

## Cooling Heifers in Late Gestation Yields More Milk and Healthier Calves

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Heat stress during the entire dry period has a profound negative effect on milk production in the next lactation. But in animals giving birth for the first time, there is no “dry” period yet there may still be impacts of heat stress on mammary growth, and therefore productivity in the first lactation. In addition, nulliparous animals are still growing in total body size even as the first gestation progresses. Thus, any impairment due to heat stress in this physiologic state may have long lasting impacts on productivity. Calves born to mature cows that experience heat stress in late gestation also have lower passive transfer of antibodies from colostrum relative to calves from cooled dams, but this has not been examined in those born to first calf heifers.



The purpose of our experiment was to determine if late gestation heat stress in cows calving for the first time impaired productivity, in a manner similar to older cows, because regardless of age there is exponential growth of the mammary gland in late gestation. In addition, the immune status of the calves from both groups of heifers was assessed to determine if the impact on passive transfer was similar to that of mature cows.

Our hypothesis was that exposure of pregnant dairy heifers to heat stress abatement during late gestation (approx. 2 months before calving) would positively impact their metabolism, growth, innate and acquired immunity, and consequently increase milk yield during their first lactation relative to heifers that were not cooled. Further, we hypothesized that calves born to heat stressed

heifers would experience reduced passive transfer and growth in comparison to calves from cooled dams.

Thirty nulliparous Holstein heifers were selected for the study during late gestation, blocked by genomic PTA (Predicted Transmitting Ability) of milk, and assigned randomly to one of two treatments for the final 60 d of pregnancy. Treatment 1 consisted of active cooling with soakers and fans and shade (**CL**,  $n = 15$ ), whereas Treatment 2 was the heat stress group that only had shade (**HT**,  $n = 15$ ); both groups were housed in a sand bedded freestall barn for the duration of the study. After calving, all of the cows were housed together in a freestall barn and managed as a group.

Active cooling during late gestation reduced the respiration rate by 15 breaths per minute ( $44.3$  vs.  $60.0 \pm 1.6$  bpm) and rectal temperature by  $0.18$  °F ( $101.66$  vs.  $101.84 \pm 0.07$  °F) relative to the heifers that only had shade, indicating that the use of fans and soakers was effective to relieve heat stress in heifers. Late gestation heat stress caused dramatic loss of productivity in the first lactation, similar to that observed in multiparous animals. Milk yield was tracked for the first 15 weeks in milk, and the cooled heifers produced 8.6 lbs/day more milk than the heat stressed heifers ( $78.9$  vs.  $70.3 \pm 03.1$  lbs/d), while milk composition was unchanged. This was associated with reduced gestation length ( $276.4$  vs.  $272.7 \pm 1.4$  days) and other physiological shifts consistent with heat strain when heifers did not have access to active cooling. Further, calves born to heat stressed dams had reduced IgG transfer relative to calves from cooled dams, indicating lower immune status and potential for survival. The potential effects on the productivity of those calves is unknown, but we have observed significant reductions in yield from calves that experience heat stress in utero in mature cows.

In summary the effects of late gestation heat abatement were similar in first calf heifers to those observed in mature cows. And, the impact on early life immune status in their calves was improved when heifers were cooled. With summer on the way it is important to make plans to provide active cooling to dry cows and springing heifers in order to optimize productivity and health.

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## UF Dairy Club Toured the Dairy Industry in Georgia

Albert De Vries

The UF Dairy Science Club held its Spring Farm Tour on Saturday April 17<sup>th</sup>, 2021. The Spring Farm Tour was organized by the Dairy Science Club to sample the dairy industry in Georgia.

The UF Dairy Club is an active club of undergraduate students that are interested in dairy science. Lately, the club consist of over 20 active members, with other students showing an emerging interest in membership. Most members are students in the Animal Sciences major. Some students major in Biology, Zoology or another major in the College of Agricultural and Life Sciences. The Club just finished an active 2020-2021 year, despite the many covid-19 limitations on in-person meetings.

The day started early by boarding the three vans by the 14 undergraduate students, 3 graduate students and an advisor that went on this tour.

The first stop was BrooksCo Dairy in Quitman, GA. Ashley Bailey, a UF Animal Sciences alumnus, and his staff greeted the Club and showed us around the dairy. For many Club members, it was the first dairy farm other than the UF Dairy Unit that they visited. We were impressed by the hearty welcome, the open discussion, and the tour of the facilities.

