FARM REPORT

In This Issue:

Visit our blog:
minermatters.com

Like us on Facebook

facebook.com/ MinerInstitute

FROM THE PRESIDENT'S DESK: COWS ARE SENSITIVE TO STARCH

The interaction between dietary starch and fiber has been well studied over the years. Specifically, researchers have focused on the rumen and how too much rumen fermentable starch may reduce fiber degradation and overall energy available to the cow for milk and milk component production.

At Miner Institute we have been focused on how lactating cows respond to undegradable NDF at 240 hours of in vitro fermentation (uNDF240) and physically effective uNDF240 (peuNDF240). The peuNDF240 has been determined simply by multiplying uNDF240 by the fraction of ration particles retained on the 4-mm sieve using the Penn State Particle Separator (or the 1.18-mm sieve if sieving a dry sample in the lab).

In work conducted over the past few years, we wanted to assess how rumen fermentable starch interacts with uNDF240 and peuNDF240 – specifically at the lower end of the uNDF240 range found in lactation diets. Basically, we wanted to look at diets formulated for about 7% uNDF240 or about 4% peuNDF240 (DM basis). We know from experience that these rations have a greater risk for sub-acute rumen acidosis whereas diets containing more than about 10% uNDF240 (DM basis) are more likely to limit intake due to gut fill.

There are many take-homes from this research, but for this article I want to focus mainly on how milk fat responded to varying levels of starch with these lower uNDF240 and peuNDF240 diets. In this research we evaluated two levels of starch and rumen fermentable starch. On the lower end, we fed about 20.7% starch and 16.8% rumen fermentable starch. On the upper end, we fed 24.7% starch and about 19.1% rumen fermentable starch. Here is an important point to appreciate: Even our higher level of rumen fermentable starch is fairly moderate by industry standards. In practice we can easily find diets with 22 to 23% rumen fermentable starch.

Yet even with only modest rumen fermentable starch (19% of dry matter), we saw less milk fat and 3.5% fat-corrected milk production than cows fed about 17% rumen fermentable starch. Additionally, cows fed higher rumen fermentable starch tended to have lower efficiency of fat-corrected milk production. Mirroring the reductions in milk fat, cows fed moderately high levels of rumen fermentable starch also had lower acetate-to-propionate ratios in rumen fluid.

Overall, we found that feeding moderately

See **STARCH,** Page 4

ADDRESSING CONSUMERS' OPINIONS ON ANIMAL WELFARE

Connecting with the public and telling the story of dairy farming can lead to positive discussions with curious consumers. But what do we do when consumers' opinions of good animal welfare and farmers' practices of good animal husbandry diverge? First, it's important to make the distinction between animal welfare and animal husbandry.

Animal welfare is rooted in maximizing the quality of life for the animal. Dr. Jennifer Van Os researches animal welfare from a biological perspective at the University of Wisconsin-Madison. She discussed the relevance of animal welfare to the animal, producer, and consumer during the PRO-DAIRY and Northeast Dairy Producers Association Virtual Operations Managers Conference Series. She framed her discussion around the components of animal welfare: health, nutrition, environment (temperature, air quality, shelter) and behavior (choices, variety, social interaction). Animal husbandry is an approach to providing quality animal welfare through the production and care of domestic animals. As agriculture intensifies and evolves from its traditional feel, consumers' perceptions of good animal welfare deviate from practices of good animal husbandry. Addressing this disconnect is important for the future of the industry as people want to feel comfortable with the food they eat and buy.

The first step to bridging the gap between the consumer and farmer is transparency. Whether through farm visits, social media, podcasts, or news outlets, transparency boosts the dairy industry's credibility and trust from the consumer. Dr. Van Os described a study in Canada that surveyed people on their perception of dairy farming before and after a farm tour. Of the visitors, 24% had an improved perception of dairy farming, due to the proof of good nutrition and health throughout the herd. However, this study also exposed that transparency isn't always sufficient in easing consumers' minds; 32% became more critical of dairy practices. These visitors were concerned with the behavior aspect of animal welfare and were not convinced during the tour. Other studies find similar results: the divergence lies primarily in the behavior component of animal welfare. Outdoor access, space per cow, cow-calf separation, and social interaction all fall under the behavior category of animal welfare. How do we address these difficult topics?

