

# FARM REPORT



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## FROM THE PRESIDENT'S DESK: TIME TO THINK HEAT STRESS AGAIN

It's only March, but it's still not too early to think about the heat stress abatement strategy for your farm in 2017. I try to write a reminder article every spring in the Farm Report and sometimes feel like a broken record, but the accumulating research proves the wisdom of effectively cooling your cows, even in northern regions of the U.S. The economic impact of heat stress is severe: unabated heat stress reduces feed intake by up to 35% or more. Even on well-managed dairies, heat stress can easily reduce intake by 10 to 15% and milk yield by 20% or more.

Foremost among the many important effects of heat stress in dairy cattle is the increase in core body temperature that leads to prolonged standing in an effort to cool off. Accumulating research indicates that high-producing dairy cows become heat stressed at a temperature-humidity index (THI) of only 68. This heightened sensitivity to heat stress is due to greater metabolic heat output associated with higher milk production. Wisconsin researchers observed that, as THI increased from 56 to only 74, lying time decreased by 3 hours per day while standing in the alley increased by 2 hours per day. Lameness score and claw lesions increased markedly and were associated with greater standing time, sporadic feeding, and slug feeding. To be clear,

THI of 74 is common in the Northeast and our herds will experience all of these detrimental behavioral responses.

Ordinarily, the comfort of the resting surface, or competition for the resting space, determines whether a cow will meet her resting requirement. However, during heat stress conditions core body temperature appears to control whether the cow lies down or stands up. Cornell researchers found that the cow stands up once her core body temperature reaches approximately 102.0oF, and she won't lie back down again until her body temperature falls to approximately 100.9oF. Research published last year from Arizona and Missouri confirms that cows are very unlikely to lie down when their body temperature is above about 102oF. So, if you want your cows to achieve their required resting time, cooling is a must!

And what about chewing? There is a strong biological relationship between resting and ruminating, with greater than 90% of rumination occurring while cows are recumbent under comfortable conditions. Heat stress abatement therefore boosts rumination as it enhances lying time. At Miner Institute we've

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# COWS CAN BE PICKY EATERS TOO

Do you know someone who picks and chooses what they eat on their plate? Maybe this is someone that likes to eat healthy and sorts for all the veggies, or maybe it's someone who can't stand the thought of eating something green and sorts against all the veggies. Just like people, cows can have preferences in what they choose to consume, which can sometimes lead to sorting.



We evaluated sorting in a Calan bin study at Miner

Institute. To determine the extent of sorting, if any, we took a TMR sample and then an orts sample from all cows on two days. We then used the Penn State Particle Separator (PSPS) to determine the amount of feed that was on each screen (19 mm, 8 mm, 4 mm, and pan) for both the orts and the corresponding TMR. We discovered that not all cows sorted, and cows that did so didn't consistently sort from day to day. It was interesting to find that some cows changed their behavior from day to day and possibly chose fiber vs. grain based on how they felt that day. For instance, when walking the Calan bins I noticed a cow that had eaten every last piece of long fiber she could from her TMR. This cow had also been sick four days earlier and treated for indigestion, so maybe she was sorting for the fiber because she was still in the recovery phase and the fiber helped buffer her rumen and reduce the risk of subacute ruminal acidosis (SARA). A study conducted at Pennsylvania State University found similar results when cows were allowed a choice between a long forage and slow fermentable starch diet (LC) vs. a short forage and fast fermentable starch diet (SC). Cows increased their intake of LC from 18.1% of total daily DMI to 38.3% when they were given a rumen challenge.

