FARM REPORT

FROM THE PRESIDENT'S DESK: HOUSING CRYSTAL BALL

The most recent issue of the Journal of Dairy Science contained a crystal ball view of the future of dairy cattle housing (J. Dairy Sci. 103:5759-5772). A diverse group of dairy scientists from the U.S., the Netherlands, Israel, Italy, and Slovenia examined recent innovations and expected advancements in housing design with an eye on comfort, labor efficiency, technology, environmental sustainability, profitability, and even aesthetics.

This paper was written from a much different perspective than the typical housing publication, with the focus on what might be and why versus detail on building layout, dimensions, and so forth. I can't say I agree with everything in it, but it really made me think – more creatively and outside the box – than I ordinarily do. If you have access to the Journal, I'd strongly encourage you to read this article.

A major element of their discussion was the certainty that we will need to move beyond the standard free-stall barn in order to successfully address future needs of the dairy industry. They advocate greater use of loose housing systems – termed freewalk housing by the authors – but with innovative technology that vastly improves on today's loose housing.

For example, in addition to the fairly standard composted bedding material in use today, they discuss the possibility of artificial permeable floors as resting and walking areas within the barn. These systems are currently under development and not ready for commercial use. Essentially, they are multi-layered with a top cover that allows urine and moisture drainage but retains feces above the floor for removal. A mattress under this top surface would be comfortable for walking but also strong enough to handle robotic scraping. A system beneath the surface would collect and transport urine away from the pen. A prototype barn in the Netherlands also contains trees to provide shade since the roof lets in substantial light.

In the article there is a great photograph of this system. It is certainly not your father's free-stall barn, and I have to admit that part of me was thinking "no way" as I looked at it. But still, elements of this sort of system may well be part of the housing solution for our industry as we move forward.

This is only one example of future housing systems that the authors present. Regardless of the housing design, they focused on a few primary drivers and potential conflicting factors in building design that will likely determine what housing designs become reality and what housing never makes it out of the research phase.

A key factor that will drive housing design

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In This Issue:

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NEW SEEDINGS ARE SPRINGING UP AT MINER INSTITUTE

The North Country has been experiencing an unseasonably dry spring, but our new alfalfa-grass seedings appear to be tolerating it well thus far. Here at Miner Institute we seeded about 32 acres to alfalfa-grass that was planted with a nurse crop of peas and oats. The use of nurse crops in perennial forage establishment is less common now than in times past (mostly due to more effective herbicides), but they can be a way to reduce weed abundance and erosion in your establishing alfalfa-grass fields. The use of a nurse crop will also boost establishment-year yields without diminishing forage quality, provided that the nurse crop is harvested at the proper maturity. The downside of using a nurse crop is that it will directly compete with your alfalfa-grass mixture. While this competition doesn't typically prohibit the alfalfa-grass establishment, I've often wondered just how much the establishing crop might suffer if water becomes severely limiting in the upper soil horizons. When all is said and done it will be interesting to see how our driest field sections fare in comparison to wetter field sections.

This year our alfalfa was seeded with several cool season grass species including meadow fescue and reed canarygrass, among others. Cornell University research has shown that meadow fescue provides more highly digestible forage than other grasses in the North Country. Furthermore, meadow fescue is a little less competitive than other forage grasses such as tall fescue or orchardgrass. This makes it an ideal candidate for inclusion in mixtures where a significant legume proportion is desired. Reed canarygrass can also fit into alfalfa-grass mixtures, but in a different way. While this grass isn't known for outstanding quality, it's very persistent and its spreading habit allows it to fill in thin areas of the field that may result from alfalfa winterkill. Reed canarygrass also complements alfalfa well as it is highly competitive in the wet spots (where the alfalfa often dies out), and it usually doesn't overrun the alfalfa in the well-drained sections of the field.

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is available space per cow. That idea is certainly not new, and as we move into the future it will become even more important as we look to enhance natural behaviors and meet societal expectations of good animal welfare. The authors propose a model that integrates four key elements that interact to determine space per cow. These are welfare, environmental impact, economics, and landscape considerations. For any type of housing to be successful, it will need to balance these factors in a way that provides the needed space for good cow comfort.

Some other blue-sky systems discussed in the article include creative combinations of free-stalls and freewalk systems, barns with multiple climates and multiple functions, and even a CowToilet that separates feces and urine. If this last invention doesn't prompt you to read the paper, then I don't know what will!

