FARM REPORT

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FROM THE PRESIDENT'S DESK: RECUMBENT RUMINATION

Rumination is the signature behavior of ruminants such as dairy cows. Typically, a healthy dairy cow ruminates about 8 to 9 hours daily. Adequate rumination buffers the rumen fermentation and helps provide the physiological benefits of sleep, so it is critical for both rumen and overall health.

Researchers have long measured rumination response to fibrous and particle size characteristics of the diet. And more recently, research has assessed how the cow's management environment may attenuate that response. Increasingly, on-farm systems are becoming available that monitor rumination time for individual cows to quickly flag health events and dietary changes. These systems monitor rumination time, but cows can ruminate either standing up or lying down. Does it make a difference to the cow? Let's look at what the research tells us.

Research confirms that rumination bouts are more common when the cow is lying down. More rumination occurs at night when cows are more likely to be resting. In an ideal environment, 85% or more of the daily rumination occurs while the cow is lying down. The optimal posture is called sternal recumbency where the sternum is flat on the ground. So, rumination that occurs then is called recumbent rumination. Recent research tells us that recumbent rumination plays a critical role in optimizing health and productivity.

Several years ago, Miner Institute work led by Mac Campbell showed that overstocked cows that were able to achieve more rumination while in the free stall had less incidence of subacute rumen acidosis. Cows that spent 90% or more of their rumination time in stalls typically had only 2 to 4 hours per day with rumen pH less than 5.8, the common benchmark for subacute acidosis. Cows that ruminated outside the stalls has as much as 8 to 10 hours per day with pH less than 5.8.

At this summer's American Dairy Science Association meeting there was a report from Trevor De Vries's group at the University of Guelph about rumination while lying down and measures of productivity [2021. J. Dairy Sci. 104 (Suppl. 1):31]. They assessed data from 30 Holstein cows that were milked and managed in an automated milking system barn. These researchers found that cows that had a greater probability of ruminating while lying down also had greater total ruminating and lying time – which makes sense. Of course, if they spent more time lying down, they also had less idle standing time. Taken together, these behavioral changes - greater ruminating while lying with less idle standing - should contribute to better health and well-being.

Associated with these changes in ruminating and lying, the researchers observed greater dry matter intake as well as higher milk fat and protein percentages. To me, these positive changes in milk composition and feed intake

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PARTITIONING OF RUNOFF & TOTAL P LOST FROM NORTHERN NY CORN FIELDS

To better understand the extent and patterns of phosphorus (P) loss from Northeastern dairy farms, Miner Institute has instrumented corn fields in Northern New York with edge-of-field water quality monitoring stations. These stations continuously measure and sample the drainage leaving the fields as surface runoff and tile drainage, and samples are analyzed for a variety of water quality parameters.

In freshwater watersheds, dissolved reactive P (DRP) and total P are important indicators, as P is the first limiting nutrient in lakes and rivers. Therefore, when P levels rise, higher levels of biological activity can be supported. When these levels reach a certain threshold, negative consequences such as cyanobacteria (commonly referred to as blue-green algae) blooms will occur. Biological organisms consume P primarily as DRP, but total P is also an important measure because the variety of forms that comprise total P can eventually become DRP.

The number of fields monitored in a given year changed depending on the number of funded projects, but between 2014 and 2020, surface and subsurface drainage water quantity and quality from six different corn silage fields was measured under a variety of management scenarios. Common amongst all fields was conservation tillage in fall and/or spring and annual organic (dairy cow manure) nutrient applications, supplemented with inorganic fertilizer as needed (dictated by soil testing).

The graph (on facing page) shows the total P lost (lbs/acre/year) from each runoff pathway in each of the research fields. The total losses and primary pathway of loss varied across fields and years. Although not shown, the patterns of loss for both DRP and total P were very similar. On average, 0.21 and 0.39 lbs/acre/year of DRP and total P, respectively, were lost from the fields. The total P lost represented 1.8% of the total amount of P applied to the fields over the same period.

