

FARM REPORT



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FROM THE PRESIDENT'S DESK: TIE STALL WELFARE REVIEWED

An excellent review on the welfare of dairy cows housed in tie stalls was published recently in the *Journal of Dairy Science* (2021. 104:9383) by researchers from the UK and the well-known animal behavior group at the University of British Columbia. As I drive around northern New York state I still see quite a few tie-stall barns, and I grew up on a St. Lawrence County farm with tie stalls and stanchions. So, this review caught my attention.

Although the majority of dairy cows in the U.S. are housed in free stalls and other loose housing systems, USDA data tell us that about 39% of dairy farms primarily use tie stalls. We rarely focus on tie-stall systems in the dairy industry and so this review will be a great resource for anyone working with these farms. Two obvious differences between tie stalls and less restrictive housing are exercise and freedom of movement. Tie stalls are inescapably restrictive, to some extent, for natural behaviors such as lying and turning around. Provision of pasture or other exercise opportunity is important for good welfare, and USDA indicates that 73% of tie-stall farms in the US offer pasture at various times throughout the year.

As summarized in this article, scientific opinion on the welfare of cows housed in tie stalls ranges from flat-out opposition to acceptance of well-designed systems. Clarity is much needed, and the main goal of these researchers was to conduct a systematic

review of the published literature on welfare of cows housed in tie stalls. They focused on the three components of welfare: basic health and biological function, natural behavior, and affective state.

Their data set consisted of 102 papers published between 1981 and 2020 with the majority of studies conducted in Scandinavia and North America. By far, health outcomes for cows housed in tie stalls vs. less restrictive housing were the most common focus of these papers with far fewer focusing on natural behavior and affective state. Affective state is not a commonly used word in our industry (though it ought to be), and it refers mainly to freedom from hunger and thirst; pain, injury, and disease; and fear and distress.

The review found that cows in tie-stall barns had less prevalence of white line disease and digital dermatitis, while cows in loose housing experienced fewer leg lesions and injuries. Unsurprisingly, the prevalence of mastitis and transition cow diseases didn't seem to differ in any consistent manner between tie- and loose-housed cows. Design of the stall system and its management results in considerable variation in the health of cows.

Behaviors associated with lying down and standing up are often negatively affected in tie stalls. Anyone who has spent time in a tie stall barn, especially one that was not well

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MITOCHONDRIAL DISEASE IN DAIRY HERDS

A few weeks ago I attended the Cornell Nutrition Conference in Syracuse, NY. One talk that caught my attention was “Biogenic Small Molecule Screening to Combat Mitochondrial Disease” by Dr. Joeva Barrow from Cornell University, which described the importance of mitochondrial disease in the dairy industry and gave insight into a potential way for treating it.

Commonly referred to as the “powerhouses” of the cell, mitochondria are one of the most important components of cells. Mitochondria are small, complex structures called organelles which reside inside most animal cells. They contain their own unique DNA sequence that does not correspond with nuclear DNA. Mitochondrial DNA is responsible for providing the building blocks used in energy production. Mitochondria perform a variety of roles necessary for cellular metabolism and homeostasis. They are most commonly known for synthesizing cellular energy (in the form of ATP), though they are also responsible for processes such as calcium metabolism, programmed cell death (apoptosis), regulation of the immune system, stem cell management, heat production (thermogenesis), and hormone synthesis. Proper mitochondrial function is an important part of

animal growth and production.

Mitochondrial disease is a blanket term referring to any disorder resulting in loss of mitochondrial function. Because mitochondria are essential for energy production and metabolic processes, any small mutation in mitochondrial DNA has the potential to negatively affect tissues and organs throughout the body. The tissues and organs most affected by mitochondrial disease are those that require high energy input. For dairy cattle this would include mammary tissues, reproductive organs, and tissues associated with the immune system. There can be a wide array of symptoms depending on what tissues are affected and what kind of disorder is present. Some common symptoms include increased risk of infection, stunted growth, muscle fatigue, loss of coordination/memory, seizures, and organ disease/failure. At present, there is no practical way to tell if a cow’s decline in health is due to a mitochondrial disease.