After shaking out nearly 150 PSPS, we next had to determine what was considered sorting. A recent review at the University of Guelph calculated sorting activity by first multiplying the DMI of the cow by the DM percentage of each fraction of the PSPS to get predicted intake of each fraction. Then actual intake of each fraction was expressed as a percentage of the predicted intake of that fraction. Values equaling 100% indicated no sorting, <100% indicated sorting against that fraction, and >100% indicated sorting for that fraction. In a perfect world every cow would be at 100% for each fraction but that's nearly impossible in the real world. For our study we looked at the number of cows that deviated  $\pm 10\%$  from 100% for each fraction. When we averaged the percent actual intake of each fraction from both days sampled for each cow we found that 11 of 65 cows sorted for the long particles (19 mm screen) and 5 cows sorted against the long particles. We saw the most sorting with this fraction, which makes sense since this was the smallest fraction (approximately 5.5% of the diet) so any variation would have a greater impact. In comparison, the bottom pan (approximately 36.0% of the diet) had 2 cows sorting against the long particles and 3 cows sorting for

the long particles. We also averaged the percent actual intake of each fraction of all cows from all days and found 104% actual intake for the 19 mm screen, 99% for the 8 mm screen, 100% for the 4 mm screen, and 100% for the pan, so overall cows were sorting for the long particles but not to an extent that we would be highly concerned.

Certain characteristics including forage inclusion rate, DM content, particle size, and number of times

feed is delivered can lead to sorting. It's important to regularly check your TMR for sorting so that you can monitor your herd's sorting rate. If your cows tend to sort on a regular basis or if your cows suddenly start to sort, you can identify potential causes of the sorting including changes you recently made that could have caused the cows to start sorting. If you're identifying TMR sorting in your herd on a pen basis, take multiple samples along the feedbunk when fresh feed is delivered as well as multiple samples when orts are collected. Then use a PSPS to evaluate sorting levels using the methods listed above.

Sorting on dairy farms can lead to big problems if the cows don't eat what you formulate for them. For example, a study conducted at the University of Guelph found that every 2% increase in selection against long particles led to nearly 2 lb/day decrease in 4% fat-corrected milk per cow. In addition to production impacts, sorting can also increase the risk of SARA. Monitoring sorting in your herd and taking necessary steps to reduce sorting can help increase production and maintain herd health.

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# 48TH ANNUAL CROP CONGRESS AT MINER INSTITUTE

This year marked the 48th annual Crop/Corn Congress meeting held at Miner Institute. We had another successful meeting that featured some of the latest crop production-related research being conducted in New York with over 70 attendees.

Dr. Elson Shields discussed issues with controlling corn rootworm with transgenic corn (Bt) in NY. As a refresher, “Bt” stands for *Bacillus thuringiensis*, a soil-dwelling bacterium. Nearly 20 years ago, genes from this bacterium were used to create transgenic corn hybrids that could systemically produce crystalline proteins that act as toxins to European corn borer, rootworms and other lepidopteron pests when ingested. While this is an advantageous way of controlling rootworms, recent data from Iowa and other locations in the Midwest show that western rootworms have developed resistance to the Bt toxin. While there are several different proteins that are used in transgenic corn hybrids (termed “events”), data indicates that the western corn rootworm is developing resistance to the most popular proteins in use. Soil insecticides can be used to help control rootworms, but insecticides are generally not as effective or as safe for the environment. Dr. Shields also provided an update on using entomopathogenic nematodes (parasitic to certain insects) to control alfalfa snout beetle. Not only can these nematodes reduce snout beetle populations, there is encouraging news

that they can also help to control corn rootworms. Dr. Shields found evidence that these same nematodes will use rootworms as hosts, thus acting as a biocontrol agent. Work is ongoing in Northern NY with funding from the NNYADP.

Mike Hunter from Jefferson County Cornell Cooperative Extension discussed controlling western bean cutworm in corn with Bt. His data indicate that Bt hybrids reduce the risk of damage from this insect, but are not foolproof. Depending on the specific Bt event and other factors such as western bean cutworm populations and corn rotation history, damage from this insect can be quite variable.