Importantly, 67% of both DRP and total P losses occurred from surface runoff, despite surface runoff producing just 17% of the total drainage from the fields. This disproportionate contribution of surface runoff to field-scale P losses relative to drainage volumes was observed across most site-years. This is a result of the substantially higher concentrations of total P that were observed in surface runoff relative to tile drainage. Therefore, the significant reduction in surface runoff that typically accompanies the installation of systematic tile drainage does have the potential for reductions in field-scale P losses in these landscapes.

Unfortunately, there have been relatively few studies that have examined the impacts of tile drainage on P loss, particularly in the Northeast where greater topographic relief may influence the partitioning of runoff between surface and subsurface pathways compared to the flatter landscapes in the Midwest that have historically received greater scrutiny. Miner Institute has begun investigating the water quality implications of tile drainage in the past several years, but as seen in the varied P losses illustrated above, any research question regarding the agronomic and environmental interface needs to be investigated across multiple years and sites before broad conclusions can begin to be drawn. Differences in management (crop, tillage practices, manure application methods) also have the potential to significantly impact the partitioning of runoff and nutrients between surface and tile flows and therefore must also be evaluated to broaden our understanding of the environmental impacts of tile drainage.

— Laura Klaiber
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FORAGE INVENTORIES AND FALL ALFALFA MANAGEMENT

By now you should have a good idea of your forage inventories. In the case of hay crop silages and dry hay, what you have is what you've got — at least until first cut comes off next May. With corn silage, hopefully you'll have enough 2020 crop to last at least until the end of the calendar year. Corn silage increases in feed value for the first several months after ensiling — primarily grain digestibility. (More on this next month.)

Use your ration sheets (getting help as needed) to calculate how much of each forage you'll need between now and the time the new crop becomes available. It's better to find out that you'll be short of feed now, while there's still time to work with your nutritionist (and perhaps your crop consultant) to plan a strategy. This could involve feeding more of one forage and less of another, purchasing forages, or selling your lowest producers and problem cows.

Forage inventory data can also be used to make decisions on your 2022 acreages of hay crops and corn for silage. You know which hay fields were studs and which were duds, therefore which ones should be rotated into corn or another annual crop. Unless it's been at least 45 days since the previous harvest, the field has a lot of growth and you need the feed, I'd resist the urge to take an October harvest of alfalfa. Fall-grown alfalfa usually has large leaflets which may mislead you into thinking there's more yield out there than there really is. A dry matter yield of less than ½ ton per acre probably costs you more to harvest than it's worth. And research has shown that taking a fall harvest is often "robbing Peter to pay Paul" since first cut yields of alfalfa cut the previous October are normally lower than if the field wasn't harvested.

I'm bullish on corn for silage and have been for many years, particularly for progressive dairy farms set up to efficiently handle silages. Dairy nutritionists can make a wide range of milking cow rations "work", including rations including 70 lbs. or more of corn silage. An unusually big corn crop can be high-chopped or perhaps be sold as silage or grain, so there's little downside to having too much corn. And if you have good silage storage options, your feed consultant might be able to increase the amount of corn silage in your rations. Apply Roundup (glyphosate) this fall to kill worn-out grass and run-out alfalfa and alfalfa-grass fields. This should result in a good seedbed — either conventionally tilled or notill — by next May.