Mitochondrial disorders can remain hidden in an animal for years before finally taking effect. There is no phenotypic expression associated with the disease. Therefore, the only way to test for it before symptoms become evident would be through genetic screening. Even

if genetic screening of every animal in a herd was feasible, there is not much that can be done to mitigate symptoms, as there is no treatment or cure available at this point in time. Unfortunately, mitochondrial disease cannot be bred out of a herd. Unlike typical heritable traits (i.e. milk yield, yearling weight, birth weight), mitochondrial DNA is directly inherited from the dam with no input from the sire. Any bred heifer/cow with a mitochondrial disorder will pass it on to her calves 100% of the time. As of today, the only way to manage mitochondrial disease in a herd is selective culling.

Mitochondrial diseases will be better understood as more research is conducted. Uncovering what genes (if mutated) are responsible for development of these disorders will inevitably help develop more reliable diagnostic strategies. More research needs to be done to develop effective screening and treatment methods. Currently, Cornell University is looking into the therapeutic properties of biogenic small molecules. One molecule identified, oxybutynin, has been shown to negate the effects of a particular subset of mitochondrial disease, and may be used as a treatment in the future.

— Emily Youngmark
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2022 CROP INPUT COSTS: IT'S GETTING UGLY

Correction: Not only is it *already* ugly but it's butt-ugly. Fertilizer prices have skyrocketed (a cliched term but in this case appropriate), and won't be coming down anytime soon. By spring there's a good chance that they could be higher — particularly nitrogen fertilizers. Anhydrous ammonia, not commonly used in the Northeast but the standard N source in the Corn Belt, is approaching \$1000 and may be \$1200 per ton by 2022 spring planting. The price per pound of nutrient is already over \$0.60 for all three major fertilizer products commonly used in the Northeast: MAP in starter and blended fertilizers, urea and liquid N (UAN), and muriate of potash. That works out to about \$15 in fertilizer cost in each ton of corn silage. And you've already paid for these nutrients, either in fertilizer purchases or in the nutrients in the forages, minerals and grains you feed your livestock that are excreted as manure. This amounts to about \$300 per acre nutrient "investment" in a 20-ton yield of corn silage, and that doesn't account for any secondary or micronutrients. That's more than you paid for the fertilizer used in 2021, but approximates what it will cost in 2022 — and that's a conservative estimate that will be influenced by supply and demand as well as transportation issues. (I already had to rewrite this article once due to continuing price increases, and by the time you read this it might need further adjustment.)

Another product in the news is glyphosate (Roundup), as the prices of this herbicide have increased greatly recently. And that's if you can find it since supply shortages are a growing concern. Some Midwest suppliers have been charging \$80 per gallon for glyphosate, several times what it cost this past spring. China is the world's largest producer of glyphosate, exporting 80% of what it produces or about 60% of the global supply. There are long delays in getting products from China into the U.S., with California ports clogged with container ships waiting to unload, and also the trucker shortage.

In the past farmers have had to contend with fluctuating input costs, but not with product availability. This is no longer the situation. Of particular concern is the future supply of phosphate fertilizers, a threat the fertilizer industry has known about for many years but which hasn't received much press. To the extent possible try to tie up crop input supplies as soon as possible, and if you have room for the product on your farm remember the old saying about a bird in the hand...

— E.T.

HOW TO TOILET TRAIN YOUR COW

The above headline, which was in a recent issue of *The Economist*, is one I never thought I'd write. A group of German scientists, in a case of the triumph of hope over experience, is attempting to train dairy cattle to urinate in a particular area, where the urine could be collected thereby reducing ammonia emissions. The trial consisted of 16 calves who were rewarded with molasses or barley if they peed in a designated area. If they didn't, negative reinforcement consisted of a spray of water. (Wonder what PETA would say about that?) Were they successful? Somewhat. Of the 16 calves, 11 (65%) were deemed to be "successfully toilet-trained". The researchers noted that dairy cattle are fairly intelligent animals (compared to what?), and their success rate with calves was roughly comparable to the success in toilet-training children. But almost all children eventually become toilet-trained since a 35% failure rate would be, shall we say, inconvenient. As-yet unanswered questions: Can the "carrot or stick" method of toilet training be extended to dairy cattle feces? How would this work on a commercial farm? Even if it was technically possible, would farmers be willing to take the time to toilet train their calves and provide urine collection areas for each class of animal, knowing that perhaps one-third would choose not to participate?

— E.T.