Dr. Quirine Ketterings discussed research on winter forage crop production following corn silage and brachytic brown midrib sorghum silage as an alternative to corn silage. Her research indicates that winter cereals, particularly triticale, must be planted properly and early enough in the fall to enable sufficient biomass production for an economic yield the following spring. In order to maximize yield, quality and economic return, nitrogen (N) may need to be applied in early spring. Supplemental N may not be needed if winter forages are planted on higher fertility ground with a manure history. Dr. Ketterings also showed how soil organic matter and soil phosphorus (P) levels limit yields, and the importance of harvesting at the flag leaf stage for optimum forage quality.

Her work was also supported by the NNYADP. More details on this work can be found on Dr. Kettering’s website (<http://nmsp.cals.cornell.edu>).

Laura Klaiber presented work from her M.S. Thesis (University of Vermont) related to how tile drains influence P loss in surface and subsurface tile drainage runoff. Her work showed that tile-drained plots had much lower erosion and sediment loss than undrained plots. For one large runoff event that included snow melt, tile drained plots had substantially lower losses of total and soluble reactive P (bioavailable P). Flow-weighted mean concentrations of total, soluble reactive and particulate P in tile runoff were significantly lower than concentrations in surface runoff when averaged across all runoff events. Eric Young shared data from an ongoing NRCS-funded edge-of-field water quality monitoring study where nutrients in both surface runoff and tile drainage flows are being measured. Results over the past year of monitoring indicated that  $\geq 90\%$  of both soluble and total P losses were due to surface runoff, whereas the majority of N losses were accounted for tile drain flow.

For more information on any of these topics contact the authors directly or Eric Young. Slides from each presenter are available at Miner Institute's website <http://www.whminer.org/outreach/>.

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# TIPS FOR FEEDING COWS WITH MILKING ROBOTS

Automatic milking systems (AMS) also known as milking robots are becoming more common in the US and Canada. Growth in AMS is driven by improved performance of newer generation AMS, a better understanding of facility design and management that considers cow behavior, and less labor needed for milking.

New opportunities and challenges with AMS are present for producers regardless whether they transitioned from a tiestall with a pipeline milking system or a group housed facility with a conventional milking system. Last year a Wisconsin led research team evaluated 635 North American farms with AMS to determine factors related to increased daily milk production either on a cow or robot basis. They found that free-flow traffic that allows each cow to decide when to be milked and move freely among the AMS, stalls, and feeding area resulted in greater milk production than forced traffic (e.g. AMS before the feeding area). Most likely the forced traffic system decreases each cow's feed intake, through negative effects on number of visits to the feedbunk and time spent eating. This altered feeding behavior can potentially increase the risk of rumen acidosis (SARA). In addition, too much concentrate (grain) provided in the AMS was related to lower milk production. A recent survey by Canadian researchers found that 90% of AMS producers are using a free-flow traffic system to maximize performance.

The feeding system is often changed when a producer transitions to an AMS. There is a learning curve for producers that fed TMR before an AMS as well as producers that component fed cows. Typically, cows in herds with an AMS receive a portion of their daily ration in the form of concentrate while milking. The concentrate is used as a way to attract cows to the AMS. The remaining ration (partial mixed ration; PMR) is supplied in the feed bunk.

A recent *Journal of Dairy Science* review by researchers from Spain and Wisconsin suggested that the ideal AMS situation is one that allows free traffic and nutritional approaches that reduce variation in the number of daily visits to the AMS. They pointed out that cows need to eat and be individually milked, which is an unnatural behavior since cows are social and like doing similar activities as the rest of the herd. Therefore, consideration should be given to feeding patterns of cows when designing the nutritional program for an AMS. Delivering a PMR twice daily vs. once daily seems to be a strong stimulus for a cow to visit an AMS.

