UT PARLOR

A publication for Tennessee's dairy producers and supporting industries

SUMMER 2018

June Dairy Month: Celebrating Our Farmers and Our Products

Another year is well underway, and here at the halfway point we stop to recognize dairy. In Tennessee, we have around 250 dairy farms run by dedicated dairy farm families. It has been a tough couple of years financially, so from all of us, thank you for all you do to provide safe, nutritious and delicious dairy products. While we honor the men and women of the dairy industry, let's not forget about the many benefits of dairy products. The Dairy Alliance (thedairyalliance.com) and the National Dairy Council (nationaldairycouncil.org) have many resources for you and your family, including dairy recipes, dairy facts and dairy myths. Here, we will highlight some of the recent findings on dairy products and their health effects.

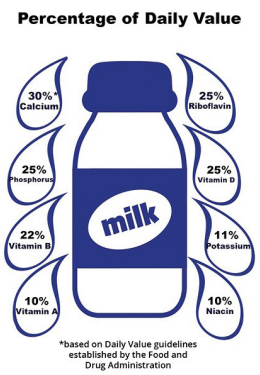

Photo credit The Dairy Alliance

Dairy is packed with vitamins, minerals and protein. In just 8 ounces (1 serving), milk provides 8 grams of protein along with daily requirements of calcium (30 percent), riboflavin (25 percent), phosphorous (25 percent), vitamin D (25 percent), vitamin B (22 percent), potassium (11 percent), vitamin A (10 percent) and niacin (10 percent). Combined, these vitamins and minerals support strong bone health, growth, metabolism and blood pressure.

One of the health benefits most people associate with dairy is bone health. Over time, bones can become porous and brittle or weak, which can lead to breaks or fractures. The National Osteoporosis Foundation states consuming foods rich in calcium and vitamin D, along with proper exercise, are the best ways to build bone density. By age 18, at least 90 percent of an individual's bone mass has been acquired. Consequently, childhood and adolescent consumption of dairy is critical for bone density development. Three servings of dairy provide at least 75 percent of an individual's calcium and vitamin D requirements. The recommendation is slightly higher for adolescents at four servings a day. Following these recommendations will improve peak bone mass, the key to reducing bone disease risk.

Dairy consumption has also been linked to decreased risk for cardiovascular disease. The National Dairy Council examined research published from 2009 to 2015. The Council found a 6 percent reduction in risk for cardiovascular disease with an increase in milk consumption. Another study reported dairy consumption was associated with a lower risk of stroke and coronary heart disease. While the evidence for most dairy benefits is reported as fluid milk or generic dairy consumption, some studies have looked at the benefit of fat content in dairy. Four studies have examined the impact of dairy fat intake, specifically saturated fats. These studies found for each 5 gram increase in dairy saturated fat per day, cardiovascular disease risk decreased by 21 percent. Fatty acids in milk also have been linked to decreased cardiovascular and coronary heart disease risk. Although these results are promising, more information is still needed on why dairy fat has this benefit.

Dairy's heart benefits also extend to blood pressure. A search of recent published data found several multiyear studies on dairy's effect on blood pressure. Studies from France and China have linked dairy consumption to lower diastolic and systolic blood pressure. These findings agreed with five US studies that linked dairy consumption to beneficial or neutral effects on blood pressure. Higher dairy consumption has also shown lower blood pressure in adolescents and children. This is another example of how a healthy life starts early with dairy.

Type 2 diabetes and obesity are also impacted by dairy consumption. Throughout the literature, dairy consumption has either reduced risk for Type 2 diabetes or had a neutral effect on it. Like many other studies,

the benefits have generally been associated with milk consumption or general dairy consumption. Similar to heart disease, increased dairy fat consumption (i.e., whole milk) decreased Type 2 diabetes by up to 62 percent. Higher fat dairy consumption was also associated with decreased insulin resistance in a study of overweight and obese adults. Following this same trend, increased dairy consumption has been associated with decreased obesity, weight loss over time and reduced waist circumference.