The next stop was the SweetGrass Dairy Cheese Shop in Thomasville, GA. Co-owner Jessica Little provide delicious sample platters of a variety of their cheeses. This stop also served as lunch break and many students on the tour purchased cheeses to take home.

The third stop was at Leatherbrook Holsteins in Americus, GA. Adam Graft welcomed the Club and showed us around the impressive facilities. He shared the dairy's story, answered questions, and provided access to a full refrigerator with refreshments.

The final stop was at Barrington Dairies and Highbrighton Dairy in Montezuma, GA. Pete Gelber and some of his staff welcomed us and showed some of the many facilities. We looked at the new rotary parlor, free stalls, and the heifer facilities. At the end of the tour, we enjoined a wonderful dinner provide by the dairy. The Club was back in Gainesville, FL, Saturday evening late.

Well done Dairy Club and thank you Georgia dairy owners and staff. Photos courtesy of Cash Rice who was the Dairy Science Club president in 2020-2021.



UF Dairy Science Club at BrooksCo Dairy in Quitman, GA



UF Dairy Science Club at the Sweet Grass Dairy Cheese Shop in Thomasville, GA



UF Dairy Science Club at Leatherbrook Holsteins in Americus, GA



UF Dairy Science Club at Barrington Dairies in Montezuma, GA

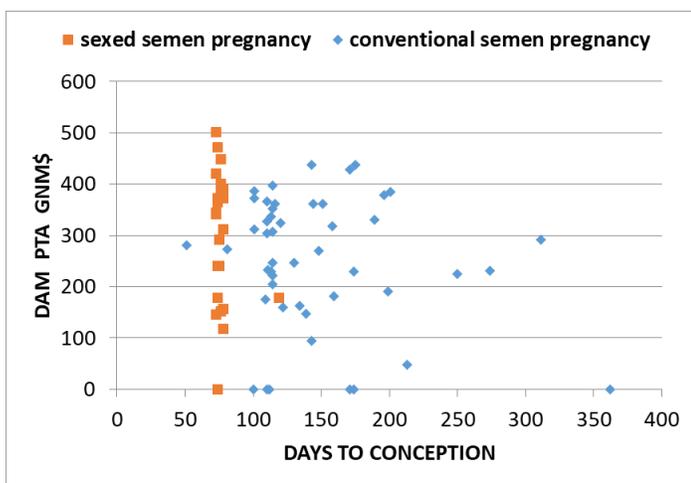
### **Case study: Opportunity Cost of Ignoring a Dam's Genetic Merit in Insemination Decisions**

Albert De Vries

A case study. The dairy had been using sexed and conventional semen in first lactation cows. At the time of this analysis (May 2021), 24 cows were pregnant from sexed semen and 48 cows were pregnant from conventional semen. The dairy's policy was to use sexed semen in first inseminations and conventional semen in repeat inseminations. The dairy was in a growing mode and needed to get some cows pregnant with female sexed semen to produce the desired number of heifer calves. First inseminations were selected for sexed semen because the dairy expected better conception rates in first inseminations compared to later inseminations.

The difference was small, however, and will be ignored in this case study. The dairy planned to keep and raise all heifer calves out of these pregnancies to become part of the milking herd.

All but 7 of the 72 cows had genomic test results. The genomic test results of the dams were not considered at the time of the insemination, however. The figure shows the 72 dams' PTA for genomic Lifetime Net Merit dollars (GNM\$) and their days in milk at conception. Recall that GNM\$ is a lifetime profit value, relative to that of an average cow with a GNM\$ of \$0. Thus, the heifer calves with the higher GNM\$ are expected to become more profitable cows. Average days to conception was 77 for the 24 cows pregnant from sexed semen and 148 days for the 48 cows pregnant from conventional semen. This confirms that first inseminations were done with sexed semen according to the dairy's policy.



*First lactation dams' genomic PTA of Net Merit Dollars (GNM\$) and days to conception for 72 cows that were pregnant from either sexed or conventional semen.*

The sires used for the sexed and conventional breedings had similar PTA for GNM\$. It follows that the differences in expected GNM\$ of the heifer calves to be born out of these 72 pregnancies are all due to the differences in GNM\$ of the dams.

The figure shows a spread in GNM\$ from \$0 (no data) to \$502. Some cows with low GNM\$ were pregnant from sexed semen while some cows with high GNM\$ were pregnant from conventional semen. By ignoring the genetic merit of the dams, the dairy's sexed semen use policy resulted in making some dairy heifer calves with low genetic merit on purpose. What opportunity was missed by not getting the 24 dams with the highest GNM\$ pregnant from sexed semen and the other 48 dams with lower GNM\$ from conventional semen?