The ideal quantity of concentrate to provide in an AMS is evolving. Researchers from Spain and Wisconsin indicated that a cow will not consume all the concentrate when it exceeds ~8.8 lb (4 kg) per day. Higher amounts will

increase the risk of SARA, decrease intake of PMR, as well as contribute to inconsistent milking frequency. Usually, a cow visits an AMS fewer than 3 times per day. Therefore, each cow has a limited number of times to eat the concentrate and a limited time during each visit (~7 minutes). In addition, a cow can only eat ~0.55 to 0.88 lb of pelleted concentrate per minute so concentrate should be limited to 2.2 to 3.3 lb per visit. A pelleted concentrate is preferred over a mash or meal form. In some situations, addition of flavoring to the concentrate has increased visits to an AMS. The researchers conclude that approaches that depend on greater than 17.6 lb of concentrate intake per day will fail. Approaches that keep the concentrate allowance less than 8.8 lb per day will likely benefit from precision feeding approaches.

Here are the key points to consider when feeding cows in herds with AMS:

- Provide a free-flow traffic system
- Consider the feeding patterns of cows and feed a PMR more than once per day
- Restrict pelleted concentrate allowance in the AMS to less than 6.6 to 8.8 lb/d

— Heather Dann  
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\* References available upon request

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## 2017 DAIRY NUTRITION SHORTCOURSE

The Dairy Nutrition Shortcourse will be conducted at Miner Institute in Chazy, NY on June 5 - 8. This shortcourse is designed primarily for early career nutritionists and allied industry professionals seeking a more comprehensive foundation in the principles of dairy cattle nutrition and their application within dairy herd management. The course blends classroom-based instruction with practical skill development along with networking opportunities for attendees with each other and with course faculty in informal settings. Course registration will open in **April 2017**.

### General and Registration Questions:

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# EARLY SPRING THOUGHTS

Though it may not feel like it, the first day of spring is March 20. According to the poet Alfred Tennyson, “In the Spring a young man's fancy lightly turns to thoughts of love”. A nice thought, but a farmer's fancy might be better spent in looking at his current forage and soil analyses to see if they may suggest some needed changes. Here are several to consider:

- By now the starch digestibility of your corn silage undergone most of the changes that will occur and is a much different feed than it was a month after ensiling. The changes have mostly been positive and could result in your being able to feed less grain. Your dairy nutrition consultant is probably aware of this, but it doesn't hurt to check.
- If the dry matter content of your corn silage less than 30% and it's not due to unusual events, then you should plan on doing whatever changes are needed for your corn to be harvested at no less than 32% DM. (Albert Einstein said that insanity is doing the same thing over and over and expecting a different result.) These changes

could include earlier planting, later harvest, or planting slightly shorter-season hybrids. Of these, guess which is easiest to do?

- The ideal NDF of hay silage varies depending on the relative amounts of alfalfa and grass in the field, but ADF should be in the 28-32% range. Less than 28% and you probably sacrificed some yield by cutting too early, over 32% and you harvested too late. You won't always hit the ideal range, but the ADF of most hay silage should be close to 30%.
- Fertilizer prices will remain low this spring compared to recent years so there's no reason to delay fertilizer applications. Potash prices have strengthened a bit but 0-0-60 is still a good buy. Use manure and fertilizer to maintain soil test K levels in the medium-high to high range — this is especially important for anyone seeding alfalfa-grass mixtures. Seeding alfalfa-grass into a low fertility field is a recipe for failure.

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## A MODEST SUGGESTION

In a typical year I take a dozen or more flights so have a chance to observe airborne behavior by fellow travelers. Before takeoff we're instructed by the flight attendant to turn off our cell phones or to put them into something called “Airplane mode”. This allows the users of cell and smart phones to check the time but temporarily disables wifi and therefore the user's connection to the outside world. What's amusing is what happens when the plane touches down and users are once again allowed full use of their “devices”: Dozens of small screens light up as they reconnect to their beloved wifi. This is particularly common with “Millennials”, generally defined as those born in the 1980s and 90s. This generation came of age after cell phones were in almost universal use,

and can't imagine life without them. I've seen Millennials so transfixed by their smart phones that they walk into doors, light poles, other people and, in one case, a pond.