After all of the information above, hopefully you've learned all about the health benefits a dairy a day can bring to you and your family. The best part? Consuming the recommended three servings of dairy can bring all of these benefits to your life, whether you prefer no-fat, low-fat, or full fat! So celebrate June Dairy Month with us, and let us know, "Got Milk?"

–Liz Eckelkamp
eeckelka@utk.edu

For full reports or more information, see these resources:

The Dairy Alliance—thedairyalliance.com

The National Dairy Council—nationaldairycouncil.org

(continued next page)

New Face at the Department of Animal Science

Photo courtesy Liz Eckelkamp

A new faculty member joined the Department of Animal Science in 2017. In this article, you will get a brief introduction to Elizabeth (Liz) Eckelkamp, the new dairy Extension specialist with a full Extension appointment.

Hello, everyone. I'm Liz Eckelkamp, your new dairy Extension specialist. Although I didn't grow up on a dairy, I have been fortunate enough to work with dairy farmers and the cows they care for. When I started my undergraduate degree at Louisiana State University, I was provided with a dairy scholarship. As part of that scholarship, I took dairy classes, participated in dairy club, and worked with dairy cattle. I started working with dairy cattle at the LSU dairy farm, which has unfortunately closed since my time there. I started most of my mornings bottle feeding calves, scraping alleyways, milking cows and pushing up feed. Even though I only worked on a dairy for three years, it gave me a small glimpse into the daily life, difficulties and joys of working with dairy cattle.

I began my master's program at the University of Kentucky in the summer of 2012. My small dairy world rapidly expanded while working with Jeffrey Bewley, an Extension dairy expert, and meeting Kentucky farmers. I started working with facility design, impacts on cow health and management implications on lactating cow housing. I worked with 16 wonderful farm families who opened their farms and their lives to me. I still keep in contact with as many as I can, and it's almost like a family reunion every time I see them at meetings. Working together, we identified key management factors for compost bedded pack barns. We also found that compost bedded pack and sand-bedded freestall housed cows could both maintain a low somatic cell count (SCC), bulk tank somatic cell count (BTSCC) and clinical mastitis incidence.

When I finished my master's, a PhD opportunity to continue working with farmers opened up at UK in 2014. This time, I worked closely with four farm families. They helped me understand how they used precision dairy technology in their daily routine. Every day, they recorded how they used a health alert created by the system. They gave us invaluable insight into the way that the end-users of precision dairy technology, the farmers, incorporate it in their lives.

Working with dairy producers, and the projects I have completed with them, has taught me that no issue is isolated. A whole systems approach must be taken when addressing an issue. The amount of bedding a farmer should use will relate to nutrition level, and the use of a technology, whether a management software or a wearable technology, must integrate within their daily lives. I personally have worked with a dairy farmer who used no kind of technology whatsoever, and after working with me he is confident with PCDART, his wearable leg and neck tags, and has just started running a robotic milking system. His dedication and eagerness to learn is inspiring to me, and I hope to help and inspire the dairy producers of Tennessee.

In closing, my interest in aiding the producers of Tennessee and conducting research at the University of Tennessee sparks from my passion for the dairy industry, dedication to improving the lives of dairy producers, and the desire to improve the health and welfare of their dairy cattle. If you have any questions, please do not hesitate to contact me by phone at 865-974-8167 or email eeckelka@utk.edu.

National Dairy Council. 2016. Science Summary: Bone Health & Peak Bone Mass. nationaldairycouncil.org/content/2015/science-summary-dairy-and-peak-bone-mass

National Dairy Council. 2016. Dairy & Cardiovascular Disease nationaldairycouncil.org/content/2015/science-summary-dairy-and-cardiovascular-disease

National Dairy Council. 2016. Dairy & Type 2 Diabetes nationaldairycouncil.org/content/2015/science-summary-dairy-and-type-2-diabetes

Beydoun, M.A. et al. 2018. Dairy product consumption and its association with metabolic disturbance in a prospective study of urban adults. British Journal of Nutrition. 119:706-719.

