UT PARLOR

A publication for Tennessee's dairy producers and supporting industries

FALL 2018

The American Dairy Science Association National Meeting

This year is flying by, and Tennessee was privileged and excited to host the National American Dairy Science Association meeting in Knoxville. Lasting from June 24 to 27, the meeting was attended by 1,800 dairy scientists from 48 countries! The University of Tennessee Institute of Agriculture and UT College of Veterinary Medicine were well represented with 32 posters and oral presentations on topics ranging from the benefits of "king-size" stalls to novel ways to improve feed intake. Overall, 51 professors, graduate students, and undergraduates participated in ADSA. Some highlights from a few of the talks follow.

Photo courtesy Liz Eckelkamp

Feeding management of heat-stressed dairy cows with dietary protein levels

Heat-stressed dairy cows encounter metabolic problems that result in production losses and poor efficiency of dietary nutrients. Dietary protein is poorly utilized, contributing to increased nitrogen wasting through urine and feces instead of going toward milk production. Properly managing dietary protein intake during heat stress is important for sustaining milk production and optimizing use of nitrogen from the animal. Our research has addressed these problems by supplying two different levels of crude protein (moderate at 16 percent and low at 12 percent) to two separate groups of cows under heat stress conditions either with fans and sprinklers or without. We controlled the feed intake of the cooled-off cows to match the intake of the heat-stressed cows. Feed intake can have a large impact on production and efficiency, so controlling that factor removes any changes due to intake. The data from this study showed that lowering crude protein in the diet of heat-stressed cows improved their metabolic response to support milk production. We saw increased use of nitrogen from the diet and improved use of energy in the body, contributing to sustained milk production compared with the cooled-off cows. These responses to lower crude protein had no observed negative impacts on milk production, body weight, body condition score, somatic cell counts or body temperature.

Take-home message: Lowering crude protein in the diet of heat-stressed cows will improve their metabolic responses to support lactation and increase efficiency for nitrogen and energy. Overall, feeding lower protein during heat stress conditions can be sustainable, lower environmental impact, and reduce feed costs.

- Jeffrey Kaufman, PhD Student in Dairy Nutrition

Nutritive analysis of four spring forage mixtures for organic dairy production in the Southeast

The Southeast US grazing season lasts from late March to early November. During this time, temperatures can range from 40-90 F. In the Southeast, our predominate forages are cool-season forages that thrive in the spring and fall seasons when temperatures range from 40 F to 70 F and rain fall is plentiful. During the summer months when temperatures rise and droughts are prominent, cool-season forage growth is slow and quality of pastures decreases resulting in the "summer slump." To combat this summer slump, researchers at the University of Tennessee and University of Kentucky are studying the incorporation of warm-season forage species into pasture rotations to increase forage yield and quality. Though traditionally not used due to warm-season species having naturally lower quality, warm-season species grow best above 85 F and are drought tolerant, making them more hardy during the summer season. To examine this, warm- and cool-season grasses, legumes and brassicas were mixed together to create four different forage mixtures to be tested on five functional certified organic dairy farms. After the first

year, we found that mixtures containing predominantly cool-season forages maintained higher protein and lower fiber concentrations throughout the entire grazing season. This result may be because summer 2017 was unseasonably cool. This research is being repeated in 2018 and results will be compared to those found in 2017.

Take-home message: Warm-season forages have the potential to increase forage quality and yield in the summer season. Research from 2018 should help to determine to what extent this diversification of pasture may help to increase pasture yield and quality.