— Ev Thomas
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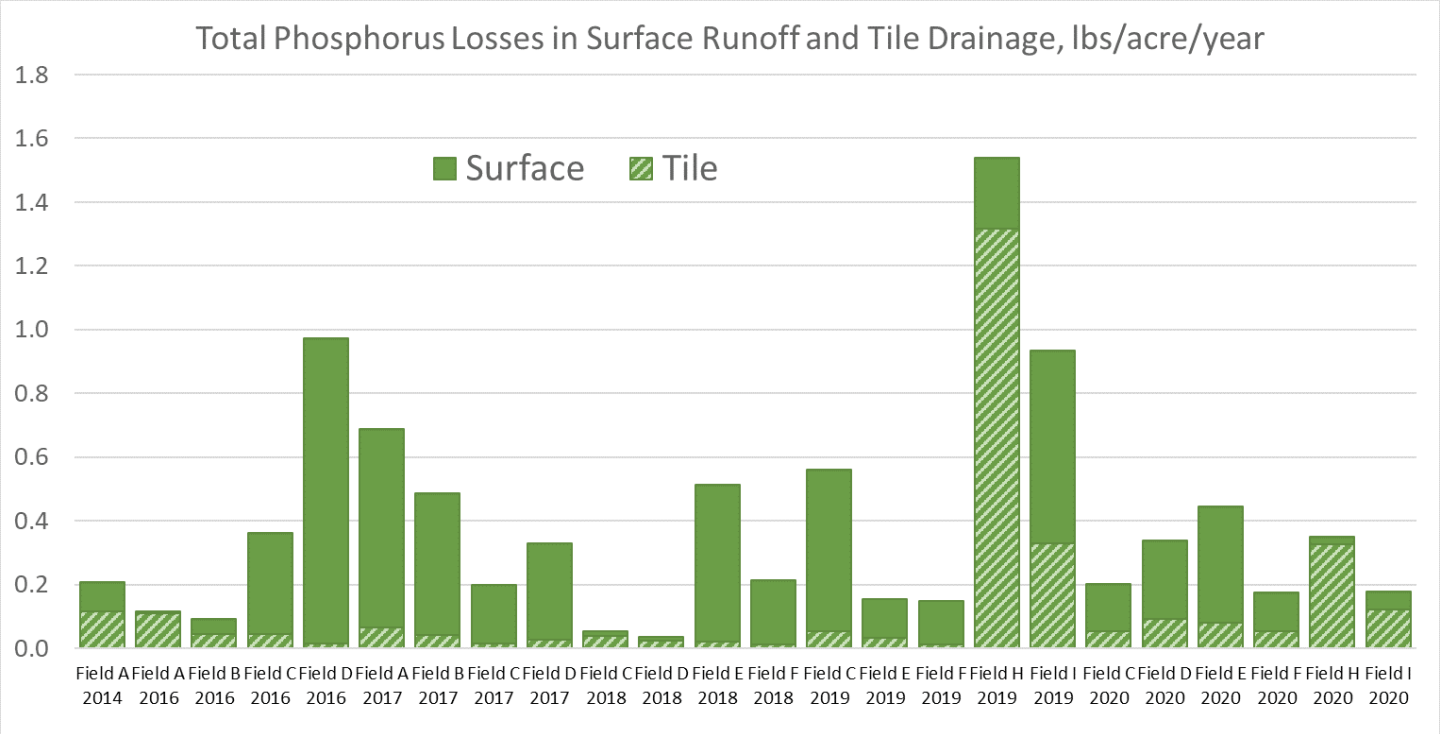

STAYGREEN MAKES A DIFFERENCE

We were reviewing the results of a Delaware County (NY) corn silage drydown summary for early September which included measurements (via DairyOne) of milkline and % starch for 29 fields. One field was at ¾ milkline with 33% DM and 31% starch, while another *at the same ¾ milkline* was 41% DM with 36% starch. In another comparison, two hybrids were at ½ milkline; one was 35% DM and 32% starch, the other was 44% DM with 37% starch. There were no replications so this isn't "research", nor was it intended to be. But it's worth noting how different % DM and starch content can be with two hybrids that are at the same milkline. This may be due to differences in the staygreen trait, which primarily is a measure of plant health. Silage-only hybrids aren't intended to remain in the field until full physiological maturity, so many have lower staygreen ratings. The kernels and stalks of a hybrid with a low staygreen rating dry down at about the same rate. But farmers who harvest corn for grain want green, healthy stalks that resist lodging as the grain dries down, which is why many grain or dual-purpose hybrids have high staygreen ratings.

Differences in staygreen can have a marked effect on whole plant dry matter at the same milkline. This is yet another reason why it's important to use milkline as a *guide* to harvest maturity, but to make harvest decisions based on dry matter tests. In the Delaware County tests, relying solely on milkline for two of the fields would result in chopping corn silage that was already over 40% DM and getting dryer by the day — likely resulting in challenges in packing and air exclusion, and perhaps in NDF digestibility. Something to consider as you order seed corn for 2022.

