# FARM REPORT

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# FROM THE PRESIDENT'S DESK: THE RAT RACE IS NO PLACE FOR A DRY COW

Just like humans, it appears that cows feel the stress of a life that is unpredictable and competitive. In human terms we talk about the "rat race" and the stress-related health consequences that accompany a work environment that is too competitive, with events that are unpredictable and mostly out of our control. Tomorrow's make-or-break presentation to win over a new client? Guess what it's been moved up to 9:00 AM – today! We all can imagine the profoundly negative behavioral and physiological stress responses to news of that sort … and if we work with dairy cattle we ought to be concerned with how they respond when we place them in environments that are too competitive and where too little emphasis is placed on ensuring consistent management routines.

A recent study published in the Journal of Dairy Science led by the globally recognized research group at the University of British Columbia did just that (J. Dairy Sci. 101:9309-9320). Their study focused on the effect of feed bin stocking density, predictability of feeding time from day to day, and social stability on behavioral and health responses in transition cows during the 5 weeks leading up to calving. Considerable work over the years has shown that the chronic stress associated with unpredictable and competitive social environments leads to poor health in humans, and their question was "Does the same hold true for dry cows as they head toward calving?" Certainly the periparturient cow is under enormous metabolic stress and we know that the time right before and after calving is prime time for disease occurrence in cattle.

In this study, a baseline period five weeks prior to calving was used for comparison where cows had ample access to stalls (3 stalls per cow) and free access to feed bins (1 bin per cow). At 4 weeks before calving, cows were assigned to one of two treatments: 1) predictable and noncompetitive, or 2) unpredictable and competitive. For the first treatment, cows remained in the same pen for the entire experiment with free access to feed bins (1.5 bins per cow) and stalls (3 stalls per cow) and they were fed at the same time every day (7:00 am and 4:00 pm). In contrast, the cows forced to endure unpredictable and competitive environments had 1 feed bin per 2 cows and 1 stall per cow. So-called resident cows who were in the pen and part of the treatment competed with the experimental cows for feed and stalls. In addition, cows

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# FEEL THE BURN

Subacute ruminal acidosis (SARA) is a major challenge in dairy nutrition strategies aimed at fulfilling the energy needs of a high-producing cow. SARA is a prevalent and widespread metabolic disorder in intensive ruminant agriculture systems, including the dairy industry. It's initiated when the equilibrium of the rumen pH goes below 5.6 for more than 3 hours over the course of a day, causing the rumen to be more acidic. But what causes this to happen? How do you identify it? What are the negative effects this disorder has on the animals?

SARA is more likely when the ration contains an imbalance of starch and fiber. Increased amounts of metabolic energy are commonly provided in the cow's diet by adding rapidly fermentable carbohydrates, usually in the form of starch, to meet her high nutritional demands during lactation. This lends itself to increase the risk of SARA, by the rapid fermentation of the carbohydrates which stimulates microbial growth. With increased fermentation large amounts of volatile fatty acids are produced from the microbes. As the energy density of the diet increases, the physically effective fiber (peNDF) content decreases. On the flip side, these carbohydrate and starch sources usually replace part of the fiber sources. Physically effective fiber stimulates chewing and saliva production, which is the cow's natural way of regulating the acid base balance in the rumen. In other words, saliva helps keep the pH from dipping too low, similar to how an antacid stops your heartburn: It neutralizes it. Anything below the recommended 21-23% peNDF is accompanied by a linear drop in chewing activity, which ultimately results in a decrease in saliva secretion. More acid production and less saliva result in more frequent drops in pH; these drops in pH can cause SARA if they are frequent and last long enough.

We have an idea of some of the causes, but how do you know a cow is experiencing an acidotic challenge? Unfortunately, there are no "textbook" signs of SARA in an affected cow. Most of the signs aren't obvious while the cow is alive, including rumenitis (inflammation of the rumen wall), peritonitis (inflammation of the abdominal lining), and rumen parakeratosis (hardening of the rumen wall). These are caused by inflammation associated with SARA.