— Hannah Bailey, Master's Student in Dairy Nutrition

Assessing environmental stress

Stress is a poorly defined term often used in conjunction with dairy cattle welfare. Stress can refer to cow comfort, preference or desire for a resource, or ability to live naturally. Across two studies conducted at the University of Tennessee, cows have been evaluated under environmental stress conditions: elevated stocking density and heat stress and nightly housing of cows with their calves postpartum. To assess the effects of a single or dual environment stressors, cows were randomly exposed to four conditions for 14 days each: 100 percent stocking density with heat abatement (non-stressed), 141 percent stocking density with heat abatement (overstocked), 100 percent stocking density without heat abatement (heat stressed), and 141 percent stocking density without heat abatement (overstocked and heat stressed). Milk production was lower in heat stressed 2+ lactation cows compared to all other treatments. Overstocked and overstocked heat stressed cows were more active than heat stressed or non-stressed cows. However, dual concurrent stressors did not have a greater impact on dairy cow production and behavior versus a single environmental stress. In a second study, 20 first lactation cows were separated within six hours of calving until five days postpartum, and assigned to either traditional early separation or nightly commingling for two weeks. Nightly commingled cows were housed with their calves from post-PM milking to pre-AM milking on pasture. No differences were observed in dam milk production and somatic cell count, or calf weight gain, health score,and activity. Although housing calves with dams nightly from five to 19 days postpartum did not negatively impact behavior, production and health, these results must be further explored past 19 days postpartum and without a five-day separation.

Take-home message: Both heat stress and overstocking are environmental stressors and should be managed if they occur individually or together. Housing calves with dams is a possibility, with very specific management. However, the long-term effects are not understood and more research is needed.

— Amanda Lee, PhD Student in Dairy Welfare

Feeding rumen-protected methionine to dairy cows

Typical rations given to dairy cows in the United States provide dietary protein through large amounts of soybeans. However, soybeans provide miniscule amounts of methionine (Met), an essential amino acid necessary to promote protein synthesis in the body, along with other important metabolic and hormonal regulations. Supplying Met to cows will improve overall health and support lactation compared with their typical diet. Without protecting that Met from rumen microbes, the cow will never be able to use it. Companies have developed a rumen-protected form of Met that avoids breakdown by the rumen microbes and is directly utilized by cows for protein synthesis. Our research focused on a new prototype of protected Met. At the manufacturer's recommended levels, supplementing rumen-protected Met increased the supply of Met found in cow's plasma. As a result, milk protein synthesis was increased in the cows supplemented with rumen-protected Met compared with non-supplemented cows. A portion of dietary protein (i.e., blood, fish or bone meal) can be replaced with rumen-protected Met. Research by multiple scientists has shown that cows sustain milk production but reduce the wasting of protein as urinary and fecal nitrogen.

Take-home message: Supplementing the lactating cow's diet with rumen-protected Met improves milk protein synthesis and can improve nitrogen utilization by replacing a portion of the animal-protein sources in the diet. Overall, supplementation of Met to a diet that has a large portion of its protein from soybeans will improve the protein value in that diet.

— Jeffrey Kaufman, PhD Student in Dairy Nutrition

Rumen-protected lysine supplementation

Corn-based dairy rations are common across the United States. Corn silage and grain are great sources of energy and low in fiber. Corn-based products are also low in many limiting amino acids, like lysine. During lactation, some amino acids are used in greater quantities and can limit milk production if they are not fed in high enough amounts. Feeding more crude protein, which can increased feed costs and nitrogen excretions, or utilizing rumen-protected essential amino acids can increase amino acid concentrations in the diet. Lysine is an amino acid used extensively in milk and milk protein production, muscle maintenance, and fetal growth. When lysine demands are not met, milk yield and milk protein can be depressed throughout their entire lactation. The most significant decreases are seen during peak lactation through mid-lactation. We studied the effects of a new rumen-protected lysine product on milk production of cows from peak to mid-lactation. We observed that rumen protected lysine increased milk yield and milk lactose yield when fed to cows during peak to mid-lactation.

Take-home message: Rumen-protected lysine has the potential to be an excellent source of increasing lysine levels to aid in increasing milk production in lactating dairy cows. Evaluate your diets to see which amino acids are limiting, and see what options are available to increase them.

— Hannah Bailey, Master's Student in Dairy Nutrition

Working together, research and extension can create new management practices to improve farm efficiency, sustainability and profitability.

