day-to-day management of a large crop operation changed some of the recommendations I made to farmers. This is what makes the people who work at Miner Institute so valuable to their clientele, which includes farmers, agribusiness professionals, college students and ag educators: They work on a moderately large dairy farm which includes a crop enterprise managed to meet the forage needs of the herd. The herd is continually involved in a variety of "farmer friendly", practical research projects but still is one of the top-producing herds in the nation.

*— E.T.*

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# MILK, Continued from Page 4

flow. This high vacuum pressure can also influence teat ends and potentially leave cows with firmer teats that take longer to close following milking and increase the risk of environmental mastitis.

Farms can utilize parlor reports to monitor efficiency of their milking routine. For example, at Miner Institute for each milking our Boumatic parlor generates a milking report that includes milk in the first two minutes, seconds in low flow, and flow rates throughout the first minute of milking, and each of these are broken down by pen. To generate this report, in Dairy Comp 305 we type PARLOR\WM1 into the command line (where 1 corresponds to the milking shift, so to get the report for the second milking shift the command would be PARLOR\WM2). Using these reports, our management team can see variations between pens and milking shifts to pinpoint potential problems. Other herd management systems and parlors, that I am not as familiar with, should be able to generate a similar report, therefore I would highly recommend reaching out to a representative if you aren't familiar with how to generate such a report.

Overall, proper udder preparation before milking is extremely important, and most farmers do know that. It's important that those that perform those tasks day to day really understand what they are doing, and what can result when it is not done right. The goal is to have cows calmly come into the parlor and be milked to maximize production and efficiency. So once again, dip, strip, and wipe are the three tasks that can result in either milk being left in the cow, or more milk going in the tank.

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## Is there something you'd like to know more about?

**Email article suggestions to dutil@whminer.com**

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## Closing Comment

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