— *E.T.*

THE HITS JUST KEEP ON COMING

On August 17th, 1957, during a baseball game in Philadelphia against the New York Giants, Phillies batter Richie Ashburn hit a foul ball that struck Alice Roth in the face, breaking her nose. As she was being carted off on a stretcher, play resumed. Ashburn fouled off the first pitch thrown to him, hitting Roth again and breaking a bone in her knee. "No harm, no foul."? Not hardly!

Farmers can be forgiven if these days they feel a bit like Alice, as the hits just keep on coming. New York farmers are at risk of losing neonicotinoid seed corn treatments because of the effect on honey bees; the Oregon state legislature has been pursuing a ban (temporary, at least) on large-scale dairy farm construction; and weather woes have affected farming operations from coast to coast including restrictions on water use in the drought-stricken Southwest and hurricane Ida damage in the Northeast.

The situation may currently look bleak, but we can always hope for better days ahead. Richie Ashburn visited Roth in the hospital and they became friends. In future games Roth chose to sit in the left field bleachers, well out of harm's way. And her son eventually became the Phillies' batboy.

— *E.T.*

INTERN INTRODUCTION

My name is Kelsey Hefter and I'm the new dairy research intern at Miner Institute! I'm from Northeast Wisconsin, specifically the Fox Cities area. Although I didn't grow up on a farm, I do come from a farming family. After my family sold the cows, my dad continued to be herdsman at other dairies for 20 years, where I occasionally got to help him at work. I have always loved being around animals, which led me to join 4-H and show cows from the farms I worked at. I was involved in the dairy industry through showing at county and state level, which led me to study agriculture in college. I recently graduated from the University of Wisconsin-River Falls with a Bachelor of Science in Dairy Science and a minor in agricultural business.

Throughout my time at UWRF I was a member of the dairy club and the Animal Welfare Lab, where I was involved with several research projects under Dr. Kurt Vogal and Dr. Sylvia Kehoe. The summer after my junior year, I interned with Cargill Animal Nutrition. I was one of four Dairy Focus Consultant interns in the U.S. that summer. This was a virtual internship because of Covid-19, which allowed us to work as a cohort team where we attended the same labs and seminars. I focused on two projects, the first relating to snaplage products, and the second pertaining to liquid whey products. I was able to learn more about nutrient digestibility and how to analyze forage lab reports.

I recently completed an 8-month-long internship with the Novus, Int. C.O.W.S (Cow Comfort, Oxidative Balance, Wellbeing, and Sustainability) Program. While interning with Novus I completed virtual work doing assessment data analysis, updating graphs/figures for report deliveries and Novus presentations. I also assisted the marketing team in updating descriptions for supporting research papers for Novus, Int. products. Lastly, throughout the internship I had the opportunity to travel around Wisconsin, Minnesota, Illinois, and Idaho to assist with cow comfort assessments. At these assessments I took pen measurements, did injury and locomotion scoring, and attached data loggers that measure lying time.

I've always had a passion for animal welfare, and between opportunities at UWRF as well as my internships with Cargill and Novus, I was able to discover career opportunities relating to cow comfort and animal behavior. I am very excited to continue gaining hands-on experience and growing in my knowledge of the dairy industry during my time here at Miner Institute! My goal for this internship is to learn the methodology around dairy research and decide if I would like to attend graduate school or get a job in industry.

— Kelsey Hefter
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RUMINATION, Continued from Page 1

match perfectly with the observation by Campbell that ruminating in free stalls aligns with better rumen pH conditions, particularly with greater competition at the feed bunk and free stalls.

The bottom line is that there is accumulating evidence that the posture of the cow while she ruminates matters. We cannot rely solely on monitoring total rumination time per day – as important as that is. Cows that ruminate more while lying down have higher rumen pH, eat more, and produce milk with more fat and protein. That is a hard combination to beat! One more reason to ensure that cows have unfettered access to comfortable resting areas.