NEW DIETARY GUIDELINES FOR AMERICANS PROVIDES WIN FOR THE DAIRY INDUSTRY

Have you had your daily dairy intake today? At the 83rd annual Cornell Nutrition Conference in Syracuse, NY, Dr. Jim Aldrich spoke about the new Dietary Guidelines for Americans (DGA) released in 2020, and the impact the new guidelines have on the dairy industry.

The DGA informs government funded programs like the Supplemental Nutrition Assistance Program (SNAP) and National School Lunch Program (NSLP) about dietary standards for meals. These guidelines are important for incorporating dairy products into meals and can have a huge impact on the dairy industry. Dr. Aldrich said that in 2019 the amount of fluid-milk, cheese, yogurt, and other dairy products that moved through these programs represented approximately 10 percent of U.S milk production.

According to the DGA, more than 80 percent of Americans have dietary patterns that are low in vegetables, fruits, and dairy. The new guidelines include dairy as one of the major food groups, the others being; fruits, vegetables, grains, oils, and protein foods. The dairy category includes milk, yogurt, cheese, low-lactose and lactose-free dairy

products. The guidelines include the health benefits of consuming nutrient-dense foods, including dairy products. Dairy product consumption has many health benefits, especially building and maintaining strong bones. The nutrients in dairy products, including calcium, potassium, vitamin D, and protein, are important for health and maintenance of your body. For most ages, three servings of milk daily are recommended (one serving is one cup of milk). An easy place to see the dairy consumption guidelines is on [myplate.gov](https://www.myplate.gov), where it is listed along with the other main food groups. The 2020-2025 DGA can be found at https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf.

An important aspect of the new guidelines is that they do not recommend other products sold as “milks” but made from plants (e.g. almond, rice, coconut, oat, and hemp “milks”) as adequate substitutes for dairy products. These products are not considered nutrient-dense, and their overall nutrient contents are not similar to dairy milk. These products have served as a major competitor to fluid-milk in recent years, so this is a big win

for the dairy industry! For Americans who choose not to consume dairy products, the DGA recommends soy-based alternatives.

Dr. Aldrich discussed how despite dairy products now being recommended as one of the major food groups, the DGA still states that saturated fats should be limited, so only low-fat and fat-free dairy products are being recommended. He also discussed how soy-based products were suggested as milk alternatives, despite the fact that they are an inferior product to dairy nutritionally and have a higher cost. There is still great value for consumers to know that dairy products are a great source of nutrients to include in their diet. Dr. Aldrich stated, “93 percent of Americans do not consume the recommended servings of dairy products. Therefore, if more people would adhere to these guidelines, dairy consumption in the United States would increase.” Together, as an industry, it’s time to spread the word to our colleagues, families, and friends about getting their recommended dairy intake!

— Kelsey Hefter
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Learn more about Miner Institute's equine program, visit whminer.org/equine



FEEDING 2021 CORN SILAGE

In a perfect world this article wouldn't be published until December, because dairy farmers would have enough 2020 corn silage to feed until at least then. But the world is far from perfect, and some farmers were caught short by a 2020 corn crop that didn't meet expectations. If you'll run out of corn silage in the coming weeks, work with your dairy feed consultant to decide when to start mixing the 2020 and 2021 corn crops. Avoid making sudden changes in rations; what Charlie Sniffen used to call "rumen buggies" take time to adjust to significantly different forages, and it's important to keep these microbes happy.

If possible don't cover 2020 corn silage with this year's crop, but as long as it's protected by an air-tight cover, after it's fully fermented silage should retain its quality for several years — perhaps more. I remember reading about silage that was discovered in the bottom of an old upright silo in Central NY. The silage was several decades old, but once the layer of spoilage

was removed what was under it was still palatable. We don't recommend long-term storage of silage, but it shows how stable silage can be once it reaches its terminal pH. Some farmers put up a bag or two of corn silage to feed between the following year's corn harvest and the approximate end of the calendar year. This can be three months of feed, so if you go this route make sure you put up enough to last.

The digestibility of corn silage increases significantly during the first month after ensiling. Seven-hour starch digestibility increases by at least 5 % points during those first few weeks of fermentation. Early increases in NDF digestibility are somewhat less, but are positive. After the first month NDF digestibility changes little if at all, but starch digestibility continues to increase for at least three months, perhaps longer. And as we've previously noted, the increase in digestible energy is enough that you may be able pull some corn meal or other starch source out of the

ration without suffering a loss in milk production.