Just like with other ailments, a decrease in dry matter intake is seen during SARA. It's one of the few consistent visible signs, but a decrease doesn't necessarily mean that she's experiencing an acidotic challenge, just that she's not feeling well enough to eat. Depending on your operation, it can be difficult to notice if one particular cow is not eating like she normally would. The literature has also described alterations in fecal consistency, however they're usually fleeting and often go unnoticed. Changes in manure can include a change in color (bright and yellowish), appearance of foam or gas bubbles, abnormal amount of undigested material, or have an abnormally loose consistency. These signs are not consistently associated with SARA, therefore it becomes harder to diagnose incidence and severity. There are several diagnostic techniques that can be performed, but these are best left to your veterinarian because they tend to be more invasive and are not commonly performed in the field.

Although it's hard to identify, SARA can have significant long-term negative economic effects for the farm and health effects on dairy cattle, even on well-managed farms. Financial losses caused by this disorder result from decreased milk production and efficiency in the cow, while also increasing risk of premature culling and death loss. Furthermore, this condition affects more than 20% of dairy cows, and can cause financial losses of about $400 per cow per lactation. Additionally, SARA has been known to cause laminitis, sole ulcerations, and indirectly affect fertility.

Subacute ruminal acidosis is one of the most important metabolic diseases in the dairy industry, caused by a high amount of rapidly fermentable carbohydrates in the diet. It's difficult to identify, but the consequences can be severe. So the question now is: How do you mitigate the frequency of SARA in your operation? Look in next month's *Farm Report* for my recommendations on management strategies to alleviate the burn from SARA.

— *Katie Smith*
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# CROP CONGRESS AT MINER INSTITUTE WEDNESDAY, JAN. 30, 2019

**Joseph C. Burke Education and Research Center**
**586 Ridge Road, Chazy NY**
**10 a.m. to 3 p.m.**

Cornell Cooperative Extension
North Country Regional Ag Team

**AGENDA:**

10 - 10:45 am: *Optimizing Alfalfa Grass Mixtures,* Jerry Cherney, Cornell University

10:45 - 11:15 am: *Western Bean Cutworm - Now What?,* Mike Hunter, Cornell Cooperative Extension

11:15 am - 12:15 pm: *How Plants Talk and Why We Should Listen,* Clarence Swanton, University of Guelph

12:15 - 1 pm: Lunch, available for $5

1 - 1:45 pm: *Insect Pest Management in Field Crops*, Elson Shields, Cornell University

1:45 - 2:30 pm: *Investigating the Health Effects of Glyphosate*, Dan Wixted, Cornell University

2:30 - 3 pm: *When is it Too Late to Plant a Cover Crop?*, Kitty O'Neil, Cornell Cooperative Extension

NYS DEC Pesticide and CCA credits are pending approval.
You must arrive on time and stay for the entire program to receive these credits

Free Admission!
Crop Congress is organized in collaboration with Cornell Cooperative Extension. . Pre-registration is encouraged.
For more information contact: Wanda Emerich, 518-846-7121 x117 or Emerich@whminer.com

Miner Institute is located in Chazy, NY on Miner Farm Road, Route 191- 1 mile west of Interstate 87, exit 41. Travel time is approximately 1 hour south of Montreal, 20 minutes north of Plattsburgh, NY, 1.5 hours from Burlington, VT, or 3 hours north of Albany, NY.

# RAT RACE, Continued from Page 1

experienced a random delayed access to feed at the morning feeding of either 0, 1, 2, or 3 hours. Then, every three days cows were reassigned to a new feed bin and consequently a new cow to compete with. The delayed feed access and changes in feeding partner were alternated daily until calving. And finally, 14 days after cows started the study, these cows were moved to an entirely new pen with totally different cows to compete with!

So, how did the cows respond? Cows in both treatments ate the same amount of feed, but cows in the unpredictable environment spent less time eating and ate faster – i.e., they began to slug feed. These same cows also experienced more social turmoil and were displaced more from the feed bins. Life in an unpredictable and competitive environment resulted in higher blood non-esterified fatty acids (commonly called NEFA) which is associated with a greater risk of metabolic problems at calving. Additionally, mature cows facing unpredictable environments were more likely to develop endometritis after calving and showed definite symptoms of systemic inflammation.