BENCHMARK MEASUREMENT	AVERAGE FOR TN HERDS USING PCDART	INDUSTRY GOLD STANDARDS
Pregnancy rate	*16.4%*	*20-30%*
Conception rate for past 12 months	*40.4% (first service) 39.5% (total)*	*35-45%*
Voluntary waiting period	*56.9 days*	*60-75 days*
Days to first service	*103.8 days*	*90-100 days*
Heats observed for year	*38.2%*	*>50%*
Calving internval	*14.5 months*	*12-13 months*

Adapted from DairyMetrics (Dairy Records Management Systems, Raleigh, NC) Tennessee herd averages in August 2018. Standards reported from Paul Fricke, professor, reproductive physiology, University of Wisconsin-Madison; Jeff Stevenson, professor, bovine reproductive physiology, Kansas State University; and Missouri Dairy Growth Council's Dairy Cattle Reproductive Manual.

Back to the Breeding Basics

Just as the summer slump hits its lowest point, Tennessee dairy farmers are gearing up for fall calving and the following breeding season. Now is a good time to review your breeding program and set yourself up for success.

When assessing your breeding program, rely on measurements in terms of your goals and challenges. Conception rate, pregnancy rate, heat detection rate and days to first service are great tools for monitoring your breeding program. These can be found in herd management software (PCDart, DairyComp305, etc.) or calculated from your paper records. For example, if your farm struggles to catch heats in the summer, you may focus on your heat detection rate. Setting measureable goals, tracking them and benchmarking to others in your area can make you aware of the strengths and weaknesses in your breeding program.

Heat detection

It is estimated that approximately 50 percent of heats go undetected and 15 percent of cows that are inseminated are not in estrus. Effective heat detection protocols like heat patches, visual observations or technologies can help minimizing days open and the associated economic losses. Standing heats are usually detected based on changes in activity. Activity can be suppressed by hot temperatures, slippery footing or health issues. Secondary signs of heat like mucus discharge, swollen vulva, or chin resting and back rubbing on other cows are expressed before, during or after estrus and can help identify cows around the time of estrus.

After detecting a standing heat, the common recommendation has been to breed according to the AM/PM rule. If the cow was first detected in standing heat in the morning, she should be bred 12 hours later that evening. Current research is suggesting some modifications to this guideline. While the cow should be bred in the last half of standing heat for optimum fertility, the heat isn't always caught soon enough to wait a full 12 hours. Fertility and conception rates decline significantly after 12 hours of standing heat. If the heat is caught hours after it was first exhibited, you might lose your window of time if you follow the AM/PM rule. Research from Virginia Tech suggests that while fertility is at its peak 6-12 hours after the start of standing heat, it is actually much lower after this time period than before it. Based on this, if you are watching for heats throughout the day and are confident that you have observed standing heat when it first begins, follow the AM/PM rule. If you are watching for heats once a day, you might

Photo courtesy Tori Couture

consider breeding within a few hours after observing the standing heat for maximum fertility.

A timed artificial insemination (TAI) program can minimize heat detection issues, particularly around challenging times of the year — either during the summer when fertility is low or when it is time to breed large groups of cows. Many different programs are available and effective. The key is finding a program that works for you and sticking to it. Timing is everything when it comes to TAI, so make sure to administer shots and breed at the appropriate time.

If you don't, these programs can be draining on both time and money, as cost per cow ranges from $15-$20 without including labor and semen. Even if you are not using TAI, remember the AI basics:

1) Thaw semen at 95 F for 45 seconds and maintain a similar temperature throughout handling.

2) Use thawed semen within 15-20 minutes to minimize any decline in quality.

3) Deposit semen just on the other side of the cervix.

Finally, make sure that the final product — the calf — is worth the effort you are putting into it. Consider if the cow herself is still meeting your expectations for your herd, keeping in mind that many of her qualities will be passed on to the calf. While we may know this, it can be tempting to breed a cow just because she's in heat. When evaluating a cow's place in the herd, you might consider her DIM at the time of breeding, lactation number, milk production, the cost of that pregnancy, and if she is able to meet that economic requirement. Once you have decided a cow meets your breeding requirements, you have several sire options — conventional, sexed or beef semen, and/or a herd bull. During the summer, AI is preferred over a bull, because heat stress negatively impacts male fertility. Sexed semen is typically reserved for heifers and the top cows in your herd. Beef semen is becoming commonly used on cows who will not be producing replacement heifers, such as those that are likely on their last lactation before leaving the herd.