— Rick Grant
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VET CORNER: TIMED ARTIFICIAL INSEMINATION (TAI) PROTOCOLS IN DAIRY CATTLE

Dairy farms only have two options to breed their dairy cattle, natural service (Bull Bred) or Artificial Insemination (AI). Dairy farms also have two options to perform AI in dairy cattle, AI to detected estrus (standing heat detection) or timed artificial insemination (TAI). In the 1970s, bovine estrus synchronization protocols were developed to improve AI to detected estrus. Then in 1995, Pursley et. al., released the first version of ovulation synchronization protocols to breed cows via TAI. These ovulation synchronization protocols are commonly referred to today as "OvSynch" or "CoSynch" protocols. Ovulation synchronization protocols made huge advances in dairy cow reproductive management and are widely incorporated into reproductive management programs by most dairy farms in the United States. In the 1990s the dairy industry also saw the release of activity monitoring systems to assist dairy farmers in breeding their cows via AI to estrus detection. Over the past several years there have been vast technological improvements to activity monitoring systems. In the 2000's we are slowly seeing dairy farms utilize both synchronization protocols and activity monitoring systems to maximize reproductive efficiency on their operations.

Figure 1: The Estrous Cycle in Dairy Cattle with two follicular waves (illustration from Pinterest)

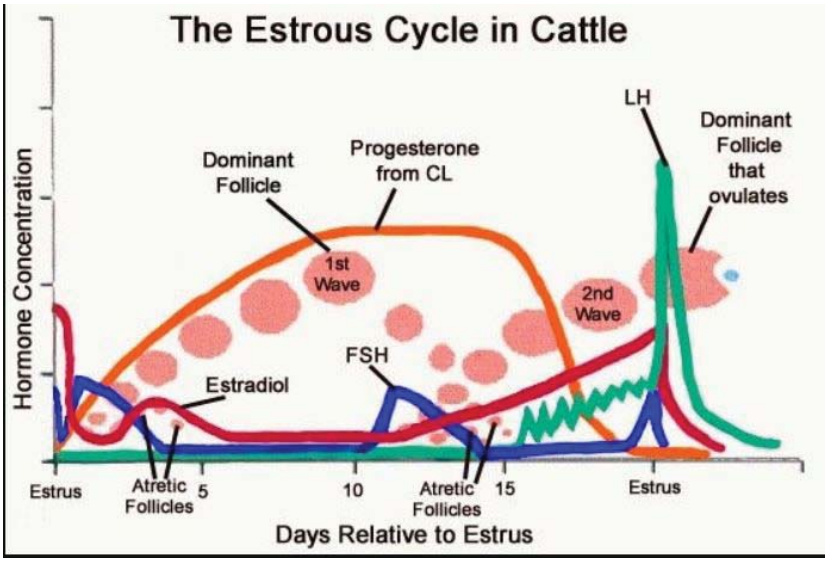
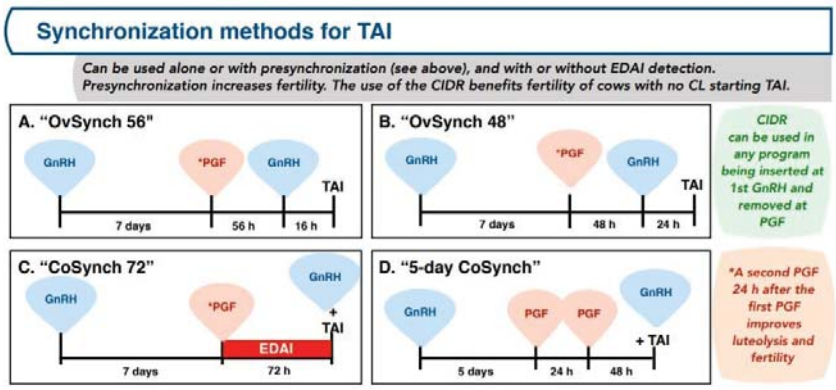


Figure 2: Dairy Cattle Reproduction Council – dcrcouncil.org (2018)



As most dairy operations are still using some form of synchronization protocols, it's important for dairy producers to have a general understanding of the physiology of the cows' estrous cycle to maximize the cow's response to these synchronization protocols. Figure 1 illustrates the typical 21-day estrous cycle of a dairy cow.