Although there is still more to learn, as always, it's becoming abundantly clear that providing a consistently comfortable environment and predictable management routine improves dairy herd health. The take-home is to never undervalue the cost associated with making your cow's work place a rat race.

*— Rick Grant*
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# SPRINT FOR ENERGY: FRESH COW DIET

The transition dairy cow goes through many changes within a short time, changes that can be very stressful. After calving, the cow has large energy demands for lactation and cannot consume enough feed to meet these demands. The fresh cow diet or diet fed in early lactation needs to be fermentable without limiting intake. There are several ways to increase the amount of fermentable carbohydrates, whether increasing concentrates or digestible fiber from forage. When increasing energy with concentrates there is opportunity to provide too much energy which will lower rumen pH causing acidosis. Not all concentrates have the same fermentability which means the starch content could be similar, but one could have more available starch than the other. Whereas increasing energy from forage fiber needs to be done carefully as it can limit intake if the forage is low quality. There needs to be a balance between providing energy from concentrates and forage fiber for optimal rumen health and intake.

Starch from concentrates is a major source of energy for the cow, and will quickly degrade in the rumen. The digestibility of starch can be measured by in vitro or in situ incubation for 7 hours. Another useful metric is rumen fermentable starch (RFS) which is calculated by multiplying the starch content by the 7-hour starch digestibility. For an example, if concentrate A has a starch content of 72% and a 7-hour starch digestibility of 55% it would have a RFS of 39.6% of DM. This measure will allow for differentiation of concentrate sources on available starch for the cow. In a Journal of Dairy Science article researchers at Michigan State University investigated fresh cow diets with two levels of starch (low starch 22% of DM and high starch 28% of DM) with two different fermentabilities using either dry ground corn (DGC) or high-moisture corn (HMC). The cows fed the diets with HMC had lower dry matter intakes than the cows fed DGC diets by 1.9 pounds in the low starch diets and 8.6 pounds in the high starch diets. The cows fed the DGC produced more energy-corrected milk in the first 3 weeks of lactation than the cows fed the HMC, by 7.1 pounds in the low starch diets and 14.8 pounds in the high starch diets. This is driven by the fermentability of the HMC versus DGC with RFS being 45.4% versus 32.1% of DM, respectively. The fresh cow's rumen is still adjusting to higher energy diets and the diets with too much readily available starch can have negative effects on intake and performance.

Forage fiber can provide a large source of energy for the cow, but there has to be consideration for the fiber fractions. Neutral detergent fiber (NDF) is the main measure of fiber and quantifies total cell wall. This fraction does not explain all the differences in intake and performance. A measure of fiber digestibility is NDF digestibility at 30 hours (NDFd at 30 hours) and has been related to intake and performance. With these measures one can better evaluate the response cows will have to the forage. In a Journal of Dairy Science article, researchers at Cornell University investigated the use of brown midrib (BMR) corn silage in the close-up and fresh cow diets compared to conventional (CON) corn silage. BMR corn silage has a genetic mutation that reduces lignin concentration, increases NDFd at 30 hours, and lowers uNDF240 allowing for higher intakes and milk production. The BMR corn silage in this study had a 17% higher NDFd at 30 hours than the CON corn silage (73.8 vs. 56.8%) and the BMR and CON corn silage diets had similar starch and protein. During the close-up period, cows fed the BMR corn silage diet from 14 days before parturition consumed 2.4 pounds more dry matter than cows fed the CON corn silage diet. During the first 3 weeks of the fresh period, cows fed the BMR corn silage diet consumed 4.4 pounds more dry matter and produced 7.1 pounds more milk than the cows fed the CON corn silage diet. The cows fed the BMR corn silage diet during the close-up period had fewer health disorders during the first 6 weeks of lactation. Highly digestible forages such as BMR corn silage offer an alternative to concentrates for providing energy without compromising intake or rumen health.