Dr. Van Os suggests focusing on what the farmer can and may need to in the future to improve upon their practices. She emphasized the importance of following the latest best practices that derive from scientific evidence, which is beneficial to both the welfare of the animal and public perception. A paper from the University of British Columbia also suggested the need to adjust practices, determining that the best approach to interacting with consumers is allowing two-way engagement. Listening to the public's concerns about animal welfare and reworking practices to mitigate those concerns might be the best way to overcome differences. An example is phasing into building structures that promote freedom of movement and cow comfort (ie., more space per cow). In the long term, dairy farmers may also need to provide some degree of outdoor access and decrease cow-calf separation. It is important to embrace the idea that knowledge is fluid; producers should modify practices based on scientific evidence to improve both consumer acceptance and animal welfare.

In addition to transparency and the willingness to change, one of the most powerful tools for connecting with consumers is showing how much we care. During the Pennsylvania Dairy Summit, Amy Leslie, the Director of Industry Relations at American Dairy Association Northeast, discussed how to communicate effectively with consumers. Leslie emphasized the importance of speaking with "one voice" as the dairy industry. Big and small, organic and conventional — all farmers care about their animals. You might be the only dairy industry contact point that a concerned consumer has, so make it count. During their talks, Leslie and Dr. Van Os referenced the same Theodore Roosevelt quotation, "Nobody cares how much you know until they know how much you care." Communicating how much you care, rather than how much you know, is oftentimes more effective. Both consumers and farmers want the best for animals; listening to each as well as scientific evidence can lead to improved practices and stronger trust.

— Julia Fouts
fouts@whminer.com

NAG, NAG, NAG

April is when some of us advising farmers gently remind them of the need to do various "spring things". Timing is everything, particularly as perennial plants break dormancy, soon followed by the need to get crops in the ground. Following are a few chores you should soon be checking off your "to do" list:

- Fertilize **grass fields** with manure or N fertilizer. You shouldn't need a complete fertilizer if you apply manure at least once during the growing season, but 70-100 units of N per acre as the fields are greening up is critical for good yield and protein content. Is a 4-to-1 payback (increased crop value vs. fertilizer cost) enough to move the needle? (Our research showed a 5-1 payback but N prices are somewhat higher this spring.)
- **Mixed stands** with at least 50% grass will also benefit from topdressed N — about 50 units of N per acre, with more or less depending on the amount of grass in the stand. That's equivalent to just over 100 lbs. of urea or 150 lbs. of my favorite N source: a 50-50 blend of urea and ammonium sulfate. Topdressed N will not hurt the alfalfa in a grass-alfalfa stand.
- Walk your **alfalfa fields** after they begin spring growth. Winterkilled plants are easy to ID, but also look for alfalfa plants that are alive but visibly less vigorous than others in the immediate area. The slow growth could be a sign of insect damage to taproots, or root rot due to cracked crowns from prior wheeltrack injury. You can't do anything to heal damaged plants, which may die as the soil dries. This could affect your crop rotation plans, but better to know this sooner than later.
- Don't be in too much of a hurry to start **corn planting**. Most corn hybrids won't germinate until soil temperature at planting depth is at least 50F. Corn planted the first week of May (or before) usually isn't any higher yielding than corn planted a week later. When you finish planting is probably more important than when you start: A reasonable goal in much of the Northern U.S. is to be done by the last week of May. If this seems impossible maybe you need more labor, bigger equipment, or better drainage.

— *Ev Thomas*
ethomas@oakpointny.com

STICKER SHOCK

Fertilizer prices are very high this spring and likely won't come down much anytime soon. Compared to January 2021, diammonium phosphate (DAP) is up over 25%, muriate of potash is about 15% higher while urea is at least 30% more expensive. This is bad news for farmers, but less so for dairy farmers since they have a high-quality source of nutrients: manure. Past manure applications probably have increased plant-available P levels, in some cases enough that little or no phosphorus fertilizer is needed. A recent soil test is the only way to be sure. CAFO farms are required to soil test each crop field at least every third year, and since soil test P levels rarely change much from year to year, a field with a high soil test P in 2019 is probably still high in 2021.