The cow's estrous cycle is approximately 21 days in length. The estrous cycle begins immediately after ovulation of the previous cycle and ends with ovulation of the dominant follicle following estrus (heat) 21-days later. In that 21-day period, most cows have two follicular waves with the first wave starting at Day 0 and ending at approximately Day 10, and the second wave starts on Day 10 and ends at ovulation of the dominate follicle on Day 21. After ovulation of the dominate follicle, a primary corpus luteum (CL) is formed on the ovary. The CL produces a hormone called progesterone. Progesterone is important for two reasons. First, it's the hormone that maintains the fetus in the early stages of pregnancy and secondly, at high levels it prevents the cow from going through estrus (heat). The goal of synchronization protocols for TAI is to synchronize follicular development, corpus luteum regression and ovulation.

Figure 2 shows the four synchronization protocols for TAI published by the Dairy Cattle Reproduction Council (DCRC). DCRC updates these protocols periodically when new peered reviewed research warrants updating of the protocols to maximize reproductive efficiency in lactating dairy cattle. Visit dcrcouncil.org for the most up to date information on dairy cattle reproduction.

The two hormones used in all four of these synchronization protocols are

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SAVE THE DATE: DAIRY DAY 2021

Wednesday, December 8

10 am - 3 pm

Speakers will include Miner Institute Staff:
Dr. Rick Grant
Dr. Heather Dann
Katie Ballard
Dr. Sarah Morrison

After lunch, there will be a Tour of Miner Institute Dairy and Research facilities highlighting our new Calf Barn and Lactating Cow Research Barn.

Hot Lunch will be available for $5
Admission is free.

Dairy Day will be held in-person at the
Joseph C. Burke Education and Research Center
586 Ridge Rd.
Chazy, NY 12921

We will follow current CDC and local health department guidelines on that date.

Any questions? Contact Wanda Emerich, 518-846-7121, ext. 117 or emerich@whminer.com

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Gonadotropin-Releasing Hormone (GnRH) and Prostaglandin F2 Alpha (PGF). The first GnRH (G1) is administered on Day 0, the Prostaglandin F2 Alpha (PGF) is administered on Day 7 (Day 5, 5-Day CoSynch) and the second GnRH (G2) is administered on day 9 or 10 (Day 6, 5-Day CoSynch). TAI is on Day 10 (Day 8, 5-Day Co Synch).

G1 stimulates ovulation of the dominate follicle from the first follicular wave creating a secondary CL on the ovary. To maximize reproductive efficiency, G1 should be administered between days 5 and 12 of the cows' estrous cycle. To achieve the proper timing of G1, the cow can either go through a hormonal pre-synchronization protocol or a veterinarian can scan the cows' ovaries with an ultrasound to estimate the stage of the estrous cycle.

PGF is to regress any and all CLs on the ovary. CL regression reduces the amount of circulating progesterone. The reduction in circulating progesterone is crucial, as the dominate follicle of the second follicular wave will not ovulate in the presence of high levels of progesterone. CL regression is so important to the success of TAI protocols adding a second dose of PGF on Day 8 is sometimes used to maximize CL regression.

Finally, G2 stimulates the ovulation of the dominate follicle from the second follicular wave. Ovulation generally occurs 24-32 hours post G2 injection. Notice in the two OvSynch protocols G2 is administered 16 or 24 hours prior to TAI. Whereas, in the CoSynch protocols G2 is administered at TAI. The reproductive efficiency of OvSynch protocols is slightly better than that of a CoSynch protocol, but CoSynch protocols are not as labor intensive because it reduces the number of times the cows are handled.

Currently, synchronization protocols for TAI play a significant role in the reproductive efficiency of dairy herds. However, the technological advancements of activity monitoring systems, to breed cows via estrus detection, are increasing at a significant rate. Someday the dairy industry may be back to breeding 100% of dairy cows off natural estrus detection.

— Kevin Tobey. DVM
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Members of local fire departments from Chazy, West Chazy, Rouses Point, Altona, Mooers, Champlain and Beekmantown visited Miner Institute for a tour of our facilities. We will use suggestions and feedback given to update our safety plan. The importance of being prepared for an emergency cannot be overstated!

Closing Comment

Just because you are offended doesn't mean that you are right.

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