After calving the dairy cow transitions from having relatively low energy requirements to very large energy requirements for lactation. She cannot consume enough feed to meet these energy demands. The fresh cow diet needs to provide enough energy without causing acidosis or limiting intake. Starch fermentability can have negative impacts on intake and milk production during the fresh period. Rumen fermentable starch is a good measure to use to quantify the amount of starch that can be used by the cow. Highly digestible forages such as BMR corn silage are also good options for providing energy for fresh cows without limiting intake. Optimizing her diet during the fresh cow period will allow her to handle these changes more easily.

*— Michael Miller*
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# DISCUSSIONS ABOUT CULL DAIRY COWS

Dairy cull cows pose a significant risk and hurdle for the dairy industry yet are rarely discussed. Between 28 and 35% of cows are culled from farms each year. The reasons for culling and condition of those cull dairy cows entering the market can be quite varied. This lack of uniformity makes it relatively challenging to manage those animals from their farm of origin to slaughter. Reasons for culling can include low production, reproductive issues, making room for replacements, and health reasons. With these various reasons the range of health status, body condition, and locomotion of cull cows can be rather large.

A recent article in the Journal of Dairy Science (101:11170-11174) caught my attention in which a panel convened to discuss the topic of cull dairy cows in Canada. The panel was composed of farmers, veterinarians, people involved in regulation, and experts closely involved in transport, auction, and slaughter of dairy cull cows. The objective was to discuss regional management practices, welfare concerns, and suggestions for needs within this dairy cull cow market. While their focus was on Canada, there are many parallels between Canada and the U.S., including the size of the country and possible transit times for dairy cull cows, depending on the region. The panel had eight main consensus points:

1. **Travel times and potential delays from farm to slaughter.** Cull dairy cows travel up to 1,500 to 2,800 miles across Canada, with trips lasting 7 to 10 days in certain cases. A farmer sending a cull cow may think that she'll be processed soon but often these animals are traveling quite a distance because certain slaughter houses may not be equipped for handling these types or condition of animals. Are there ways we can minimize this time and distance?
2. **Increasing awareness between different parts of the system.** There is a disconnect between what farmers and veterinarians believe happens from transport to slaughter and what actually does occur. Farmers sending dairy cull cows may think that they travel a short distance and are processed very quickly. Finding ways within region to share this information would be important for aiding in culling decisions and minimizing welfare concerns.
3. **Proactive culling.** More proactive culling could prevent some of the health and welfare issues seen in slaughter plants and in the transport system. Promoting a greater awareness of these animals being culled for a high-quality endpoint.
4. **Assess animal condition before leaving the farm.** With the first three points in mind can we develop training and consistency of assessment of animals before they leave the farm? The panel discussed development of a decision tree that would identify the best option for each animal and would include training and assessment by personnel at the farm, those involved in transport, and veterinarians.
5. **Identify local options for slaughter.** If cull dairy cows are traveling longer distances is there an option for a more local slaughter? Identifying more options within a region would be beneficial to those animals that cannot travel longer distances and would help the people handling those animals.
6. **Investigate different management options for high-risk animals.** Options may include "direct-to-slaughter" directives, on-farm emergency slaughter, and mobile slaughter. These options may be region dependent and have to adhere to regulations to make sure the end product is safe. Implementation of these methods have pros and cons but may be beneficial for improving welfare in the most severe cases.
7. **Training and equipping farms and auctions for euthanasia.** Ultimately, euthanasia on farm may be the only option for most severe cases in which shipping and on farm slaughter isn't an option. Training and tools to accomplish this must be available for farms to implement.
8. **Cooperation among enforcement agencies and adoption of beneficial regulatory actions.** Consistent enforcement of pertinent regulations is needed to aid in promoting animal welfare and also boost public confidence. The parties involved in the implementation of these inspections will be country specific.

Cull dairy cows are more likely to show lameness and other problems. This can lead to poorer carcass quality and difficulties during extended transport. Identifying methods for improvement and increasing communication across this system will benefit the productivity and welfare of these animals. I'm not an expert in this area and hope to learn more about this system in the future. However, the JDS article is a good starting point for evaluating what we're doing right in this system and what might be improved. I care about the welfare of our animals and hope that as we move forward we can continue to evolve to meet the needs of all aspects of the dairy industry.