Silage: Harvesting and Storing

It is almost that time of year, time to chop and ensile forage. Mother Nature has thrown us a few curve balls this year, but we can still maintain a high-quality forage. The purpose of this article is to go over some of the main keys of silage fermentation from Penn State's "From Harvest to Feed: Understanding Silage Management." We will hit each of the five main topics:

1. Forage moisture content.
2. Fineness of chop.
3. Exclusion of air.
4. Forage carbohydrate content.
5. Bacterial populations.

Photo credit Liz Eckelkamp

Preharvest considerations

Forage moisture content is critical to maximize silage values including 1) nutritional value per acre, 2) losses in the field and in storage, and 3) palatability and animal consumption. A combination of plant maturity and moisture content can help ensure you provide a high-quality feed. Some recommendations for harvesting moisture content are below:

Type of storage	Alfalfa	Grass	Corn silage	Small grains
Horizontal silo	65-70%	65-70%	65-70%	65-70%
Conventional upright	60-65%	60-65%	63-68%	63- 68%
Oxygen-limiting upright	40-55%	40-55%	55-60%	55-60%
Bag	60-70%	60-70%	60-70%	60-70%
Baleage	50-60%	50-60%	----	----
Pile or stack	65-70%	65-70%	65-70%	60-70%

Adapted from Table 4. Recommended moisture content of silage crops by storage structure. From "From Harvest to Feed: Understanding Silage Management." Penn State University

When you have identified the target moisture for your forage, cutting a test section will let you determine the best time to harvest. There are a few ways to check your moisture content: a Koster tester, an electronic tester or the handy dandy microwave. For the low-tech option, all you need is a kitchen scale, a microwave, a cup of water and a composite green chop sample. A small caution: Avoid using the microwave in your house kitchen if you want your family to keep talking to you. First thing, measure the weight of whatever you are putting the green chop on. A paper plate works well. Next, add some green chop and get the total weight of plate + chop. Place the plate and water cup in the microwave for approximately 30 seconds at a time and weigh after each run. When the weight stops changing, you have your dry weight. Calculating dry matter is as easy as

final weight ÷ initial weight × 100.

To harvest corn at 65 percent moisture (above), you want a dry matter of 35 percent. Fineness of chop is another critical component of good silage. Corn silage chop length should be set between 3/8 to 3/4 of an inch. Chop too fine, and you can reduce the amount of effective fiber in the diet. Chop too long, and compaction can become difficult, resulting in trapped air. With trapped air, silage can heat and spoil instead of fermenting.

Postharvest considerations

Doing everything right on the front end can be completely undone with improper storage. The main key is — limit oxygen! Harvesting and filling a storage vessel quickly helps maintain proper moisture, and thereby limits oxygen. Compaction also helps reduce oxygen and improve silage fermentation. Silage in upright silos is compacted by gravity. However, all other storage sources need

mechanical compaction — like a tractor compressing a silage pile in a horizontal silo. The final step for effective ensiling is limiting air entrance into the pack. Exposure to air can delay silage stabilization and cause spoilage. Covering silos with plastic is critical to reducing spoilage on the tops and edges of silos. After filling and compacting, silos should be covered and sealed. Also, slope the silage mass to allow water to drain away from the feed.

Forage carbohydrate content, i.e., sugar, helps silage success. This content is not usually a problem in corn silage harvested at the correct moisture content. Keep an eye on moisture at corn harvest and properly remove oxygen. This practice should allow for plenty of bacterial activity. What about inoculants? Like carbohydrate content, corn silage harvested at the correct moisture content should not need additives or preservatives. Corn silage has naturally occurring lactic acid bacteria, the main drivers of fermentation during the longest ensiling phase (day 2 to 21). Exceptions to this would be if corn was harvested immature, stressed by drought, overly dry or killed by frost.