In the end, we will build barns that are environmentally, economically, and socially sustainable. That trend in dairy cattle housing design will continue. With that in mind, I found this article thought-provoking and futuristic, and I'd encourage anyone with an active interest in building design to gaze into their crystal ball.

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NOBODY ASKED MY OPINION, BUT…

…I wonder at what age people stop stating their age by half-years. For instance, you'll hear a 5-year old proudly state that "I'm 5 and a half", but folks seldom report their age, for instance, as "67 and a half".

….speaking of age, John Adams declined an invitation to give the third-annual Boston Massacre oration on the grounds of old age. He was 37. (This didn't prevent him from being elected as America's second President at age 61.)

…I haven't found "social distancing" to be difficult at all. Of course, for the first two months of spring the population of Oak Point consisted of 5 humans and 2 dogs.

— E.T.

BENEFITS OF WINTER RYE AND NO-TILL IN NORTHERN REGIONS

A five-year study published in the March/April issue of the Journal of Environmental Quality by Waring et al. shows water quality benefits of a rye cover crop and no-till crop production in northern Iowa. While a sizable body of research has demonstrated the ability of cover crops to reduce nitrate-nitrogen ($N0_3$-N) losses (the primary form of nitrogen (N) lost in tile drainage), what is unique about this study is that these benefits were realized despite much lower cover crop yields than many studies in more temperate locations. In the Lake Champlain Basin and surrounding regions, the challenge of planting cover crops early enough in the fall to allow for stand establishment is substantial and biomass accumulation can vary significantly from year to year.

Treatment	$N0_3$-N Concentration mg/L	$N0_3$-N Load lb/ac	Tile Drainage inch	Cash Crop Yield ton/A	Rye biomass lb/A
CT-S	16.9a	33.7a	8.8a	1.16a	-
CTr-S	12.0b	20.0b	8.0a	1.12a	568.2a
NT-S	12.6b	19.9b	7.6a	1.07a	-
NTr-S	11.4b	19.6b	7.5a	1.07a	505.8a
CT-C	16.7a	32.0a	8.7a	4.37a	-
CTr-C	11.8b	17.7b	7.1a	4.06b	118.6a
NT-C	11.1b	20.0b	8.2a	3.79b	-
NTr-C	11.4b	20.3b	8.4a	4.06b	125.8a

Five-year treatment means for selected response variables. Treatment means within each crop rotation (separated by dotted line) are significantly different ($P<0.05$) if they do not share the same letter.

The objective of the Iowa study was to examine the impacts of eight different treatments on tile drainage volume, $N0_3$-N concentrations and loads (concentration x drainage volume), and corn and soybean yields in 125' x 50' research plots. The corn rotation treatments were fall chisel plow tillage with (CTr-C) and without (CT-C) winter cereal rye cover crop and no-till with (NTr-C) and without (NT-C) a winter cereal rye cover crop. The soybean rotation had the same treatments as those during the corn rotations, with treatment abbreviations denoted with an "-S" to differentiate between the corn and soybean rotations (CT-S, CTr-S, NTr-S, NT-S). Each treatment received the same rate of sidedress during the corn rotation and no N applications were made during the soybean rotation. All plots rotated between corn and soybean on a yearly basis, and the cover crop was terminated with glyphosate at least two weeks prior to planting. The no-till treatment plots were transitioned from a conventional tillage system two years prior to the start of data collection.

While there is a lot of data and nuance to the research, the most important take-home message for those of us struggling to get a cover crop stand established before the cold sets in, is that even with the rye biomass prior to corn and soybean only tipping the scales at roughly 0.06 and 0.27 ton/acre respectively, there were significant reductions in the concentration and loads lost compared to the winter fallow chisel plowed plots. The CT-C treatment lost 32.0 lb/A of $N0_3$-N as compared to 17.7, 20.2 and 20.3 lb/A $N0_3$-N from the CTr-C, NT-C, and NTr-C treatments, respectively.

Interestingly, the combination of no-till and rye did not result in greater $N0_3$-N reductions than either practice on its own in soybean or corn rotations. However, all treatments did show significant $N0_3$-N concentration and load reductions compared to chisel plow alone in both crop rotations. These reductions occurred despite no differences in tile drainage runoff within crop rotations. This is an important factor to consider, as N reductions have previously been shown to be offset by increased rates of drainage in long-term no-till systems due to improvements in soil structure. However, as periodic tillage is being considered as a means to break up the large pores that form in long-term no-till and pose a risk of carrying applied nutrients directly to tile drains, these results could prove important regardless.