*— Sarah Morrison*
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# REVISITING NOTILL

The acreage of cropland devoted to notill has stopped increasing, and with some crops (primarily soybeans) it's started to decline. This may come as a surprise since farm magazines often run stories about how this farmer and that one increased yields while decreasing soil erosion losses through the use of notill. However, continuous tillage is used on far more acres than is continuous notill and various forms of strip tillage. In fact, more acres of corn are conventionally tilled than the acreage of notill and reduced tillage combined.

What's more common — and in my opinion more practical — are alternating periods of notill and conventional tillage (moldboard plowing, chisel plowing, etc.) When I managed the crop operation at Miner Institute we notilled some land every year, including some very stony fields that never saw a moldboard or chisel plow. We'd grow 4 or 5 years of notill corn in these fields, then before seeding them to alfalfa-grass we'd run our John Deere Do-All over the fields, smoothing out five years of ruts (which were minimal because this land had "two stones for every dirt") and working up just enough soil so that we could seed with our conventional press-wheel grain drill. We also cultipacked the field to squash some of the stones back into the soil. We got very good seedings with only one shallow tillage pass over the approximately ten-year corn-alfalfa/grass rotation. We managed the fields in this manner from the early 1980s, when we first converted these fields from permanent pasture and wasteland, until I retired from the Institute in 2008, and similar management has continued since then.

Today's notill corn planters — and notill grain drills — are far superior than the ones we used a generation ago. We started with an Allis-Chalmers notill corn planter (a plate planter) and a John Deere Powr-Till seeder, both brutes that long ago earned their place on the farm's "bone pile" though I think the seeder may still lurk in some dark corner of a storage shed, covered with pigeon poop. The John Deere corn planter we now have will do both conventional and notill planting with minimal adjustments. Our first JD notill corn planter had both steel and rubber press wheels, with the steel wheels recommended for notill and the rubber ones for conventional tillage. One year after changing them (because the crops crew was busy doing more important stuff) I decided that the rubber press wheels would be as good for notilling into corn silage stubble as would the steel ones. It turned out that indeed they were, and we never did go back to those steel press wheels. If you haven't notill planted corn into corn silage or soybean stubble — both ideal situations for notill — and you have a corn planter with the capability of notill planting, 2019 may be the year for you to give this fuel and labor-saving practice a try.

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# WITH APOLOGIES TO THE ANCIENT GREEKS

"Know thyself" is an ancient Greek aphorism that was inscribed in the Temple of Apollo at Delphi. For those of us who travel to far-flung places to talk to farmers about animal and crop management it's also useful to know your audience. I was reminded of this last month while speaking to a group of dairy farmers in Statesville, North Carolina. I've driven through North Carolina dozens of times over the years and see either the crop stubbles of corn, small grains, grasses and cotton — this year there was an unusual amount of unharvested cotton — but nary a field of alfalfa. My topic at the meeting was corn management so I had no reason to mention alfalfa, and during the Q & A session at the end of the meeting we learned that none of the dairy farmers at the meeting grew any alfalfa. There are over 400,000 acres of alfalfa in Pennsylvania, 50,000 acres in Virginia, but only about 3000 acres in North Carolina. South of there — almost no alfalfa at all. In fact, in the Southeastern U.S. alfalfa is such a minor crop that it's barely worth mentioning.

Not that this is anything new: At least 20 years ago I attended an American Forage and Grassland Council Annual Conference in Georgia. On the bus tour that's a part of these conferences — held in a different state each year – the organizers were determined to include at least one farm that grew alfalfa. We visited the farm but when we asked to see his alfalfa the farmer commented: "I used to have some alfalfa, but I don't grow it anymore." "Why?" "It died." "Oh."

*– E.T.*

# NO FARMS, NO BEER

In my closet hangs a well-worn blue t-shirt emblazoned with a hop cone and the phrase "No Farms, No Beer". This t-shirt attracts a lot of attention; most often I'm met with a high-five and compliments from folks who understand the important role farms play in supplying our nation's many breweries. In hindsight I should have purchased a few more shirts for when I inevitably have to send this one by way of the car washing rags.