Most farms and businesses large enough to have employees have regular staff meetings — and if they don't, they should. A suggestion: The next time you schedule a staff meeting, announce in advance that smart phones will *not* be allowed. People arriving early, instead of interacting with other people will peck away at their smart phones, staring hypnotically at the little screen. Some of the most valuable interactions at staff meetings can be during the 5 or 10 minutes *before* the meeting starts. But not if people are staring at their smart

phones, wondering if during the past two minutes someone has sent them a critically important email or text message. And how often have we seen someone “sneaking a peek” during a meeting? It can wait!

*Warning:* This idea may not go down well with some staff members (especially but not exclusively Millennials), and you should *not* offer as an alternative that they turn their phones off or switch to Airplane mode because someone may be tempted to cheat. During the meeting you may notice signs of “wifi withdrawal” including not knowing quite what to do with their now-empty hands and idle thumbs, but this too shall pass.

— E.T.

## CLARIFICATION

In last month's *Farm Report* article titled “Clean Air and The EPA” it stated that each year air pollution causes the deaths of 1.5 million people in China. Two sentences later a figure of 2 million deaths was cited. The difference: Careless editing by Ev, and the fact that fatality estimates differ widely, from less than 1 million to over 2 million, in part because some estimates only include deaths from outdoor air pollution while others also include the effects of indoor pollution.

# WHAT'S HAPPENING ON THE FARM: TIME TO MOVE ON

As I begin to pack up my boxes and start to wrap up my time at Miner Institute I'm amazed at how quickly this past year flew past. I fell into this internship sort of by chance. I was visiting Miner Institute last winter while traveling through the area and happened to run into Steve in the barn. He mentioned that they were looking for a new intern and I brushed it off. I knew that I had an interest in cow health but wasn't sure which specific direction to turn next. A few weeks went by and I finally emailed Steve, hoping that some experience with herdsman work would open up more doors for me.

I have learned so much this past year, far too much to list here. I've probably learned as much about myself and how I work best as I have about herd management. I think the best part of this internship is the abundance of avenues you are able to take if you are curious about something. You can truly alter the internship to fit your own specific interests. I got out of it what I put into it. There is ample opportunity to participate in seminars, clinics and anything else to further your knowledge in a subject. And always people willing to sit down and talk you through something if you feel that any of it is over your head.

I am sad to leave the Miner Institute family but am excited to put my skills to good use at my new job. I will miss sharing my love for donuts and finishing lines from Seinfeld with Anna. And the way Steve and Ralph bicker like an old married couple about who made the coffee in the morning. I've gained a sense of confidence to handle situations that are put in front of me. I am able to take charge of an issue and problem-solve. I've taken so much joy in watching the health of an animal improve and know that I had something to do with it. It has been an unforgettable year working with amazing people. Thank you Miner Institute!

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## EMPLOYEE TRAINING VERSUS TEACHING AND COACHING: THE VALUE OF ASSESSMENT AND RE-ASSESSMENT

Wonderful new employee; energetic, motivated, bright and inquisitive, not afraid to speak up. What could go wrong? Well, nothing too serious, thankfully, but I thought I would use this occasion to remind me as the teacher/employer to never assume and always assess and reassess.

As a lacrosse coach my goal is to teach skills, enabling the young athlete to become an empowered player. Enjoyment of the game is highly correlated to one's skill level. The sooner they learn to pass and catch, the greater their enjoyment of the game, the greater their success. My personal goal as coach is to help players become the best players they can and want to be, with the goal of developing *them*, not to benefit me. As a coach, day after day of practice is spent teaching skills, assessing and reassessing; practice,

practice, practice. Which is not the same as developing employees...or is it?

As a teacher of dairy students, our goal is to educate and empower young minds with the ability to make intelligent choices in animal and farm management. Our goal is to teach the skills of critical thinking, reviewing data, facts and gauging which will work for them, to determine which are credible and which are dubious or simply testimonial, to be objective.

As an employer the difference from teacher and coach is that YOU are vested in the employees' ability to do the job correctly. As teacher and coach, sure we want them to do well, get high grades and win some games, but it really does not affect my success. If an employee does not perform well, it

does hit your business interests.