The similar response between the NT and CTr was also surprising as no-till has not typically been associated with $N0_3$-N reductions. The authors hypothesize that the lack of tillage may have reduced the rate of organic N conversion to

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IN UTERO HEAT STRESS - OVEN TEMPERATURE SET TOO HIGH?

One of the keys to success while baking is paying careful attention to the temperature of the oven. Too low, your baked item is underdone. Too high, and you get a burnt mess. While I do enjoy baking, let's step away from the KitchenAid and talk about another "bun in the oven".

It has been well established that heat stress has negative impacts on productivity of dairy cows in the U.S. and around the world. Cows become heat stressed when they cannot easily disperse heat produced from normal metabolism. Evaporative heat loss allows heat produced through normal metabolism to be lost to the environment. As both the temperature and humidity rise, it becomes more challenging for the cow to dissipate heat. For mature dairy cows, the temperature humidity index (THI) is a good metric to account for both factors. If the THI rises above 68, impacts on productivity, lying time, and DMI (among other things) can be observed. An increased focus on dry cow cooling in the last decade has highlighted some of the challenges that cows experience during this part of gestation, as well as the lasting productivity impacts through the subsequent lactation. However, during the dry period we not only have to consider the effects of heat stress on the cow, but also on the developing fetus. Late gestation heat stress can have lasting effects on the calf for its entire life. When the cow is heat stressed, placental function becomes impaired. As a result, there are several changes that occur that negatively impact the fetus including immunity, growth, and future milk production.

Research at the University of Florida determined that heat stress in utero impairs the calf's ability to absorb IgG from the colostrum, regardless of the colostrum source. To tease apart the effect of colostrum quality and the ability of the calf to absorb IgG, cows that were either cooled or noncooled during the dry period were enrolled in these studies. Calves from those cows were then fed a pooled colostrum source from cows that had not experienced heat stress during the dry period and passive transfer was then evaluated. Calves from heat-stressed dams had lower apparent efficiency of IgG, but no difference in total IgG concentration.

From the cooled and noncooled cows, colostrum was collected and pooled based on treatment. The respective pool of colostrum was then fed to calves that were born under thermoneutral conditions. There was no difference in efficiency of absorption or total IgG concentration. This indicates that physiological changes occur to the fetus in late gestation that negatively impairs the ability of the calf to acquire passive immunity by causing premature closure of the gut. Furthermore, calves of heat-stressed dams have smaller immune organs (i.e. thymus and spleen) at birth and have been associated with compromised health and survival in the herd.

In utero heat stress has been shown to consistently reduce birth body weight of calves. Multiple studies have reported an average of 4.4%, or an almost 10-pound reduction, in birth body weight of calves born from noncooled cows during the dry period. The difference in body weight has been observed up to a year of age. Some reasons for this include reduced blood flow to the placenta and lower placental weight, which could reduce the amount of nutrients to the fetus. During late gestation, the fetus grows 0.8 to 1.3 lb. per day, so any reduction in nutrient supply to the fetus will inhibit the growth potential of the fetus. Furthermore, noncooled cows have often been observed to have a reduced gestation length, resulting in less time for the calf to grow before birth.

In utero heat stress can have long term implications for the milk production potential of the fetus. If dams are heat stressed in the final part of gestation, their calves have been shown to produce approximately 11 lb. per day less milk in the first 35 weeks of lactation relative to calves born from cooled dams. More research is still needed to really understand what is changing in the calf to produce this result.

Much of the current heat stress work has been conducted at the University of Florida and other areas of the country that experience quite severe heat loads with limited or no night cooling. North Country in New York doesn't experience the extent of heat stress relative to other parts of the country, work conducted by Miner Institute in the last several years does indicate that lactating cows without heat abatement do experience more signs of heat stress. To date, little is known about the extent that late gestation heat stress has on cows and their calves in more Northern climates. However, it's clear that there are lasting implications to the fetus in terms of health and productivity when the dam is not cooled in heat stress conditions. Therefore, do what you can to keep the temperature in the oven in check!