Potassium is a different deal altogether since crops — particularly corn silage and alfalfa — remove a lot of K. Depending on the application rate, even fields with a history of manure use may need some K fertilizer. Grasses are much more efficient in K uptake so you should focus on your alfalfa and alfalfa-grass fields, and I wouldn't rely on a 3-year old soil test nearly to the extent as for soil P status. You'll probably need a fertilizer source of N for spring applications on grass fields, but summer N needs can usually be supplied by topdressed manure.

— *E.T.*

NOTABLE QUOTES

- Where we come from is who we are, but we choose every day who we become. — *J.D. Vance, in "Hillbilly Elegy"*
- The only function of economic forecasting is to make astrology look respectable. — *John Kenneth Galbraith*
- Never doubt the courage of the French. They were the ones who discovered that snails were edible. — *Doug Larsen*
- Get your facts first; then you can distort them as you please. — *Mark Twain*

OPPORTUNITY FOR IMPROVED ANTIBIOTIC STEWARDSHIP ON DAIRY FARMS

Antibiotic usage in agriculture has received a lot of attention over the past several years as consumers are becoming more aware of and concerned about antibiotic resistance. Recently, Wemette et al. (2021) surveyed 1,000 U.S. citizens on their perceptions of antibiotic usage in the dairy industry. Of those that responded, 90.7% reported that "antibiotic usage on dairy farms pose some level of threat to human health" and 71.5% reported that "they would be willing to pay more for milk produced from cows raised without antibiotics". As an industry, we need to continue to address these concerns while ensuring the health and welfare of our animals. One area of opportunity for improved antibiotic stewardship on farms is in the preweaning period.

Diarrhea in calves can be caused by a variety of different enteropathogens including bacteria (E. Coli, Salmonella), viruses (coronavirus, rotavirus), and protozoa (cryptosporidium). Not all are susceptible to antibiotics, and it's difficult for producers to identify the pathogens causing diarrhea and then make the decision to treat affected calves with antibiotics. Broad-spectrum antibiotics have proven to be an effective treatment for calves affected by some bacterial diarrhea; however, antibiotics will not treat viral, protozoal, or parasitic agents. Antibiotic treatment of viral, protozoal, or parasitic diarrhea is not only an ineffective and unnecessary cost to the farm, but also

See **ANTIBIOTICS**, Page 5

Figure 1. Prevalence of various pathogens identified in fecal samples collected from pre-weaning calves with diarrhea on NNY dairy farms, NNYADP project, 2020.