I was so excited that my new employee appeared to fully understand what needed to be done. I was so happy to be able to go on to the tasks I had to get done, that I didn't go back and assess the employee's work. MY BAD. I assumed the model employee did not need to be assessed. Like coaching, check in and review, first daily and then weekly then periodically. As the teacher/ employer I fell into the trap of focusing on my to do list rather than keeping employee assessment on my to do list. Without hovering or hounding, be sure to follow up and make sure protocols are being followed. Assess and reassess your employees work before their failures truly become your losses.

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# DOES PARTICLE SIZE AND SOURCE OF UNDIGESTED NDF MATTER?

Fiber in the diet for cattle is a necessary component for rumen health and has been measured using methods such as crude fiber, neutral detergent fiber (NDF), and acid detergent fiber (ADF). One measure of fiber associated with rumen fill and rumination is undigested neutral detergent fiber at 240 hours (uNDF240om). There is limited information on the amount and source of uNDF240om in lactating dairy diets and its effect on performance and chewing behaviors. Last fall at Miner Institute we tried to answer those questions. We formulated three brown midrib (BMR) corn silage-based diets for similar predicted uNDF240om intake (5.11 lb/day and 0.33 % of BW) with varying lengths of straw and source of uNDF240om. The first two diets were identical except the length of the straw (0.82 vs 0.66 physical effectiveness factor; pef) and will be referred to as the long straw and short straw diets (Table 1). The third diet was comprised primarily of BMR corn silage with 1.2 lbs of long straw and will be referred to as the BMR diet (Table 1).

We used 56 Holstein cows averaging 102 (SD = 28) DIM and measured feed intake, milk yield and composition, and body weight weekly for 2-wk covariate and 4-wk treatment periods. Chewing behaviors were also measured the last week of the covariate and treatment periods with a 10 minute scan for 72 hours. Cows fed the long straw diet consumed more dry matter than those on the BMR diet, but DMI as percent of body weight was not different. The milk yield and solids corrected milk did not differ between treatments.

Table 1. Ingredient composition (% of DM) and percentage of uNDF240om of treatment diets.

Item	Diets		
	Long straw	Short straw	BMR
BMR corn silage	42	42	60
Concentrate mix	51	51	38
Long straw	7		2
Short straw		7	
BMR corn silage, % of uNDF240om	43.7	43.6	65.2
Concentrate mix, % of uNDF240om	24.3	24.2	24.9
Long straw, % of uNDF240om	32.0		9.9
Short straw, % of uNDF240om		32.2	



Cows fed the BMR and long straw diets had higher milk de novo fatty acids (g/100g FA) than the cows fed the short straw diet. The milk preformed fatty acids were higher in the cows fed the short straw than the cows fed the BMR diet. Milk de novo fatty acids are made from the end products of rumen fermentation in the cow's udder and preformed fatty acids come from fat in the feed and body fat mobilization (Heather Dann and Rick Grant, January Farm Report). Even though feed intake and milk yield were not different, the milk fatty acid profile suggests the cows fed the long straw and the BMR diets were able to use more end products from the rumen than fat from the feed and body fat mobilization compared to cows fed the short straw diet.

The cows fed the long straw and BMR diets had longer eating (233 and 233 vs 216 min/d) and rumination (504 and 516 vs 495 min/d) times than the cows fed the short straw diet. The cows fed the BMR diet had shorter meals lengths but increased meal bouts per day compared to the cows fed the long and short straw diets. As expected, the eating and rumination time would be longer for the cows fed the long straw diet, but it was interesting that the cows fed the BMR diet had similar eating and rumination times most likely due to the physical effective NDF (peNDF) of 21.9 of the diet. Cows fed the BMR diet had increased meals with shorter duration than the cows fed the long or short