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BE A DIVA: EXPLORING A NEW STRATEGY TO PREVENT JOHNE'S DISEASE

The economic impact of Johne's disease on the dairy industry rivals that of clinical mastitis; in the U.S., well over $250 million each year is lost due to reduced milk production, premature culling, and reduced reproductive efficiency. The causative agent of Johne's disease is Mycobacterium avium subsp. paratuberculosis (MAP); a resilient, slow-growing bacteria that is not only prevalent in dairy cattle but also in numerous wildlife reservoirs, with transmission possible between domestic and wild species. The physiological effects of Johne's disease on an infected animal result in high morbidity and considerable economic impact to a producer. It's likely that MAP infection can occur in utero or within the first 6 months of life, and young stock are highly susceptible. Johne's disease targets the intestinal tract, resulting in inflammation, enteritis, and subsequent issues with absorption and feed efficiency. Many infected animals may not develop clinical signs, but subclinical infection can still have detrimental effects on productivity and the animal can still shed bacteria into the environment through fecal material. Johne's disease has also been linked to Crohn's disease in humans; while there is no definitive evidence to support this connection, it's still considered a public health risk to consumers due to its presence in milk and the ability of some strains of MAP to evade pasteurization.

Numerous challenges face the management and prevention of MAP infection in cattle, mainly due to its ease of transmission, its prevalence in the environment, the lack of reliable diagnostic testing, and lack of a preventative vaccine. The most common diagnostic tests used to detect Johne's are fecal culture with polymerase chain reaction (PCR) and serum ELISA. However, these tests have varying sensitivities, which can lead to false positive or false negative results. If the sensitivity of the test is low, it's possible that the prevalence of MAP can be underestimated. These tests are also not cost-effective nor readily available to the producer, and require veterinary oversight to perform and interpret. An ideal alternative to diagnostic testing is the development of a vaccine that prevents persistent infection rather than only reducing clinical symptoms, which is the hurdle with currently available vaccines.

New research at the University of Calgary aimed to address this gap by evaluating a vaccine development strategy that could provide long-term protection against Johne's disease. The research sought to evaluate cellular immune responses in animals injected with a strain of MAP modified to create marker-specific immune responses. This approach is known as attenuation, where a strain of a pathogen is genetically encoded to remove harmful virulence factors but maintain or include those properties which stimulate an immune response. Immune markers are used to detect and measure immune responses to a certain antigen, and their identification is essential to understanding immune function. In this study calves were injected with a wild-type strain of MAP, the modified MAP strain, or a placebo. When blood samples from these calves were challenged with a Mycobacterium avium antigen, calves that received both the wild-type strain and the modified strain exhibited strong interferon gamma (IFN-γ) release, which is an indicator of a positive cellular immune response. The modified MAP strain also caused a better immune response than the wild-type strain. The researchers were successful in developing a marked strain of MAP, which could be further studied in order to take the next step toward developing a vaccine. The long-term goal is to develop a vaccine strain of MAP that would allow for differentiation between infected and vaccinated animals (DIVA). More work remains to evaluate this approach, but a live attenuated vaccine for Johne's disease would be a considerable step toward its control and potential eradication.

So, what are the benefits to attenuated vaccines? These types of vaccines are not uncommon; the intranasal influenza vaccine for humans is a live attenuated vaccine, as are the chicken pox, rotavirus, and the MMR (measles, mumps, rubella) vaccines. Their advantage is that they are relatively easy to produce and induce a more robust immune response than other types of vaccines. Since the disease-causing strain of a bacteria or virus is used in the development, inserting different genetic codes allows for an immune responses that mimics that of natural infection. In the case of using this approach for prevention of Johne's disease, studies in goat and calf models showed that using attenuated strains of MAP in vaccines resulted in less fecal shedding of bacteria, which would greatly reduce transmission and recurrent infection in herds. While more work remains to be performed, this research holds great promise toward mitigation of Johne's disease.