–Liz Eckelkamp
eeckelka@utk.edu

For more information and more specific recommendations, you can view:

Jones, C.M., A.J. Heinrichs, G.W. Roth, and V.A. Asher. 2004. From Harvest to Feed: Understanding Silage Management. Pennsylvania State University Extension. extension.psu.edu/from-harvest-to-feed-understanding-silage-management

Common Causes of Subclinical Mastitis and High SCC on Southeast Dairy Farms

As part of the Southeast Quality Milk Initiative (sequalitymilk.com), we followed 30 farms in the Southeast (Tennessee, Kentucky, Mississippi, Virginia) for a year with respect to their mastitis control practices and determining what organisms dominate subclinical infections. Subclinical infections are sneaky in that they do not show clinical signs but can significantly raise your bulk tank somatic cell count, or BTSCC. This can have immediate impacts on quality premiums you receive. Less obvious are the negative impacts of inflammation on cow productivity and efficiency and is evident at SCC of 200,000 cells/milliliter. Knowing the types of organisms that commonly cause subclinical infections can provide guidance on management practices that best control these organisms. To identify common organisms in the Southeast, we collected aseptic milk samples from 10-20 cows with the highest SCC in the herd. During 2017, we sampled 1,847 cows and 5,710 quarters. Because we sampled all quarters of cows with a high SCC, we expected a large portion of the quarters to be negative — which was the case with 2,411 quarters or 42.2 percent of samples exhibiting no growth.

Our primary focus, however, was on those quarters that were culture positive. Of those positive quarter samples, the majority (39 percent) was a group of organisms called coagulase negative staphylococci, or CNS. Many people also refer to these as non-staph A. These organisms are normally found on the skin and less commonly in the environment. Because they are found on the teat skin, effective milking procedures — such as use of pre- and post-dipping with effective teat disinfectants, as well as milking clean, dry teats — are critical for controlling these organisms. In addition, well-functioning milking equipment that has few slips or squawks that minimizes the introduction of air and milk shooting into open teat ends helps limit the risk of new infections.

Photo credit Gina Pighetti

After CNS, *Staphylococcus aureus*, or staph A, were the most common organisms isolated (15.6 percent). Sources of *Staph aureus* include infected udders, teat canals and teat lesions, as well as normal, noninfected skin surfaces. *Staph aureus* is considered a contagious pathogen and can easily be transmitted from cow to cow during milking if poor milking technique or poor functioning milking equipment is used. In addition to the recommendations listed above for CNS, wearing gloves, which have fewer grooves than our hands, decreases the area in which *Staph aureus* can bind and limits the amount being "shared" between cows. Appropriate claw vacuum and automatic take-off settings can also minimize the risk of rough teat ends that are more difficult to clean and can hold greater numbers of bacteria. Heifers also can become infected before entering the milking herd and can then become a source of herd infection. As flies can transmit *Staph aureus*, a solid fly control program can lower the risk of heifers and cows developing infections.

Approximately 7.5 percent of infected quarters grew *Streptococcus dysgalactiae*, which is a "hybrid" in that

Strep dysgalactiae can be found in infected udders, as well as manure and other organic material such as bedding. As a result, *Strep dysgalactiae* can be transmitted from cow to cow during milking or in between milkings when cows lie in wet, dirty environments. Thus, effective milking procedures, in addition to clean, dry environments, will be important to controlling this organism on farm.

Another streptococci, *Streptococcus uberis*, was identified in another 7.5 percent of quarter samples from cows with high SCC. Similar to *Strep dysgalactiae*, *Strep uberis* primarily can be found in organic material such as manure, soil and bedding, and in some cases, infected udders. To minimize the risk of cows developing *Strep uberis* infections, providing clean, dry environments will be critical. This can be more of a challenge on pastures, where rain creates wet, muddy conditions. As manure and/or mud builds up on the teats, effective milking time procedures will become more critical to remove all organic material and reduce bacterial loads on the teat skin. In some circumstances, "double-prepping" may be necessary, with the first dip and wipe used to remove the largest amount of organic material and the second to eliminate the majority of bacteria on the teat skin. Additional paper towels or cloths per quarter also may be required. The use of water is not recommended, as wet udders can increase the risk of infection and increase the risk of "dirty water" getting into milk and increasing bulk tank bacterial counts. In some circumstances, a barrier dip post-milking can minimize the risk of cows developing infections in between milkings when exposed to wet, muddy conditions. Similar recommendations would hold true for the next most common organism in subclinical infections, *Escherichia coli* or *E. coli* which accounted for 5 percent of the positive cultures.