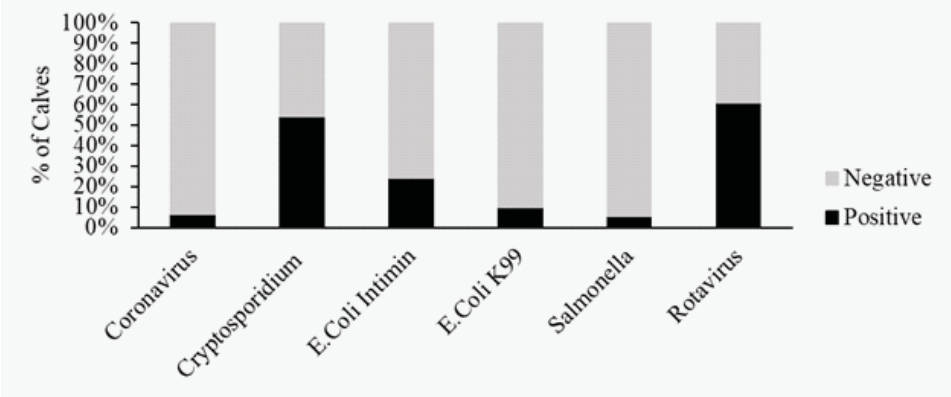
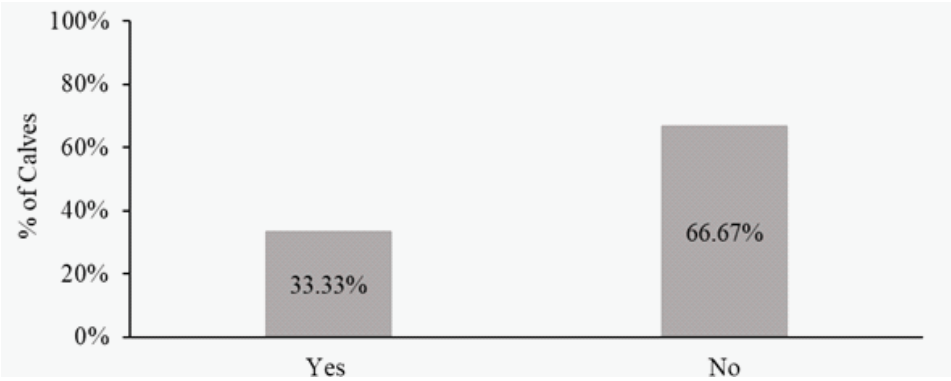


Figure 2. Percentage (%) of pre-weaning calves with diarrhea required antibiotic treatment based on assumption of bacterial pathogen identified in the fecal sample.



STARCH, Continued from Page 1

high rumen fermentable starch depressed fat-corrected milk production when diets contained relatively low content of uNDF240 and peuNDF240. Since uNDF240 has become a common measure of dietary fiber characteristics, understanding how cows respond to starch at varying levels of uNDF240 is important. Our work indicates that the risk of milk fat depression will increase when dietary uNDF240 to rumen fermentable starch ratio is 0.43 or lower, or when the peuNDF240 to rumen fermentable starch ratio is 0.51 or lower. We need more research to be certain, but for now tracking these ratios may prove useful to avoid milk fat depressing diets.

It is likely that the negative effects that we observed on milk fat will be amplified with higher levels of dietary starch. The bottom line seems clear: we need to consider the interaction between rumen fermentable starch and uNDF240 or peuNDF240 when formulating rations. High producing cows are sensitive to starch and its rumen fermentability. When we formulate lower uNDF240 diets, modest levels of rumen fermentable starch are all it takes to depress milk fat.

— *Rick Grant*
grant@whminer.com

THE PASSING OF DR. PETER VAN SOEST

As many may know by now, Dr. Peter Van Soest passed on March 21. This has been a sad day for all of us who worked with him. For those who formulate rations, we are all familiar with the fiber assays for ADF, NDF and Lignin. Peter developed these assay methods many, many years ago and they are used worldwide.

Dr. Charlie Sniffen and Dr. Peter Van Soest

I spent many hours with Pete while at Cornell University, Miner Institute, and many times since then. While at Cornell we would frequently leave the office on Friday afternoon, go to a local restaurant for relaxation, and within about an hour, all our students would join us. We would throw ideas around, challenging many students to look at things differently. I would add that this is evident in the 30+ emails that I have read so far about his passing. Pete wrote two books on nutrition plus many, many articles which I refer to frequently. We talked many times on the phone. Pete provided more than the assay methodology; he provided an insight into many subjects in the nutrition area as well as two of his passions, music and cooking!! He brought to us an intellect and challenged us to think about concepts clearly and differently.

A sad time for us – so far there has been many wonderful messages and remembrances from many places in the world. We will miss his insight and equally important, a wonderful and dear friend for many of us. I could go on about the many times he would come to Miner Institute to work with us and share his thoughts about forages and other areas. For students at Miner, class time with Pete included a romp through a corn, grass or alfalfa field, chewing on some specific sweet parts of the plants, then a discussion covering concepts and ideas about what we saw as in the fields as well as in the classroom.

His contributions transformed the way we feed ruminants, and his legacy will endure forever.