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* References available upon request

FAREWELL

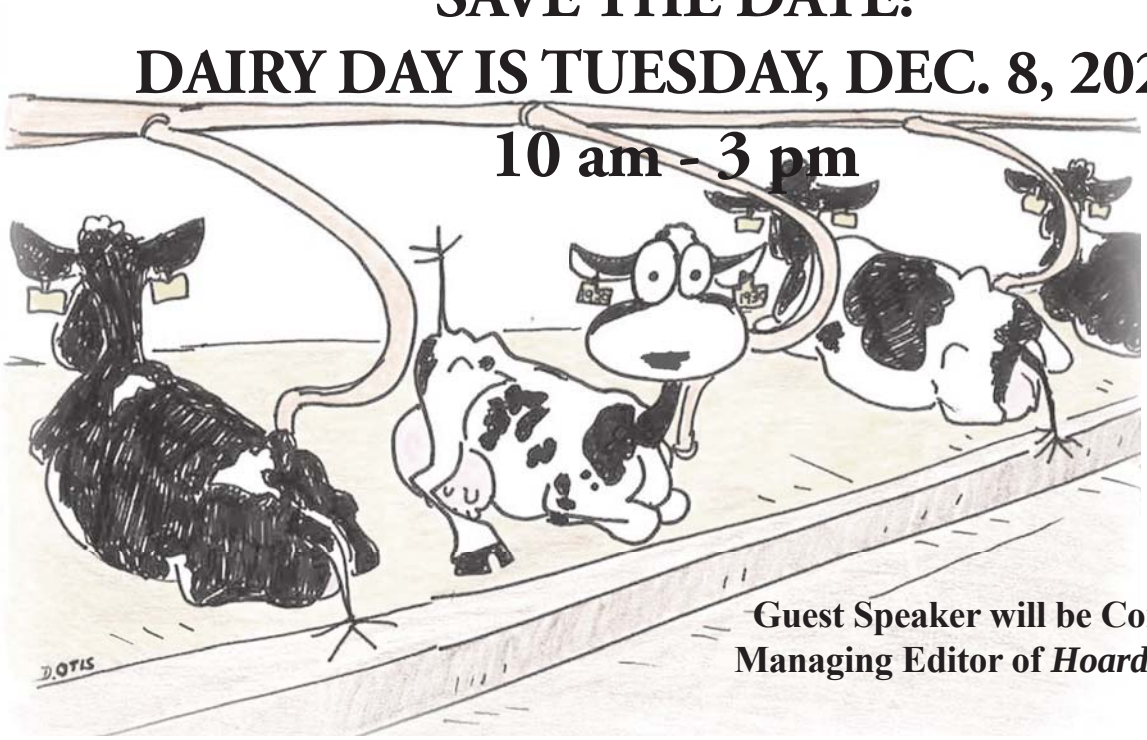
I arrived at Miner Institute in August of 2016 to start an internship after completing a master's degree at Texas A&M University in feedlot nutrition. I had a passion for dairy cattle and knew I had to pursue a Ph.D. in dairy nutrition. I'm sure Rick was wary of this kid from South Texas, but I am glad he decided to give me a chance. After my internship I accepted a position as a research technician and was fortunate to also pursue a Ph.D. under the guidance of Rick Grant and Heather Dann.

I have enjoyed my time at Miner Institute as the group here is welcoming and encouraging. The long hours spent collecting samples and observing cows during cow watches will always be good memories for me. I appreciate the research group, farm staff, crop crew, and maintenance for help with all my projects, even the odd ones. For one of my projects I was doing very large NDF procedures (see attached picture) to measure passage rate, and I remember several farm staff stopping to ask if I was boiling sap, only to be disappointed to see corn silage. Miner Institute is a special place with a great herd and even better people, and for this I am grateful for my time here.

I just completed my Ph.D. program in May and have accepted a position with Trouw Nutrition as a Dairy Nutrition Consultant in Western NY, and I will begin in early June. I'm excited to apply my knowledge and help dairy farmers. I am thankful for my time at the Institute and all the great connections I have made. The producers and people who support the dairy industry in the Northeast have been welcoming to this South Texas kid, and for that I am grateful and excited to start my career here. If you would like to contact me, my new email is michael.miller@trouwnutrition.com.

— *Michael Miller*

SAVE THE DATE:
DAIRY DAY IS TUESDAY, DEC. 8, 2020!
10 am - 3 pm



Guest Speaker will be Corey Geiger, Managing Editor of *Hoard's Dairyman*

BETTER LATE THAN NEVER

Farmers try to get chores done on time, but as the poet Robert Burns once said, "The best-laid plans of mice and men often go awry." Following are a few comments and suggestions if weather or other problems have resulted in delayed planting or harvest:

First cut grass — By June your grass has almost certainly headed, and while we say that "When you see the head the quality is dead" that refers to grass for lactating cows. Fully headed grass can still be used for heifers and some dry cows, especially if some corn silage is included in the ration. Our experience at Miner Institute has been that this ration can result in heifers growing well without getting fat.