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# GETTING SERIOUS ABOUT GRAIN DRILL CALIBRATION

Most forage seed doesn't represent a large percentage of crop input cost, but the advent of reduced-lignin alfalfa, some priced at \$6 per pound, should have farmers thinking more seriously about grain drill or seeder calibration. Over the years I've seen some huge mistakes made in seeding rates, including planting half as much alfalfa seed as the farmer intended. You probably have a fair idea of your drill or seeder calibration, often via the "by guess and by gosh" method: Put a known weight of seed in the seed box and then find out how many acres it does. However, you can — and should — do better. Alfalfa averages 220,000 seeds per pound, but some seed lots only have 200,000. Seed coatings also have an effect: You'd think that because of the weight of the coating, at a particular setting coated seed would result in fewer seeds per acre. However, coated seed tends to flow faster than uncoated seed, and the amount of coating on seeds varies considerably. When deciding on a seeding rate, be sure to account for the weight of the coating.

Calibration kits are available for most modern grain drills and seeders, but a quick way to determine calibration is to spread a tarp on level ground, then drive over the tarp at normal planting speed and count the seeds in several one square foot areas. For alfalfa, 75-90 seeds/sq. ft. is a seeding rate of 15-18 lbs/acre. If you have two or more varieties of alfalfa, check the rate for each since there may be significant differences. Determining the seeding rate of alfalfa-grass is somewhat trickier. My suggestion: Premix the alfalfa and grass seed and put it in the seed box, then drive over the tarp and only count the alfalfa seeds in the one foot squares. If you have 65-75 alfalfa seeds/square foot and the grass seed is included at the typical 4-5 lbs/acre, this should result in enough alfalfa seed for high yields plus enough grass seed to increase both yield and forage quality.

— E.T.

## HEAT STRESS, Continued from Page 1

observed an approximately 1 hour per day difference in rumination time for cows that were exposed to minimal heat stress abatement (fans only over the stalls) versus fans and sprinklers over the feed bunk and the free stalls.

We know that cows become heat stressed at a THI of only 68 with associated reductions in resting, rumination, feed intake, and milk production. As the cow's core body temperature rises she stands in an effort to speed cooling — and she's not likely to lie down again until her temperature is lowered. Resting is the cow's most valued behavior, and we must do an effective job of cow cooling to get her into the stall and lying down to avoid productive and health problems associated with excessive standing time. The latest research confirms that the quickest way to get a heat-stressed cow to lie down is to reduce her body temperature.

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# UNDIGESTED NDF INFLUENCE ON DRY MATTER INTAKE

There are many factors that influence a dairy cow's dry matter intake (DMI), ranging from environmental factors such as heat stress to metabolic disorders such as milk fever. This article will focus on how undigested NDF (uNDF) can influence DMI.

To begin we need to identify how the rumen can influence DMI. Gut fill is the broad term used to describe several factors. One description is "the retention and accumulation of particles in the rumen". This raises the question: What affects the retention and accumulation of particles in the rumen? Passage rate, feed particle reduction, and the digestibility of that feed all influence gut fill. Intake amounts and lactation status play a part in passage rate. The influence of feed particle reduction on DMI is simple: For a feed particle to pass through the rumen and into the rest of the GI tract it needs to be reduced in size. On average a critical size of 1.18 mm is required for a particle to pass from the rumen. This estimate was determined by using a dry vertical sieve particle separator.

When the cow consumes feed there are portions of the diet that are rapidly digested and other portions that take longer to digest in the rumen. This goes back to the concept of fast, slow, and indigestible pools of NDF. The longer the feed is retained in the rumen the more time there is for rumen microbes to degrade what is potentially digestible. The fast pool NDF is the portion of the fiber that can be broken down in 24 to 30 hours. The slow and indigestible NDF (iNDF) pools take longer to digest and are retained in the rumen for a longer period of time. This is where the influence