Overall, the organisms causing subclinical infections in the Southeast are a mix of contagious and environmental pathogens, and are similar to other regions of the country. Understanding what organisms dominate on your farm can provide helpful information in targeting which aspect of your mastitis prevention program may need improvement. For additional information regarding mastitis prevention and control, we encourage you to visit the SQMI website (sequalitymilk.com), the National Mastitis Council website (nmconline.org), or contact your herd veterinarian and/or state Extension specialists.

–Gina Pighetti
pighetti@utk.edu

Enrichment of Pre-weaned Dairy Calves Prepares Them for Later Success

For a variety of reasons—including reducing risk of disease, ease of management,and ability to monitor intake and health—pre-weaned dairy calves are typically housed individually throughout the milk-feeding phase of life. According to the last USDA survey, 63 percent of dairy calves are housed individually from birth to weaning. Additionally, there is growing evidence that increasing the amount of milk fed to calves during this time results in positive long-term gains in production. Prior to joining the herd as a productive member, a dairy calf will experience a variety of novel and challenging environments (i.e., the first time they are exposed to freestalls and feed barriers, entering the milking parlor for the first time, etc.). To manage these changes, it is critical that they are able to successfully cope and adjust to each. In addition to increasing the amount of milk offered, providing enrichment in how the calves feed may also be a means to set calves up for success throughout their lives. Researchers from the University of Florida recently completed a study evaluating the effects of enrichment on dairy calves' mental abilities.

Photo credit Clay Kesterson

All calves enrolled in the study were housed individually in wire-mesh pens placed on sand bedding underneath an open-sided barn. Calves were fed a gallon of colostrum and then received 1.5 gallons of pasteurized waste milk with a powder enhancer until weaning. They also had free access to starter grain and water. The only difference in management was the method for milk delivery. The control calves on this study were fed from a bucket, which was removed when the milk was finished. The enriched calves were fed using a teat and a line that was placed within a bucket of milk. The teat remained in place throughout the day to provide the calves one means of enrichment. Additional enrichment was provided by chopped timothy hay in a bucket.

After five weeks, calves were trained to complete a T-shaped maze to receive a milk reward. Once calves were trained within this maze, their response to novelty was tested in two ways. First, the location of the reward was

reversed, so calves that received the milk reward on the left now had it placed on the right and vice versa. Secondly, a multicolored ball was placed in the path to the reward.

Enriched calves took less time to complete the task when presented with the reverse learning challenge. Conversely, the control calves spent more time within the incorrect side of the maze. The novel object challenge resulted in similar response. The enriched calves completed the task faster than the control calves. The control calves spent a greater amount of time standing in the middle of the maze rather than passing the novel object. It took the control calves three times longer to pass the novel object compared to the enriched calves.

The results suggest that calves provided enrichment in early life are more flexible in their behaviors (as indicated by the quicker completion of the reverse learning task) and less fearful of novel objectives (as indicated by the greater willingness to pass a novel object to gain a milk reward). While this study is limited by evaluating the benefits of enrichment in early life only, the results suggest the potential for long-term benefits if the behavioral differences remain. It is likely that the enriched calves will handle the introduction of new housing systems, social groups or introduction to the milking parlor. Additionally, the forms of enrichment should be readily available and easy to provide on most dairy farms. The potential gains should justify exploring how to include some form of enrichment in your calf management program.

–Peter Krawczel
krawczel@utk.edu

For full reports or more information, see this resource:

Horvath, K., M. Fernandez, and E. Miller-Cushon. 2017. The effect of feeding enrichment in the milk-feeding stage on the cognition of dairy calves in a T-maze. Appl. Anim. Behav. Sci. 187:8-14.