In the current situation, the average dam that was pregnant from sexed semen had a GNM\$ of \$294. The average dam that was pregnant from conventional semen had a GNM\$ of \$249. Cows calving from sexed semen have a much higher chance (say 90%) to deliver a heifer calf than cows calving from conventional semen (say 50%). If all pregnancies resulted in a single calf (ignoring twins), then 46 heifer calves were expected to be born and 26 male calves. The weighted average GNM\$ of the dams of these 46 heifer calves was \$278.

How would the economic value of heifer calves change if the 24 dams with the highest GNM\$ had become pregnant from sexed semen? This policy implies that sexed semen would be used on some repeat breeders while low genetic merit cows

would not receive sexed semen for first insemination.

To be fair, the dairy used sexed semen only on first inseminations because of concerns about lower conception rates in repeat breeder cows. The trade-off between lower conception rates and lower genetic merits needs to be considered but is left for a future article.

The average GNM\$ of the 24 dams with the highest GNM\$ was \$396. The average of the 48 dams with the lowest GNM\$ was \$198. Again 46 heifer calves were expected to be born and their dams' weighted average GNM\$ was \$325. This is a gain of  $\$325 - \$278 = +\$47$  GNM\$ per born heifer calf, if the 24 dams with the highest GNM\$ had become pregnant from sexed semen. The value of the male calves was assumed to be not affected by their dams' GNM\$.

What is the +\$47 GNM\$ worth in today's dollars? First, let's assume that 80% of these heifer calves become lactating cows. The values of the other 20% do not depend on GNM\$ because no life calf is born, or the heifer is culled. This assumption is not quite right because the GNM\$ includes some traits that are expressed in heifers, such as heifer conception rate. Second, let's assume that the time from pregnancy to expression of genetic merit in the herd is 4 years. This is because most of the GNM\$ traits are expressed in cows, not heifers. Profit from GNM\$ differences in the future need to be discounted into today's dollars. Applying some discounting (5% per year, for 4 years,  $1/(1+0.05)^4 = 0.82$ ) results in another 82%. Finally, let's assume that \$1 greater GNM\$ would result in \$1 greater lifetime profit before discounting. This assumption means that the GNM\$ is on average a good measure of profitability differences through genetics.

Together, in today's dollars the +\$47 difference in GNM\$ is worth  $\$47 * 80% * 82% = \$31$  lifetime profit opportunity cost per heifer calf. The profit opportunity cost could be realized if the dam's PTA for GNM\$ was included in the choice of semen type. For the 72 cows that were pregnant on this dairy, that is a total opportunity cost of \$1,413.

The GNM\$ are only available through genomic testing, which is not free. The \$1,413 gain out of these 72 pregnancies is \$19.63 per cow. This gain alone is likely not enough payback for the genomic testing cost. However, genomic test results can be used for multiple decisions, for example to further

improve the selection of sires, in multiple lactations especially also on heifers, and to cull surplus heifers. The gain of \$19.63 per cow is therefore not a full account of the value of using genomic PTA of NM\$ on the dairy. On the other hand, ignoring the dams' genetic merit in insemination decisions led to meaningful opportunity cost at this dairy.

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### Florida International Dairy Academy is Looking for Participants

The **Florida International Dairy Academy (FIDA)** is launching in 2022!

FIDA is an online extension education program tailored to advance the knowledge of global dairy herd management and production. FIDA courses are taught by faculty from the UF/IFAS Department of Animal Sciences, College of Veterinary Medicine, and Agronomy.

FIDA courses are developed to take you to the forefront of practical and scientific knowledge in dairy production.



The FIDA program will prepare you for a technology-driven career applied to progressive dairy farms. Students will have access to the latest scientific and technological developments and applications pertaining to all phases of dairy production, including courses in: Nutrition, Lactation, Reproduction, Behavior and Welfare, Genetics, Forages, Health, Milk Quality, Facilities, and Economics

Don't miss your opportunity to hear the latest news about this program. Click the FIDA graphic or [https://ufl.qualtrics.com/jfe/form/SV\\_7V8BwOI060bffW6](https://ufl.qualtrics.com/jfe/form/SV_7V8BwOI060bffW6) to sign up for our email list and receive exclusive offers and information. Visit the FIDA website to learn more: <https://animal.ifas.ufl.edu/fida/> Or contact Dr. Fernanda Rezende, [frezende@ufl.edu](mailto:frezende@ufl.edu)



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