— *Charlie Sniffen*

ANTIBIOTICS, Continued from Page 4

may increase the chance of antibiotic resistance.

A project funded by the Northern New York Ag Development Program in 2020 sought to characterize the prevalence of different enteric pathogens in calves that were treated with antibiotics in response to diarrhea on Northern NY dairy farms. The aim of this research was not to discredit the efficacy of antibiotic treatment or to suggest that antibiotics should not be used for diarrheic calves. Rather, the objective was to identify an opportunity to minimize antibiotic use in situations where the animal will not benefit.

Overall, 72 fecal samples were collected from diarrheic calves that were subsequently treated with antibiotics and submitted for diagnostic testing. The results indicated that the prevalence of pathogens infecting pre-weaned calves was variable across the region (Figure 1). The most prevalent pathogens were Rotavirus (61.1% of calves sampled testing positive), Cryptosporidium (54.4%), and E. coli (24.4% for E. coli intimin and 10% for E. coli K99). The least common pathogens were Salmonella (5.6% of calves sampled testing positive) and Coronavirus (6.7%).

Only 33% of those calves sampled required antibiotic treatment based on the identified pathogen, i.e., bacterial species (Figure 2). However, this assumes that all cases of E. Coli and Salmonella were suitable candidates for antibiotic treatment, which is not necessarily the case. Overall, it was impactful to determine the frequency of potentially unnecessary antibiotic usage for diarrheic calves on these NNY dairy farms. These findings highlight the importance for dairy farmers to improve their antibiotic stewardship and present an opportunity for herds to continue to work with their veterinarians on treatment protocols for calves with diarrhea. In the future, we're hopeful that more reliable on-farm tests will become available for rapid identification of pathogens so that farms can use this to assist in treatment decisions.

Acknowledgements:
Thank you to the Northern New York Agriculture Development Program for funding this project, to the collaborating staff from the CCE County Associations, Miner Institute and Cornell PRO-Dairy, and the participating producers across NNY.

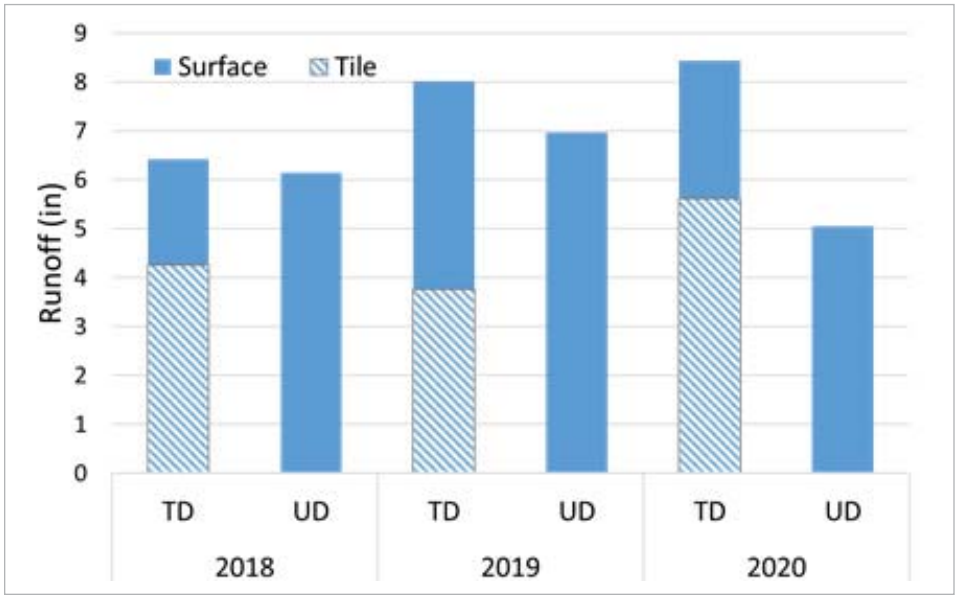
— *Casey Havekes*
chavekes@cornell.edu
— *Sarah Morrison*
morrison@whminer.com

