

What is the Value of Cooling Dry Cows?

Sha Tao and Geoffrey E. Dahl

Heat stress is a well-recognized environmental factor limiting production, reproduction and health of dairy cows during lactation, but what about the dry period? Compared with lactating cows, dry cows generate less metabolic heat and have a higher upper critical temperature. Thus, heat stress abatement in dry cow management has always been overlooked. Research shows that it substantially influences future performance of the cow and calf, however.

Dry period cooling affects milk production, feed intake, and body weight

Heat stress abatement during late gestation increases milk production in the subsequent lactation. Several factors affect the effects of cooling dry cows on subsequent milk production. Duration of cooling during the dry period may have an impact on subsequent lactational performance. Cooling during the close-up period (last 3-4 wks of gestation) slightly improves milk production in the next lactation by 3.1 lbs/d relative to those who don't receive cooling. In contrast, cows cooled during the entire dry period produce ~11 lbs/d more milk (Figure 1) during the next lactation compared with those without prepartum cooling. Cooling methods during the dry period also influence the effectiveness of heat stress abatement on subsequent milk production. With limited cooling, such as shade or short interval soaking in the middle of the day, only modest increases (2.4-6.6 lbs/d) in subsequent milk production were observed. However, when more extensive cooling (shade, fans and sprinklers) was provided to dry cows, milk production in the subsequent lactation was again significantly improved (~11 lbs/d).

Similar to lactating cows, heat stress also decreases dry matter intake of dry cows. When housed in a freestall barn through the entire dry period, cows under evaporative cooling (fans and sprinklers) had a ~15% increase in dry matter intake compared with those without cooling during summer. As a result, cooled cows gain more body weight during the prepartum period. In early lactation (first 2-3 weeks postpartum), prepartum cooled cows consume similar amounts of dry matter but produce more milk, thereby achieving a higher feed efficiency relative to prepartum non-cooled cows. However, as the lactation advances, prepartum cooled cows will consume more feed relative to non-cooled cows in order to meet the higher nutrient demand of the increased milk production.

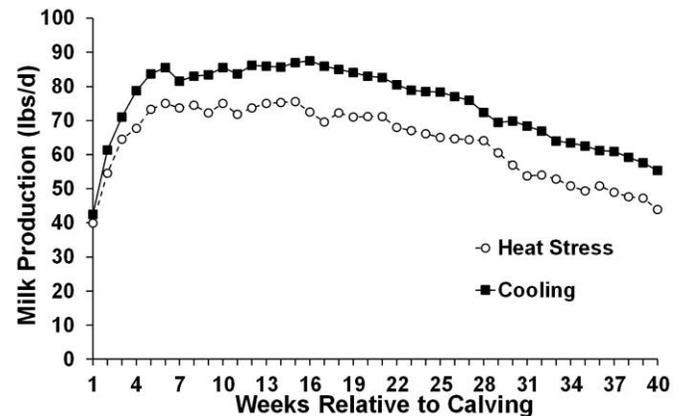


Figure 1. Cooling during the entire dry period increases milk production in the next lactation. Solid squares (■) and open circles (○) represent cooling and heat stress, respectively. Cows exposed to cooling during the entire dry period produce more milk compared with cows in heat stress up to 40 wk in milk (74.7 vs. 63.7 lbs/d, respectively).

Dry period cooling affects immune function and health

In addition to milk production, heat stress during the dry period also affects the immune function of animals during the transition period. Recent studies suggest that cooling during the entire dry period improves immune cells' proliferation and killing ability when exposed to pathogen *ex vivo* in early lactation. These studies are of importance because the enhanced immunity, especially for neutrophil function, plays important roles in the combat of pathogens involved in mastitis and metritis. Thus, it is expected that cooling heat-stressed dry cows improves animal health and decreases disease incidence during the transition period. However, the direct comparison of disease incidences between prepartum cooled and non-cooled cows in the next lactation is still not available.

Dry period heat stress affects calves

Late gestation heat stress also shortens the cow's gestation length. Relative to heat stress abatement, non-cooled heat-stressed cows during the entire dry period have ~4 days shorter gestation length. Additionally, calves born to heat-stressed cows are smaller and prepartum cooling increases calf birth weight about 13% (11 lbs). Additionally, maternal heat stress also compromises the offspring's immune function. Passive immunity is important to the survival of neonatal calves and is altered by maternal heat stress. Calves born to non-cooled heat-stressed cows during the dry period have lower serum IgG concentration and absorption efficiency relative to those from cooled dams.