Many different practices are successful for a variety of farms, so the key is to commit to a breeding program that works for you, hone in on the basics, and fertility will follow.

— Tori Couture, Master's Student in Dairy Welfare
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For more information, see these resources:

Handling of Frozen Semen Straws, Select Reproductive Solutions, Select Sires, Inc. http://www.selectsires.com/programs/images/Brochures/pdf/HandlingFrozenSemen-Straws.pdf?version=20180803

Five Keys for Reproductive Success, Dr. Paul Fricke of University of Wisconsin-Madison Hoard's Dairyman Webinar (2012) https://www.youtube.com/watch?v=p-bh-fqE1l20

Economic Value of Pregnancy in Dairy Cattle, Dr. Albert de Vries of University of Florida, Journal of Dairy Science (2006)

National Association of County Agricultural Agents

Tennessee was proud to host another national conference this year, the National Association of County Agriculture Agents, from July 28 to August 2 in Chattanooga. Current and former county agents, regional specialists and state specialists from across the country gathered to share ideas and explore Tennessee. As a dairy specialist, I was involved with several dairy tours in the Eastern Region showcasing our dairy farm families. Needless to say, it was a great first meeting for me!


Photo courtesy Liz Eckelkamp

Photo courtesy AgCentral

Our first dairy spotlight tour happened on Saturday, July 28. In spite of a two-hour traffic delay, agents from New York to Missouri enjoyed a delicious meal and talking with John Harrison about Sweetwater Valley Farm, his farming operation, his cheese plant and his new robot barn. We kept talking until well after dark — around 10 p.m. — before the agents loaded up and continued their trip to Chattanooga. This was the last stop of a two-day tour from Memphis to Chattanooga, and I think we wrapped it up right!

Tuesday, July 31, was another tour day for life-members (retired agents) and spouses. We had two buses full, around 60 people, touring Sweetwater Valley Cheese, Mayfield Dairy Plant and Tsali Notch Vineyard. John Harrison and his daughter, Mary Lyndal, shared their story and their cheese with us, along with some tasty recipe tips. At Mayfield, we learned about the Mayfield family history, took pictures with the giant Jersey, and had some delicious ice cream.
At Tsali Notch Vineyard, we ended the day with a tractor ride around the muscadine vineyard and wine tasting. We all enjoyed learning about each stop, talking to each other, and listening to Jonathan Rhea (UT Extension Monroe County agent) and John Goddard (UT Extension Loudon County agent) tell stories about Tennessee.

Thursday, August 2, was the last day of the conference and a full day of tours. A tour group focused on value-added production and agritourism visited John Harrison, while our group visited other dairy farms in the area. We packed onto a tour bus and headed to Loudon County to visit Steve Harrison. Even in the pouring rain, we enjoyed our first stop. Steve told us about his family's 200-year legacy on the land and how he managed his farm, and then he took us on a tour of the parlor. We went on to visit Butch Lay after that. His family made us very welcome on their dairy, sharing cookies and milk from their organic cooperative as we talked in the calf barn. He shared stories about his farm, his family, and their decision and journey to organic milking. We lunched and shopped at AgCentral in Athens, then moved on to the Mayfield Dairy Plant. Ice cream for dessert was just as delicious on Thursday as it was on Tuesday. The day ended at Russ Carmichael's dairy where we toured his tunnel-ventilated barn and automated calf feeder and practiced our balance across a cattle guard. Russ told us how his farm had changed over time and about his use of technologies. Our tour group enjoyed every stop and meeting some of our dedicated farm families.

I want to end this update with a big thank you to the farm families, supporters and tour guides who made the NACAA meeting a big success!

— Liz Eckelkamp, Assistant Professor and Dairy Extension Specialist
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TAAA&S
Tennessee Association of Agricultural Agents & Specialists

Photo courtesy David Bilderback

Photo courtesy AgCentral

Vet Check

Photo courtesy Lew Strickland

Tips for the Use of Reproductive Hormones

Recently, an Extension agent contacted me with an idea to hold several meetings around the state to demonstrate estrus synchronization and artificial insemination in cattle. This sounds like an excellent idea to me, but there are numerous protocols described for the synchronization of cattle and it is easy to get lost in all of the details. Since there are not many definitions of the function of these hormones to go along with the protocols, I have put together some explanations of the hormones used in order to help producers better understand what these hormones are and why you are using them.