TILE DRAINAGE EFFECTS ON RUNOFF GENERATION

Tile drainage is a crucial practice for many dairy farms in regions such as the Lake Champlain Basin where poorly drained soils and shallow water tables contribute to a relatively short growing season. Despite the high natural fertility of our soils, their natural yield potential can be low given the high frequency of ponding and soil saturation. The increased drainage capacity provided by tile drains in these fields allows for improved conditions in the spring for seed germination and crop growth, as well as overall increased crop yields and quality. This can greatly increase the economic sustainability of a farm by enabling a higher percentage of feed to be home-grown, rather than relying on purchased forage and feed commodities. There is also less variability in yields from year-to-year, which allows for better planning.

Despite the wealth of agronomic benefits that tile drainage systems provide, there is concern regarding its impacts on water quality, though few projects have specifically investigated this issue. Funding from the Northern New York Agricultural Development Program has provided the opportunity for Miner Institute to investigate its impacts on water quality through an edge-of-field monitoring project on two adjacent fields owned and operated by Adirondack Farms in Keeseville, NY.

The two fields are very similar with respect to size, slope, soil type, cropping history, and current management, with the exception that one was tile-drained (35 ft lateral spacing, 4 ft depth) two years prior to the start of monitoring. Both fields are managed for corn silage with tillage-incorporated spring manure applications, starter fertilizer at planting, and a fallow period from corn harvest until spring planting. Surface runoff and tile drainage flows from the tile-drained field (TD) and surface runoff from the non-tiled field (UD) are continuously measured and sampled year-round, allowing annual estimates of runoff, sediment, phosphorus (P), and nitrogen (N) losses.



During the first three years of the project (2018-2020), average annual runoff from TD (surface + tile) was 26% greater than UD (surface), with 7.62 in/yr and 6.05 in/yr of runoff from each field, respectively. These drainage rates represent 19% and 24% of the 31.3 in/yr average precipitation rate during the same 3-yr period. In addition to increasing total runoff, the installation of tile drainage also typically changes the primary runoff pathway to subsurface drainage rather than surface runoff. Although surface runoff remained an active pathway in TD, generating 40% of the total field drainage, there was a 49% reduction in surface runoff relative to UD.

Much of the increase in drainage from TD was due to tile drainage during baseflow periods (draining an elevated groundwater table) and tile flow in response to small to moderate rainfall events that did not generate surface runoff in either field. However, during the larger runoff events that produced surface runoff, total drainage rates tended to be very similar between the two fields. In some cases, subsurface drainage was sufficient to prevent the occurrence of any surface runoff in TD. During the majority of the large events, the main difference between the fields was that the drainage from TD was a combination of surface runoff and tile flow.

Throughout the study, the nongrowing season (NGS; October 16–April 15) was consistently the dominant period of runoff from both fields. Despite 54% of the total precipitation occurring during the growing seasons over the 3-yr monitoring period, 79% and 88% of the drainage occurred during the NGS in UD and TD, respectively. In TD, 91% of surface runoff and 86% of tile flows occurred during the NGS. These patterns are common in cold, humid climates where groundwater tables rise in the NGS as a result of limited evapotranspiration due to cold temperatures and a lack of crop uptake. Additionally, snowmelt events that provide a sudden influx of drainage water and periods of frozen soil with limited subsurface drainage capacity provide highly favorable conditions for the generation of large runoff events.

Stay tuned for next month's Farm Report, when we'll take a look at how the differences in runoff impacted nutrient and sediment losses.

— Laura Klaiber
klaiber@whminer.com

3 KEY ELEMENTS TO HEAT ABATEMENT: SHADE, AIR, AND WATER

While we're still experiencing some chilly weather here in the North Country, summer is fast approaching, and it's important to start thinking about heat abatement strategies for our cattle. Lactating dairy cows begin experiencing heat stress at a Temperature-Humidity Index (THI) of 68, resulting in lowered dry matter intake, milk yields/components, and lying times. As cows increase their standing time and start slug feeding when it's cooler at night, increased lameness can also become prevalent in the herd. When considering what heat abatement system may be suitable for your farm, it is essential to think about three things we can provide to help cool our cattle: shade, air, and water.