Take home messages

- Dry cows also suffer from heat stress; cooling dry cows improves production and health of the cow and calf.
- Cool the entire dry period if possible.

More information? Contact Sha Tao at taosha0512@ufl.edu or Geoff Dahl at gdahl@ufl.edu

Dr. Sha Tao New Dairy Faculty Member at the University of Georgia - Tifton

Sha Tao currently is a post-doctoral associate at the Department of Animal Sciences of UF. After a fruitful journey at UF where he studied under Dr. Geoff Dahl, he will relocate



to the University of Georgia at Tifton, GA on July 1st, 2014 to start his new position as an Assistant Professor in Heat Stress Physiology and Nutrition. In his new position, he plans to build upon an active research and Extension program to further explore how heat stress affects cow and calf performance and to seek proper management tools to cope with the negative impacts of

heat stress in Southeast. Contact information:

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Dr. Carrissa Wickens Joins UF Animal Sciences as Equine Extension Specialist

Dr. Carrissa Wickens joined the faculty in the Department of Animal Sciences January 1, 2014. She will serve as the second Equine Extension Specialist for the state of Florida. During the past four years, Dr. Wickens served as an Assistant Professor and Equine Extension Specialist with the Department of Animal and Food Sciences at the University of Delaware where she taught undergraduate equine science courses and provided educational resources and programming for Delaware equine owners.

Carissa completed her Ph.D. in Animal Science at Michigan State University in May 2009 with an emphasis in horse behavior and welfare. The focus of her doctoral research was stereotypic behavior in horses, with a primary focus on the oral stereotypy of crib-biting. Dr. Wickens's dissertation research was comprised of a crib-biting and gastric ulceration study and administration of an online horse

behavior questionnaire designed to investigate risk factors and owner opinions associated with crib-biting and weaving behavior in Michigan horses. During her Ph.D. program, Carissa also assisted with the development of an online Animal Welfare Assessment Course funded through the USDA Higher Education Challenge Grants Program.

Carissa received a Master's degree in Animal Science from Michigan State University in 2003. Her Master's Thesis focused on the protein nutrition of the exercising horse. During the Master's program, she also assisted with swine protein and amino acid nutrition studies and with teaching ANS 141 - Draft Horse Basics and ANS 413 - Non-Ruminant Nutrition. Carissa completed her Bachelor of Science degree in Animal Science with a Specialization in Agribusiness at Michigan State (2001). Carissa spent the 2003-2004 academic year in Alabama at Auburn University working under the direction of Dr. Cindy McCall. She assisted with equine behavior and nutrition research there and with teaching Horse Management, Horse Production and Introductory Animal Science courses.



Carissa's current responsibilities with IFAS are to develop and implement equine education and outreach programs throughout the state and to conduct applied research in the areas of equine management, behavior and welfare. Contact Dr. Wickens at cwickens@ufl.edu

UF Looking for Candidates for Assistant or Associate Professor of Dairy Cattle Health and Well-Being

The University of Florida has an opening for a position in Dairy Cattle Health and Well-Being at the rank of Assistant or Associate Professor. This is a joint faculty position in the Department of Large Animal Clinical Sciences (LACS) in the College of Veterinary Medicine and the Department of Animal Sciences, Institute of Food and Agricultural Sciences (IFAS) at the University of Florida. The overall expectations for the position are to conduct research and outreach to improve dairy cattle health and well-being. More information at <https://jobs.ufl.edu/postings/48209>

UF Animal Sciences Participates in Southern Great Plains Dairy Consortium Teaching Program on Large Herd Dairies

How can future dairy producers improve the dairy industry? Students participating in the 2013 Southern Great Plains Dairy Consortium (SGPDC) Teaching Program are challenged to answer this question. The teaching program, which is held annually in Clovis, New Mexico, in May and June is an educational program designed to teach college students from across the country about the multifaceted dairy industry, with focuses on improving industry competitiveness and the production of safe, wholesome products.

Consortium professors spend six weeks teaching students a wide array of vital dairy subjects. Each week students are presented with a new focus where they spend time in the classroom learning the basics, and then move their “classroom” to dairies in the surrounding area, including parts of West Texas. That’s where they take what they learned in the classroom and use it in a hands-on learning experience.