I'm Cari Reynolds, the newest Research Intern here at Miner Institute. In a previous life I had a job most people believe is found next to the unicorns, and cows that calve when asked nicely; I was the Quality Assurance manager of a small, independent craft brewery. Yes, that means I got paid to drink a lot of beer. At 9 AM. The only other place you don't get judged for knocking one back before noon is the airport. Or Las Vegas. Earlier this year, several media outlets raised concerns that a European barley shortage is threatening to raise the current prices of beer, alarming hopheads and Miller Lite devotees alike. A warmer-than-usual summer wreaked havoc on Europe's barley crop, and researchers now predict that climate change will eventually result in an overall drop in barley production worldwide, thus bringing a price increase that will be felt all the way down the supply chain to the consumer. However, there may not be an immediate cause for alarm. Let's take a quick look at the current state of North American barley production, discuss barley's starring role in the brewing process, and ponder why we may not feel as much as a financial strain as Europe. Also, we'll look at how your contribution matters to the brew scene.

According to the National Agricultural Statistics Service (NASS), approximately 153 million bushels of barley across 1,978,000 acres were harvested in the US in 2018, an increase in 23,000 acres from 2017. Canada's barley production

Cari Reynolds, wearing her favorite t-shirt with Dr. Chris White, founder and CEO of White Labs Inc., one of the world's foremost producers of brewer's yeast.

was plentiful as well, with a reported 3.65 tonnes/ha across 2,330 kha. Approximately 70% of total barley harvested in the U.S. is used in beer production, as the cost-effectiveness (and surplus) of corn and soybeans have edged out barley's use as animal feed. In contrast, only 14% of barley produced in Europe is used in brewing; it remains Europe's most economical animal feed choice, as corn and soybeans are often imported. If animal feed use will need to take precedence over brewing, Europe will likely see the impact of a beer price hike more immediately than the U.S. The higher-quality barley sought after for malting will also carry a heftier price tag in Europe if barley quality degrades. Because the leading barley-producing U.S. states and Canadian provinces are in notably cooler regions, their location gives them the advantage of being able to make changes ahead of anticipated climate shifts in the coming years to ensure that yield and barley quality stay high.

So, how exactly is barley used in the brewing process? Malting companies ("maltsters") soak the barley and allow it to germinate, which releases key enzymes needed to convert soluble starches to fermentable sugars. It's then dried and roasted, sometimes to the exact specification of the brewer for a certain recipe. During the first step in the brewing process, known as "mash-in", grains are mixed with water and heated to a certain temperature, at which the starches are converted to sugars that yeast can use during the fermentation process. After all the starches have been converted, the sweet liquid ("wort") is then recirculated over the spent grain husks, which act as a natural filter bed. This process, called "lautering", allows any remaining sugars in the grain to be extracted and for the wort to be homogenized. As it contains the highest amount of available sugars, barley is considered the superior choice for base malt. Other grains such as flaked or rolled oats, corn, wheat, and rye are also used, but do not have as many available sugars so are mainly used as an adjunct grain to create different flavor profiles and mouthfeel. For example, some stouts often have a flaked-oat addition to the grain bill, and cream ale gets its signature flavor and aroma from the addition of corn.

If you live locally to a maltster or a brewery there are several ways you can help out. A smaller brewery may offer complementary spent grain after brew days if you're willing to pick it up. It contains no alcoholic content, and as it's now sweet from the converted sugars, animals love it. If you're a barley grower, reach out to your nearest maltster and see if they're interested in teaming up. Got an orchard, or grow fruit? It's likely a local brewery would love to use your product. There are even consultants that can help you grow hop vines on your property. Today's beer consumer thrives on seeking out locally sourced beer, so having these affiliations can lead to a lucrative relationship between you, the maltster and the brewery that can proudly say their beer is brewed with all local ingredients.

As long as there is agriculture, there will be beer, and I'll keep wearing my favorite t-shirt with pride.

*— Cari Reynolds*
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Miner Institute employees assembled four bikes at the December staff meeting to be donated to Clinton County children in foster care with the help of The United Way of the Adirondack Region.

## Closing Comment

Women spend more time wondering what men are thinking than men spend thinking.

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