Leave a 4" stubble to help regrowth; leaving a higher stubble than that will have little impact on forage quality because—unlike alfalfa—the bottom part of the plant has similar quality to the top part. If you're harvesting this grass for silage pay close attention to dry matter content because this forage can dry very quickly in the windrow.

First cut alfalfa — Unless it's a reduced-lignin (i.e. HarvXtra) variety, by now your alfalfa is probably well past the ideal harvest stage. Raising the cutterbar a couple inches will leave more of those woody stems in the field and may result in enough improvement in quality to make the alfalfa acceptable for lactating cow rations. Don't worry about the impact a high stubble will have on second cut forage quality since most of the short pieces of first cut stems should fall to the ground during the next mowing. Second cut alfalfa has never been one of my favorites, so if it's a conventional variety make sure you harvest your second cut in the bud stage.

Corn planting — Corn planted in June will almost certainly have lower yield than that planted in May. (However, for the first week or so of this particular May the best place for seed corn was in the bag!) How much yield and quality will suffer depends on how late into June it's planted, the weather between planting and harvest, and the Relative Maturity of the hybrid. Each farm's situation will be different, but until mid-June I'd still hold out hope that the combination of earlier hybrids and the tendency of late-planted corn to do some "catching up" during the growing season will result in a well-eared crop that reaches at least 30% DM. Plant corn much later than this and I think you're looking at it as a summer annual forage with relatively little grain. After mid-June, if conditions are warm and dry you may be better advised to switch from corn to a BMR sorghum-sudangrass hybrid, a crop that makes better use of limited moisture.

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soluble N forms, but note that further research is necessary to determine whether the results would hold up at the field scale and in different soils/climates.

It's important to note that while there was no difference in yield for any of the soybean treatments, there was a small reduction the 5-yr average in corn yield in the cover crop and no-till treatments relative to CT-C. As has been observed in previous studies, these differences only occurred during the years with the most favorable growing conditions and highest corn yields and the authors state that it may be due to reduced N availability. Nitrogen can become unavailable for crop uptake early in the growing season due to microbial activity as cover crops decompose in the soil. Factors such as cover crop maturity at termination, whether the crop is removed as a forage crop, soil and drainage characteristics, among other factors, can impact N availability, and studies such as these will improve our understanding of how to manage these systems and their inherent variability in order to simultaneously achieve crop yield and water quality goals.

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HYPERKETO-WHAT-EMIA??

The transition period is the most metabolically challenging time in a dairy cow's life as the body of the cow adapts to large changes in nutrient demands and partitioning. Energy needs drastically increase as the cow starts lactation which increases glucose demands from the mammary gland for lactose synthesis. It's estimated that the mammary gland utilizes as much as 60-70% of the glucose in the cow's body. A challenge for the fresh cow is that she also experiences a reduction in intake while her potential for milk production increases. Her intake will naturally decrease around the time of calving due to her advanced stage of pregnancy, but once she's not eating enough to meet her energy demands she enters a caloric deficit, or negative energy balance.

Most tissues can utilize ketone bodies, but as milk production advances, utilization cannot keep up and large increases of ketone bodies in the blood occur and can reach toxic levels, a disease state known as hyperketonemia, or bovine ketosis. The major ketone bodies that increase in blood concentration are β-hydroxybutyrate (BHB) and acetoacetate, but BHB is what is primarily used to indicate and identify the presence and severity of ketosis in cows. Higher levels of BHB are associated with low intake and body condition loss, subsequently decreased milk production and increased susceptibility to other metabolic diseases such as retained placentas, metritis, reduced reproductive efficiency, and displaced abomasum. Research has shown that clinical ketosis is associated with a 4-10% reduction in pregnancies per AI service and a 2-3 day increase to days to first service.

Like other metabolic disorders, there are varying levels of severity in ketosis. Subclinical disease refers to a state where the body isn't yet showing observable symptoms, and clinical is where the body is showing observable symptoms. A cow can have subclinical ketosis and not present any symptoms, but still have some of the negative effects of the disease including decreased milk yield. The BHB concentrations in plasma or serum ranges from 10-14 mg/dl during subclinical ketosis, but anything over 14 is considered clinical. These concentrations should be measured between 7-14 days in milk. The incidence of clinical ketosis ranges from 2-15% while subclinical ketosis has been found to be as high as 80% in some herds.