Types of Hormones

There are three categories of hormones used to synchronize estrus and ovulation: prostaglandins, progestin and gonadotropin releasing hormone (GnRH). Each of these products is listed in their respective categories in Table 1.

CATEGORY	PRODUCT
Prostaglandin (PGF_{2a})	*Lutalyse (Natural dinoprost tromethamine)* *Estrumate (Synthetic cloprostenol)*
Progestins	*CIDR (Controlled internal drug release)* *MGA (Melengesterol acetate) Not for use in lactating dairy cattle*
GnRH	*Cystorelin* *Factrel* *Fertagyl*

Table 1. Reproductive hormones.

Functions

Prostaglandins (PGF_{2a}).

This class of drugs result in the regression of the corpus luteum (CL). The function of CL is to produce progesterone that maintains pregnancy. The function of prostaglandin is to lyse (stop function) of the CL which in turn lowers the concentration of circulating progesterone. A cow that has a CL at least 5-7 days old is expected to return to estrus two to five days post injection. Prostaglandin is also a smooth muscle contractor.

It is used for evacuation of the uterus when pyometra is present or to induce abortion in cattle. Due to its effect upon smooth muscle, pregnant women and asthmatics should handle with caution and wear gloves at all times when working with prostaglandins. PGF_{2a} can be stored at room temperature and is considered relatively insensitive to heat and light.

Progestins

These are "progesterone-like" compounds that mimic the natural progesterone produced by the cow's CL. The result is the cow's estrus is suppressed and ovulation is prevented. A controlled internal drug release device (CIDR) is a T-shaped nylon backbone covered with silicon and impregnated with 1.38 grams of progesterone. This product is labeled for one-time use only, and should be disposed of by incineration or double sealed in a plastic bag and sent to a solid waste landfill only. I am not endorsing the reuse of CIDRs, but if you can't stand the thought of throwing them away after only one use, CIDRs must be properly disinfected or autoclaved. After removal, wash CIDRs in soapy water to remove the mucus and debris. Soak them in a solution of 0.03 percent chlorhexadine gluconate solution for two hours, rinse the insert with clean water, air dry and store them in labeled zip-close bags. The second option is to clean them as described, then have the inserts autoclaved by your local veterinarian. A third application will be a waste of time and money. There will not be a sufficient amount of progesterone present to prevent return to estrus. Keep something in mind: reusing these inserts, and insert applicator, without proper preparation is an excellent mode of transmission of venereal diseases. Gloves must be worn at all times when working with CIDR inserts.

Gonadotropin Releasing Hormone (GnRH)

GnRH is a hormone produced by the hypothalamus. It is obtained from natural sources or synthetically produced. The natural function of GnRH is to cause the release of follicular stimulating hormone (FSH) and luteinizing hormone (LH) from the pituitary gland. These hormones consequently result in follicular activity on the cow's ovary. The main function of GnRH in the synchronization protocol is to form a CL, or stimulate ovulation of an existing follicle. Because there is little information on the stability of GnRH, this medication should be kept refrigerated (35-46 F) when not in use. Bacterial contamination will

inactivate GnRH, so the use of large multidose vials is discouraged.

Summary

Some things to remember when working with reproductive hormones:

- Always be careful when handling reproductive hormones because some can be absorbed through the skin and affect humans.
- Women (especially pregnant women), asthmatics, and persons with bronchial or other respiratory problems should exercise extreme caution when handling reproductive hormones.
- Always follow label directions and adhere to all other BQA guidelines.

If you have any questions, please contact your veterinarian, Extension agent, or myself at, lstrick5@utk.edu, or 865-974-3538.

— Lew Strickland, Assistant Professor and Extension Veterinarian
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You can view this and other available resources at the University of Tennessee Institute of Agriculture's Dairy website, **utdairy.utk.edu**.

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