Shade. Shade is the most basic and arguably most important form of heat abatement that we can provide to dairy cattle as it protects them from harsh solar radiation. If cows are housed in a barn, orient it to minimize direct sunlight shining in on the cows. East-west-oriented barns are best equipped for this, but shade cloths can be added to any barn to help mitigate solar radiation exposure. Miner Institute added a shade cloth to protect cows that are periodically housed in our research tiestall from the late afternoon sun.

For cows on pasture, shade can be provided naturally with trees or artificially with the addition of a shade structure. When building a shade structure, it's recommended that food and water are located underneath with at least 45.2 ft^2 (4.2 m^2) per cow of ground space. A recent Minnesota study published in the Journal of Dairy Science suggested that solar panels may be a viable option for providing shade for cows on pasture. When mounted at a 35-degree angle and 7.9 to 9.8 feet (2.4 to 3 m) from the ground, they can provide much-needed shade for the animals while providing producers with the added benefit of solar energy for the farm for 25-30 years.

Air. Two aspects that make air an effective cooling mechanism when cattle are housed in a barn are air exchange and air velocity. There must be adequate air exchange so that air quality is sufficient; this can be provided using natural or mechanical ventilation systems. To increase air velocity, fans should be mounted to provide at least 4.92 mph (2.2 m/s) at a cow's standing and resting height to sufficiently cool them down. To accomplish this, mount fans 6.9 to 7.8 feet (2.1 to 2.4 m) above stalls at a 15 to 20-degree angle. When deciding where to prioritize fan placement in a free-stall barn, it's better to consider placing fans over stalls before placing them over feed alleys because cows should spend more of their daily time budget lying than eating.

Water. The first step to cooling cows with water is to ensure that fresh drinking water is available. Drinking water is an excellent, natural mechanism that cows use to cool themselves, but they can only do so if the water is readily available and easily accessible. Make sure that water troughs refill at a fast enough rate so that cows can drink at their liberty. If you notice that water troughs are empty and cows are waiting for them to fill, you may need to add another water source to that area during the summer. Lactating dairy cattle drink 20 to 40 gallons (75 to 150 L) of water per day. During the summer, it's been estimated that they will drink an additional 0.4 gallons (1.52 L) per day for every 1.8°F(1°C) increase in ambient temperature when the THI is greater than 68. It is crucial that water troughs refill at a rate of 3 to 5 gal/min (11 to 19 L/min) and that there is 2.5 to 3.5 in (6.5 to 9 cm) of length in water trough access for each animal.

After ensuring drinking water availability, sprinklers and misters can be added in addition to fans to cool cows through direct or indirect evaporative cooling. Indirect evaporative cooling is accomplished by lowering the ambient air temperature that a cow is experiencing, which can be achieved via misters. These misters should be mounted above cow level where their water output can evaporate before hitting the cow's back and can cool the air. Direct evaporative cooling is accomplished with the use of sprinklers that puts water on a cow's back. This water is cooler than the cow's body temperature, causing it to evaporate and lower its body temperature. These tools must be implemented along with fans to ensure water will adequately evaporate.

Regardless of where your farm is located in the U.S it's important to provide heat abatement to your cows to improve animal well-being. It's been estimated that a lack of heat abatement costs the dairy industry $897 million every year. With profit margins getting slimmer and slimmer, let your cooled comfortable cows help you increase your farm's profitability this summer.

Recommendations were from the American Dairy Science Association's Large Dairy Herd Management, Third Edition (2017).

— Emily Fread
fread@whminer.com

**References available upon request:*

The William H. Miner Agricultural Research Institute
1034 Miner Farm Road
P.O. Box 90
Chazy, NY 12921

Change Service Requested

Non-Profit
Organization
U.S. POSTAGE PAID
Chazy N.Y. 12921
Permit No. 8

Closing Comment

Always borrow money from pessimists; they won't expect it back.

www.whminer.org
518.846.7121 Office
518.846.8445 Fax