In general there should be less than 5% incidence of clinical ketosis in a herd and less than 10% of subclinical ketosis. So how do you identify a disease that sometimes does not present with symptoms, and when there are symptoms, they're nonspecific? There are several field diagnostic procedures that involve measuring ketone body presence in the blood, urine, and milk. There is a cow-side blood test using the Precision Xtra. Although it has been validated by the University of Wisconsin and only requires a small amount of blood, usually from the tail vein, it can be cumbersome to collect blood from cows when trained labor is minimal. Urine strips offer accurate performance and an alternative to collecting blood, even though urine collection brings its own set of complications as collecting urine can be time consuming, and it also is unable to identify subclinical cows. Milk test strips are also available and several studies have found them to have good sensitivity. It is best to collect the sample from the fore strip milk while milking in the parlor. When performing herd-level testing, use at least 12 fresh cows, but it's not uncommon for producers to test every fresh cow between 7-14 days in milk.

Ketosis can cause a major financial strain on an operation. Clinical or subclinical ketosis can reduce milk yield by 2-6 lb./day, and although there are other costs associated with this metabolic disease from reproductive delays and premature culling, reduced milk yield has the most impact. It's been estimated that a cow with ketosis can have up to 500-800 lb. lower milk yield during her lactation. Although reaching a 0% incidence is unlikely if not unrealistic, there are treatments available and management decisions that producers can make to help bring this incidence down on their operations.

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DIETS IMPACT COW PERFORMANCE AND FARM INCOME

Dairy cow diets have a huge effect on a dairyman's bottom line When we think about milk as an output, the most direct input into that system is the feed. That energy, protein, and fat are directly converted into milk. Feed cost has regularly been the highest cost on dairy farms. According to Farm Credit East's 2018 Northeast Dairy Summary, feed cost is the largest expense on dairy farms. Between the years 2017 and 2018, feed cost increased for most dairy farms correlating with an increase in feed expense per cow over the same year. The bottom line: feed is expensive. We often use benchmarks such as feed cost and income over feed cost to consider the position of our dairy farms but we don't often think about what we are capturing in those benchmarks.

Mail Box Price = $16.00/cwt Milk Production = 80 lb/cow Cost of Corn Silage = $30/ton Cost of Alfalfa Silage = $160/ton Cost of Concentrate = $500/ton Corn Silage in the Diet = 65 lb as fed Alfalfa in Diet = 14 lb as fed Concentrate in Diet = 22 lb as fed	**Income:** 80 lb/cow x $16.00/cwt ÷ 100 lb/cwt = **$12.80/cow** **Expense:** Corn Silage: $30/ton ÷ 2000 lb/ton x 65 lb/cow = $1.14 Alfalfa: $160/ton ÷ 2000 lb/ton x 14 lb/cow = $1.12 Concentrate: $500/ton ÷ 2000 lb/ton x 22 lb/cow =$5.50 Total Diet Cost= $1.14 + $1.12 + $5.50 = **$7.76/cow**
IOFC: $12.80/cow - $7.76/cow = **$5.04/cow**	

IOFC calculation on an individual basis.

Income over feed cost (IOFC) or income over purchased feed cost is a "gold" benchmark that many dairymen and dairy consultants use as a guide to farm profitability. By going a step beyond feed cost and benchmarking the potential output from the feed, IOFC captures the potential productivity of a ration. This term is defined as the income remaining after paying for both purchased and farm raised feed. The drivers for IOFC are milk output, milk price, feed costs, feed efficiency and forage quality.

To determine IOFC, you most know the milk yield (lb/cow/day), milk price ($/cow/day) the ingredient composition of the diet (lb/cow/day) and the price of each ingredient ($/ton).The calculation looks at milk income minus lactating cow feed costs. IOFC can be calculated on both the individual and herd level. At the individual level, the calculation looks like this: Milk production per cow x Milk price ($) ÷ 100 pounds per cwt all subtracted with the cost of each feed per ton ÷ 2000 pounds per ton x as fed pound consumed of that ingredient per cow per day. An example of this calculation can be found in the table above.