Within the program, there are two separate sessions where students are placed based on previous knowledge of dairy management. Session one is intended for students with minimal previous knowledge and session two is for students who have taken session one and/or have a dairy background. Each session builds on the knowledge they gained the previous weeks. They are able to see what they’ve been studying in the classroom come to life in the dairy environment. Approximately 55 students enrolled in 2013.

Dr. Robert Hagevoort, a New Mexico State University (NMSU) dairy specialist and a Southern Great Plains Dairy Consortium program coordinator, recalled that when he was hired at NMSU in November of 2005, several faculty members of universities in the Southwest were already contemplating the return of some form of dairy instruction back to the region.

“Since the Southwest region ranks third in dairy production in the country behind California and Wisconsin, it should have strong dairy programs at the Land Grant universities with adequate teaching facilities, or at least have a herd of cows, which would enable us to instruct large herd dairy management, but it doesn’t.” Hagevoort declared. “However, one of the key motivating arguments for development of the Consortium program was provided by producers who were having trouble figuring out where to enroll their children in college where they could receive a meaningful degree in agribusiness or animal science with an emphasis in dairy management.”

According to Hagevoort, there are so many aspects of the dairy industry that are not being taught and experienced anywhere else. The Consortium provides the necessary classroom focus in the morning and the practical hands-on dairy experience in the afternoon. “This six-week program is a huge plus, not only for the students but also for the dairy producers,” Hagevoort stressed.

From the producer’s perspective, Jonathan Vander Dussen, a producer in the Clovis, NM area said, “This program is a great way for students who are interested in learning about the dairy industry to gain well rounded knowledge of all the different aspects involved in producing milk and large herd dairy management. Growing up in a dairy producing family, this class would have been a great asset for me. I would have been able to visit other dairies and learn why they do things the way they do, how different techniques work for them, and learning from the dairy specialists about what directly influences all aspects of producing in the dairy industry.”

Student education is important for the dairy industry, whether students go into the industry or not, the knowledge

gained here is vital to the continued growth and development of dairy herd management. The Consortium helps build a gateway for students, eager to learn about the industry and all that’s involved in running a dairy. They have the opportunity that might not be possible at their universities.

The **University of Florida** is a cooperating institution. Like many universities in the Southwest, UF cannot offer a large dairy curriculum due to a limited number of students that are interested in dairy production. The Consortium teaching program is a great opportunity for those students who want the in-depth, extensive dairy learning experience. In addition, Dr. Albert De Vries has been teaching a week on advanced dairy herd analytics and economics in session two.

“I have realized why people use the expression, ‘Any type of experience that you can receive will be beneficial to you,’” said University of Florida student Diana Roldan, an animal science undergraduate student who was in the program in 2013. “In my case, being at the Southern Great Plains Dairy Consortium helped me gain knowledge, build skills and develop a passion about dairy science, which I plan to utilize in my future career within agriculture.”



Sarah Bartolic (left) and Diana Roldan attended the Southern Great Plains Dairy Consortium Teaching Program in 2013. Both are Animal Sciences students at the University of Florida.

Dr. Mike Tomaszewski, a professor at Texas A&M University and one of the Consortium coordinators, said the future of this intensive six-week program is important so students are able to further their education. “This class is a rare opportunity for students who otherwise wouldn’t have resources to study within the dairy industry. The goal is to be able to give them the best of the industry and with this program I know we can,” he said. “I would like to see the Consortium program continue to grow as a center for learning and training for those interested in large dairy herd management.”

For more information, visit <http://sgpdct.tamu.edu>. For Florida, contact Albert De Vries, devries@ufl.edu. This article was originally written by Morgan Smith, an Agricultural Extension and Education marketing major at NMSU, and was modified by Albert De Vries.



Timed Artificial Insemination in Dairy Heifers

Fábio S. Lima and José E.P. Santos

Development and significance of timed AI for heifers

Timed artificial insemination (AI) is a technology developed in the early and mid-90's that allowed performing insemination at fixed time without the need of estrous detection. One of the first programs of timed AI reported to successfully synchronize ovulation and result in acceptable pregnancy per insemination was named Ovsynch. This pioneer program consists of 4 key steps. First a dose of gonadotropin-releasing hormone (GnRH) is administered to induce ovulation and synchronize follicle growth in the ovary of cows and heifers. Second, an injection of prostaglandin (PG) F_{2α} is administered 7 days after the GnRH to regress the corpus luteum (CL) that might have been present in one of the ovaries when the program started or the newly formed CL after induction of ovulation with GnRH. The third step is a final dose of GnRH administered 56 hours after the PGF_{2α} to induce a synchronized ovulation. Finally, cows are inseminated 12 to 16 hours later regardless of signs of estrus.