UT Dairy Challenge Team

Dairy Challenge represents one of those great opportunities for students to develop real-world skills and eventually compete against other universities for bragging rights over the next year. And believe me — if you place first at the North American Intercollegiate Dairy Challenge — you deserve to MOOO at the top of your lungs as you are competing in the top collegiate competition for dairy students.

Some of you may be wondering — what is Dairy Challenge? The North American Intercollegiate Dairy Challenge, known as the NAIDC or Dairy Challenge, is an innovative two-day competition for collegiate students where they work in four person teams as "real-world consultants." Students apply their knowledge and training to evaluate a commercial dairy, identify solutions to help the owners meet their goals and/or challenges, and present these to a panel of experts that includes dairy producers and industry personnel who conducted their own evaluation. Those teams that most closely align with the panel of experts and effectively communicate and justify their recommendations win. In addition to the Dairy Challenge competition, underclassmen also can participate in the Challenge Academy. This educational program pairs small groups of 8-10 students with representatives from the dairy industry. These leaders help students "walk" through an evaluation process, identify key issues, develop solutions, and present these to the entire Academy group.

Photo credit Gina Pighetti

To prepare for Dairy Challenge, we have a separate course ANSC 492: Dairy Challenge, which I lead in fall and spring semesters. This class provides a framework to help students learn more in-depth about dairy operations. Students develop their consulting skills by visiting commercial dairy farms and evaluating their records, animals, housing, milking and finances. Over the last several years, UT has competed and performed well at both regional and North American levels, taking first place at the North American in 2015. We've had a variety of students participate, from those who had limited dairy knowledge to those who grew up on dairies. This past year, the Dairy Challenge team included this wide blend of knowledge bases with junior Abigale George and seniors Kristen Judy, Gabbie Green and Ingrid Vorbusch-Everton. Sophomores Jarred Darnell and Alec Tester attended the Dairy Challenge Academy. Jaime Guarrera and Will Hipsher

also competed at regionals this past fall and are looking forward to competing in their senior year at the regional and North American competitions. This past semester, I asked for feedback from participating students this past spring. I've selected several comments to share below that reflect common themes I have heard over the past several years:

"Dairy Challenge is an excellent opportunity to dive headfirst into the dairy industry and learn what it is like to be on the producer side as well as the consultant side. The knowledge, experience and memories you will gain will be some of the best you will make here at UT."

"This was a real eye-opening experience for me; I had no idea how much actually goes into running dairy farm. Everything is so complex and interesting so you learn a lot, as well as that you can make many connections to other people in the field around the country."

"I have really learned how to communicate with my peers and not be afraid to agree or disagree with their ideas as well as give my own ideas. It's been an amazing experience and I do plan to continue to support Dairy Challenge once I graduate and enter the workforce."

We would like to thank the Dixie Flyers Dairy Association, which graciously donated funds to provide students the opportunity to develop and strengthen their skills in dairy sciences through activities such as Dairy Challenge. Most of these funds are used to support traveling to dairy farms to practice their skills, as well as travel to the competitions themselves.

Our funds are beginning to run low and we would greatly appreciate any support you could provide to continue offering this great learning experience and build the expertise of our students to enter the dairy industry. If you have any questions, would like to make a donation, or volunteer your time or farm for practice, please reach out to:

Neal Schrick, Professor and Head
Department of Animal Science
fschrick@utk.edu

Gina Pighetti, Associate Professor
and Dairy Challenge Coach
Department of Animal Science
pighetti@utk.edu

–Gina Pighetti
pighetti@utk.edu

You can view this and other available resources at the University of Tennessee Institute of Agriculture's Dairy website, **utdairy.utk.edu**.

Our site is currently under construction, but will be available soon.

INSTITUTE OF AGRICULTURE
THE UNIVERSITY OF TENNESSEE

Department of Animal Science
2506 River Drive
Knoxville, TN 37996

AG.TENNESSEE.EDU

Real. Life. Solutions.™