Although calculating IOFC on an individual basis may help to calculate income and expenses per cow, there are considerations between calculating milk produced by cow and milk shipped from the farm. Doing an IOFC on a herd basis may help to capture animals that may not be under normal lactating management. For example, sick cows will still need to be fed whether their milk is discarded. For example, a dairy farm's income per day is $5,120 (32,000 lb. at $16.00 cwt), it milked 400 cows in the tank that day. The daily feed expense is $3,220.40 (415 cows x $7.76/cow) with 415 cows that needed to be fed a lactating diet. This leads to a total IOFC per day of $5,120 - $3,220.40 = $1899.60 on the herd basis. Comparing this number to the example in the table, the farm still expects IOFC to be $5.04/cow, and it feeds 415 cows. The farm is expecting a total daily IOFC of $2,091.60 when calculating on an individual basis. This is an overestimation of IOFC when considering the value of the milk that is shipped from the farm. That is a 10% difference in daily IOFC on a cow basis compared to a herd basis.

Using IOFC on an individual cow and herd basis can both have their purposes. At the individual level, you can manage what the expenses for a normal cow on your farm looks like. At the herd level, IOFC can accurately capture real milk income in a more dynamic management setting. It is recommended to review IOFC at least once a month, or any time there is a large change in the diet, change in commodity pricing, or a change in milk receipts. At this time in the dairy industry, many farmers are looking for ways to save money. For many people, this may mean reducing feed cost. But with a reduction in feed cost, you must also remember to change expected milk income. With each potential diet created, remember to compare IOFC in each expected scenario. Feed is much more than a cost, it's also a direct investment on milk revenue.

— Kristen Gallagher
gallagher@whminer.com

#MINER GRATITUDE

The Miner team is truly the best team. Our staff are dedicated and believe in our mission and are willing to go the extra mile to do what needs to be done. Our staff genuinely care for the animals, the students, the research, the mission.

We are so grateful.
Here are a fwe snapshots of some of our team at work.
#Minergratitude

Dan Belrose and Mark Gonyo have each been part of the Miner team for nearly 20 years. They are part of the maintenance crew here at the Institute. They recently replaced a 2000-gallon bulk milk tank with a 5000-gallon bulk milk tank. The old tank was removed and the new tank was installed and operational all in 1 day! We are incredibly fortunate to have such a talented, multi-faceted team here at Miner and there is very few tasks that our team cannot handle! Thanks for all you do, Dan and Mark! #Minergratitude

Bethann Buskey has been taking care of Miner Institute's calves for more than 16 years. Her compassion is pretty much unbeatable and her willingness to always put the animals first makes her track record in the calf program exemplary! She is an asset within our dairy program and another great member of the Miner team. Thanks for all you do, Bethann! #Minergratitude

Henry Meseck has been part of the Miner team for more than 35 years. He is part of the crops crew, and in this photo, he had just returned to the shop after picking stones, getting a field ready for planting. Henry is a valuable and knowledgeable member of the Miner team. Thanks for all you do, Henry!! #Minergratitude

Josh Duprey is part of our milking team. Milking is a critical part of our farm operation. The milk from our farm is shipped to the McCadam cheese plant in Chateaugay. Josh and the other milkers at Miner help us to maintain our highly-productive herd and ensure the health of our animals. We are so grateful for all you do, Josh! #Minergratitude

OUR TEAM IS STRONG & RESILIENT

Check out more #Minergratitude on the Miner Matters blog page and Miner Institute's Facebook and Twitter pages!

https://www.minermatters.com/miner-gratitude.html
https://www.facebook.com/MinerInstitute/
https://twitter.com/MinerInstitute

Steve Couture has been the Farm Manager at Miner Institute for 15 years. Steve oversees our dairy operation and is a critical part of shaping the future of the Institute as a member of the management team. In this image, Steve is pushing up feed for the dairy cows. As they eat, the cows push feed out of reach with their noses! Our dairy staff go through the barns several times a day pushing feed up so that they can reach it. Thanks for all that you do for the Institute, Steve! #Minergratitude

Conner LaPierre is part of our dairy team. Conner is doing a health check on one of our dairy cows. Ensuring that all the animals are healthy is an important part of our program. Conner works with our Herd Health Manager, Kevin, to make sure all our cows are in good health and that they receive appropriate care if they are sick. We are so grateful for all your hard work, Conner! #Minergratitude

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Best wishes and stay safe!

YOUR JUNE FARM REPORT IS HERE ENJOY!

Closing Comment

One good thing about being wrong is the joy it brings to others.

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