As we've noted before, corn silage is composed of two very different feedstuffs. Well-eared, 35% DM corn silage has approximately equal quantities (dry matter base) of a modest-quality, high-fiber tropical grass (primarily the stalk and leaves) and a high-quality, low-fiber grain. During fermentation and the first several months of storage, not much happens to that tropical grass but a whole lot of changes are occurring in the grain.

On an unrelated note: My website <https://www.oakpointagronomics.com/> recently got a much-needed facelift. The website includes an archived monthly posting of topics (and the occasional rant) that are agriculturally-related but don't quite fit the Farm Report format.

— *Ev Thomas*
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TIE STALLS, Continued from Page 1

designed, will have seen problems with kneeling and hesitancy to lie down. Generally, physiological measures of stress such as blood cortisol and measures of cow comfort were better for loose-housed cows than those in tie stalls. The researchers did note that when ties cows are turned outdoors their affective state typically improves.

This review goes into remarkable depth on the essential differences in welfare between tie stalls and loose housing, and I have just scratched the surface. I would strongly encourage anyone working with tie-stall and loose housed herds to read this paper.

The bottom line of this review is that expression of natural behavior - especially lying - is restricted in tie stalls. When comparing tie stalls and loose housing, there are some health issues that are improved in one versus the other. For sure, providing access to outdoor exercise improves health and functioning for cows in tie-stall barns. The article ended with a call for more work on this topic and especially how housing influences affective state which is an important and too-long overlooked component of dairy cow welfare.

— *Rick Grant*
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SOBERING NEWS ON FERTILIZER PRICES

The price of fertilizer has increased by 15-20%, and all three major nutrients — nitrogen, phosphorus and potassium — will be more expensive in 2022 with little chance they'll come down anytime soon. Nitrogen fertilizer supplies will be stressed since winter fuel production will take precedence over the production of N fertilizers.

We've written at length on the value of livestock manure to supplement or replace commercial fertilizer, but something to focus on right now is soil analysis. CAFO Nutrient Management Plans require each crop field to be soil tested at least once every 3 years. Note the words "at least". Depending on how you do soil testing on your farm — about one-third of the fields

each year, or the whole shebang at once — you could be relying on some soil analyses that are as much as three years old. And this could be a problem.

For each crop field, how much manure have you applied since the last soil analysis? If the answer is "a lot" (and for some fields this may mean measuring application rate in depth, not tons or gallons), there's a fair chance that soil fertility — particularly P but perhaps K as well — has increased considerably. Some think that it makes no difference to the plant whether the source of nutrients is applied fertilizer or existing soil fertility, but actually it does: A field with high soil test P and K and little or no starter fertilizer will often outyield a

field with low or medium fertility even if a high rate of fertilizer is applied before or at planting. We know this to be true for alfalfa-grass seedings and soybeans, and I expect that it's true for corn and other crops as well. Therefore, now is a great time to soil sample fields that have had manure applied since the last soil analysis. If soil test P is high — much more likely for fields near the cow barn or manure storage — there's no need for starter P for corn or forage seedings: Extensive Cornell University on-farm research trials have confirmed this for corn. The price of fertilizer is much higher than a year ago, but the price of soil analysis has changed little if at all.

—E.T.