Ovsynch and other deriving programs soon become very popular and widely used by dairy producers on lactating cows to mitigate problems with low estrous expression and detection, which ultimately reduce reproductive performance of the herd. On the other hand, the use of timed AI for management of reproduction in dairy heifers is generally very low compared with that of lactating dairy cows based on surveys by the National Animal Health Monitoring System. The first studies that investigated the use of timed AI in dairy heifers used the Ovsynch protocol or deriving programs based on GnRH and PGF_{2α}. These studies failed to result in pregnancy per insemination that resembles those obtained when heifers were inseminated following detected estrus (Table 1). Furthermore, the higher pregnancy per insemination observed in dairy heifers than in lactating cows typically leads to the perception that heifers would not benefit from programs that synchronize ovulation.

In general, the goal of timed AI programs have been to result in pregnancy per insemination similar to that obtained when cows are inseminated following detected estrus, but to allow an increased proportion of eligible cows to be bred at the desired time. Until recently, the same could not be suggested for management of reproduction in dairy heifers. The low fertility resulting from the standard Ovsynch program never made insemination at fixed time attractive for dairy producers. However, when fertility to timed AI is high, there are situations in which incorporation of insemination at fixed time might be advantageous to manage reproduction in heifers.

Recent studies conducted at the University of Florida investigated a new program aiming to adequate the manipulation of the estrous cycle to the needs of dairy heifers. The initial work resulted in pregnancy per insemination for first and second services ranging from 52.2% to 61%. These values are compatible with results reported for AI at detected estrus in dairy heifers.

Optimization of timed AI program for dairy heifers

Dairy heifers have important ovarian and endocrine differences during the estrous cycle compared with lactating

cows that influence how they respond to the hormonal manipulations to synchronize ovulation for fixed time insemination. Therefore, it is no surprise that use of the standard timed AI programs such as Ovsynch resulted in low pregnancy per insemination and discouraged producers and veterinarians from implementing such technologies (Table 1). Because of the low success with Ovsynch in heifers, it was clear that changes in the program had to be made to accommodate the distinct ovarian and endocrine aspects of dairy heifers. Work at the University of Florida first demonstrated that it was possible to inseminate dairy heifers at fixed time and achieve pregnancy per AI above 50%. In fact, more recent research with heifers at first AI demonstrated that the sequence of hormonal treatments described in Figure 1 resulted in pregnancy per AI above 58%.

Why inseminate heifers using timed AI?

Many producers still think that application of reproductive technologies is not needed for management of reproduction in dairy heifers. In many cases, the high pregnancy per insemination observed in heifers detracts producers and veterinarians to consider that one of the goals of heifer breeding is to achieve pregnancy at a desired age such that cost of raising heifers and future lactation performance are optimized. Delaying pregnancy in heifers results in \$2.00 to \$2.50/day of additional raising cost with current feed prices (\$0.08 to \$0.09/lb of heifer ration dry matter). One advantage of implementing timed insemination programs in heifers is the ability to breed 100% of the animals on the day they are introduced to the breeding group. A recent survey of large dairy herds in the Western states in the US revealed that most dairy farms have pregnancy rates in heifers below 30%. This means that for every 3 weeks, less than 30% of the eligible heifers become pregnant on a farm. This is critical in farms where insemination rates are low. Simulations by our group suggested that timed insemination would be economically attractive for management of first breeding in heifers when the detection of estrus in dairy farms is below 70%, which seems to be the case of many farms. Despite the costs associated with treatments and labor, implementation of these programs can result in \$10 to \$20 reduction in cost per pregnancy in heifers. Producers should evaluate and discuss with their veterinarians and consultants the reproductive program and consider changes if heifers are not becoming pregnant at the desired age.