on DMI comes into play. Our dairy cow is only able to consume more TMR each day if there is available space, and that space is driven by digestion. For example, a lactating cow in the Miner Institute barn may be consuming 60 lbs of TMR daily. Of that 60 lbs, 30% or 18 lbs is NDF. As that 18 lbs of fiber digests, portions of it will be broken down as either fast, slow, or iNDF pool. For example, assume that 50% of the NDF consumed is in the fast pool. That means that 9 lbs of the fiber will be digested in 24 hours. The remaining 9 lbs consists of both the slow and iNDF pool. These portions will remain in the rumen longer than 24 hours. You may be asking yourself how will she consume another 18 lbs of fiber the next day if she has only digested the fast pool thus far? Keep in mind that the rumen is continually digesting nutrients, and previously consumed slow and iNDF pools will be digesting and passing from the rumen, creating room for more TMR to be consumed.

By changing the uNDF amounts of the diet we can begin to influence DMI. If we were to increase the digestibility of the diet, lowering the %uNDF, we would alter the proportion of the fast, slow and iNDF pools so that more feed would be digested in a 24-hour period. The opposite would occur if we were to decrease the digestibility of the diet. You may be thinking: Why feed any uNDF if it will influence the amount of DMI the cow can consume? The undigestible portions of the feed play a key role in maintaining a healthy rumen, something I'll discuss in a future article.

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## DIET, Continued from Page 7

straw diets. This should create a more stable rumen environment which was displayed with the milk fatty acid profiles, but need rumen parameters to verify this assumption.

These results suggest that when feeding a moderate level of uNDF<sub>240m</sub> the length of the straw is important for

rumen health. The long and short straw diets had the same uNDF<sub>240m</sub> intake (0.33 vs 0.32 % of BW) and very similar peNDF of 18.5% and 18.4%, which are well below the standard of 21% for effective fiber in the diet. So the longer straw diet created a healthier rumen environment. The source of uNDF<sub>240m</sub> does seem to

be important, but more research is needed to fully understand it. More trials are being planned and conducted at the Institute to comprehend the role of uNDF<sub>240m</sub> in lactating dairy cow diets.

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# Join us for an Ag in Society talk

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### Agriculture Myths and Facts with Dr. Joe Schwarcz

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The Agriculture in Society Speaker Series is one of our major efforts to bring science-based information to the community.



Dr. Joe Schwarcz is Director of McGill University's "Office for Science and Society." He is well known for his informative and entertaining public lectures on topics ranging from the chemistry of love to the science of aging. Professor Schwarcz has received numerous awards for teaching chemistry and for interpreting science for the public and is the only non-American ever to win the American Chemical Society's prestigious Grady-Stack Award for demystifying chemistry. He hosts "The Dr. Joe Show" on Montreal's CJAD and has appeared hundreds of times on The Discovery Channel, CTV, CBC, TV Ontario and Global Television. Dr. Schwarcz also writes a newspaper column entitled "The Right Chemistry" and has authored a number of books, "Radar, Hula Hoops and Playful Pigs," "The Genie in the Bottle," "That's The Way The Cookie Crumbles," "Dr. Joe And What You Didn't Know," "The Fly In The Ointment" "Let Them Eat Flax" "An Apple A Day," "Brain Fuel," "Science, Sense and Nonsense," "Dr. Joe's Brain Sparks," "Dr. Joe's Health Lab," "The Right Chemistry," "Is That a Fact and his latest, released in 2015 is "Monkeys, Myths and Molecules." He is also an amateur conjurer and often spices up his presentations with a little magic. Dr. Schwarcz was awarded the 2010 "Montreal Medal" which is the Canadian Chemical Institute's premier prize recognizing lifetime contributions to chemistry in Canada. In 2015 he was named winner of the Balles Prize for critical thinking by the US based Committee for Skeptical Inquiry.



Change Service Requested



Miner Institute's Mac Campbell and Laura Klaiber discuss agricultural research careers with middle school students at Peru High School recently as part of their lunchtime grill career awareness program.

## *Closing Comment*

A conclusion is the part where you got tired of thinking.

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