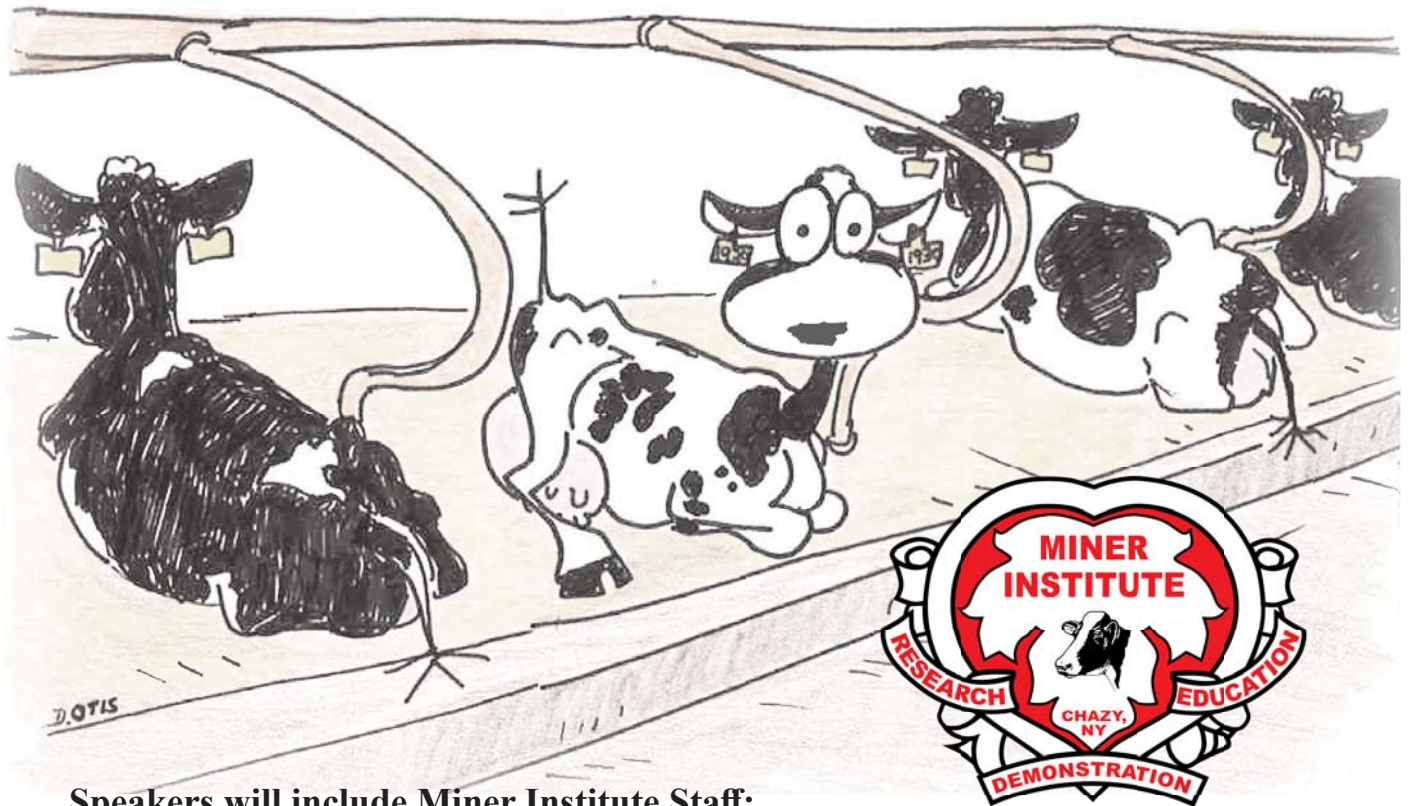
CONGRATULATIONS!



Graduate student Emily Fread, left, recently received first place honors in the Northeast American Registry of Professional Animal Scientists (ARPAS) student research contest for her poster and presentation titled: *Effect of episodic heat stress during the dry period of Holstein cows in confined housing in Northern New York*. The poster now hangs in the hallway of the Joseph C. Burke Education and Research Center at Miner Institute. Emily is hoping to wrap up her Master's degree in spring or early summer 2022. Join us for highlights of Emily's research at Dairy Day on Dec. 8.

DAIRY DAY AT MINER INSTITUTE

WEDNESDAY, DEC. 8 10 a.m. - 3 p.m.



Speakers will include Miner Institute Staff:

- Dr. Rick Grant - *What's Holding My Ration Back?*
- Dr. Heather Dann - *Tips for Transition Cow Success*
- Katie Ballard & Emily Fread - *North Country Heat Stress Updates*
- Dr. Sarah Morrison - *Calf Housing Considerations*

* 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.
- We will follow the current CDC guidelines on that date.

Any questions? Contact Wanda Emerich, 518-846-7121 x117 or emerich@whminer.com

Miner Institute is located in Chazy, NY on 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.

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Aerial image of the new calf barn, taken by Paul Frederick on October 27, 2021. A tour of the new calf barn will be part of Dairy Day on Dec. 8.

Closing Comment

A positive attitude may not solve all your problems,
but it will annoy enough people to make it worth the effort.

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