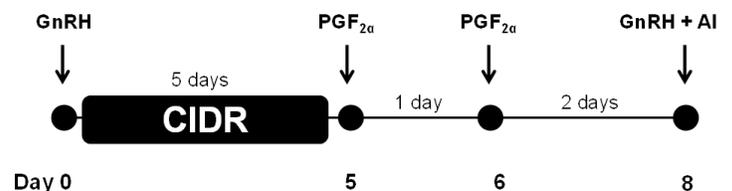


Figure 1. Timeline of hormonal treatments and insemination suggested for timed AI in dairy heifers (Lima et al., 2013). AI = artificial insemination; CIDR = controlled internal drug-release containing progesterone; GnRH = injection of 100 µg of gonadotropin-releasing hormone; PGF_{2α} = injection of 25 mg of prostaglandin or 0.5 mg of dinoprost

Table 1. Pregnancy per insemination for heifers inseminated by conventional timed AI programs or the 5-d timed AI program

Conventional timed AI programs	Heifers, n	Pregnant, %	Reference	5-d Timed AI programs	Heifers, n	Pregnant, %	Reference
7d Ovsynch	187	45.5	Schmitt et al. (1996)	1 st AI	451	58.3	Rabaglino et al. (2010a)
7d Ovsynch	77	35.1	Pursley et al. (1997)	1 st AI	416	60.3	Rabaglino et al. (2010b)
7d Ovsynch	113	42.5	Stevenson et al. (2000)	2 nd AI	165	52.1	Rabaglino et al. (2010b)
6d Cosynch 48h	175	34.3	Rivera et al. (2004)	1 st AI	1,295	56.9	Lima et al. (2011)
6d Cosynch 48h	95	29.5	Rivera et al. (2005)	2 nd AI	600	53.3	Lima et al. (2011)
6d Cosynch 48h + CIDR	94	31.9	Rivera et al. (2005)	1 st and 2 nd AI	1,106	56.4	Lima et al. (2013)
6d Cosynch 48h	82	45.1	Rivera et al. (2006)	1 st and 2 nd AI	2,144	55.9	Lima et al. (2013)
Overall	823	38.3			6,177	56.3	

Fábio S. Lima received his PhD in Animal Sciences in August 2013. José E.P. Santos is a Professor in the Department of Animal Sciences. For more information, contact José Santos at jepsantos@ufl.edu

Prediction of the Future Florida Mailbox Price: January 2014 - December 2014

Using the Class III and Class IV futures settle prices of January 10, 2014, the University of Wisconsin predicts the Florida mailbox prices for January 2014 to December 2014 as follows:

Month	Class III settle price*	Class IV settle price*	Predicted FL mailbox price
Jan-14	20.50	21.90	25.55
Feb-14	20.21	22.37	25.62
Mar-14	19.22	21.90	24.88
Apr-14	18.70	21.05	23.39
May-14	18.53	20.36	22.98
Jun-14	18.40	19.57	22.54
Jul-14	18.19	19.20	23.54
Aug-14	18.09	19.00	23.39
Sep-14	18.00	18.98	23.34
Oct-14	17.90	18.89	23.45
Nov-14	17.85	18.85	23.40
Dec-14	17.68	18.35	23.08

* Class III and IV settle prices (\$/cwt) as of January 10, 2014.

Daily updated Florida mailbox price predictions are found at http://future.aae.wisc.edu/predicted_mailbox/?state=Florida

Dairy Extension Agenda

- Tue + Wed. **February 4-5, 2014.** 25th Florida Ruminant Nutrition Symposium. <http://dairy.ifas.ufl.edu/rns>
- Sat. **March 15, 2014.** 3rd Family Day at the Dairy Farm. <http://www.familydayatthedairyfarm.info>
- Wed. **April 9, 2014.** 50th Florida Dairy Production Conference, Gainesville, FL. <http://dairy.ifas.ufl.edu>
- **May 7-9, 2014.** 63th Florida Beef Cattle Short Course. http://animal.ifas.ufl.edu/extension/beef/BCSC/2014_bscs/short.shtml
- Thu. **May 29, 2014.** Corn Silage and Forage Field Day. <http://animal.ifas.ufl.edu/extension/CSFD/CSFD/>



The University of Florida was well represented at the **2013 Southern Regional Dairy Challenge** held at Louisiana State University in Baton Rouge, LA, from November 17-19. Fifty-four students from ten Southeastern universities were each put on 4- or 5-member teams comprised of students they had just met. The challenge was to come together as a team and analyze a real dairy farm for its strengths, weaknesses and opportunities to improve its operation, then give a professional PowerPoint presentation to four judges who were looking for poise, public speaking ability and most importantly ways the challenge dairy farm could be improved. Two groups of six teams were ranked against each other.

With Florida coach Dr. Mary Sowerby (middle), are Caitlin Conway (right) from Indiantown, FL, proudly holding a first place team certificate, while Jackie Mariano from Orlando, FL, holds a second place team certificate from the same group of six teams.

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