

IMPACT OF HEAT STRESS ON FERTILITY IN DAIRY CATTLE

Heat stress can compromise a lactating cow's performance in many different ways – decreased feed intake, altered metabolism, reduced milk production, impaired reproductive performance and increased disease incidence.^{1,2,3} The inability of a cow to dissipate heat effectively compromises their ability to function normally all the way down to the molecular level.⁴ The impact of heat stress can have both short-term and long-term consequences on reproduction depending on stage of reproduction cycle and the length of the heat stress event.⁵

Impact of Heat Stress on Achieving Pregnancy

Heat stress negatively impacts the ability of a cow to become pregnant through both internal and external controlled pathways.^{6,7,8,9,10,11,12,13,14} Figure 1 identifies some of the many pathways in which heat stress can lead to reduced fertility.

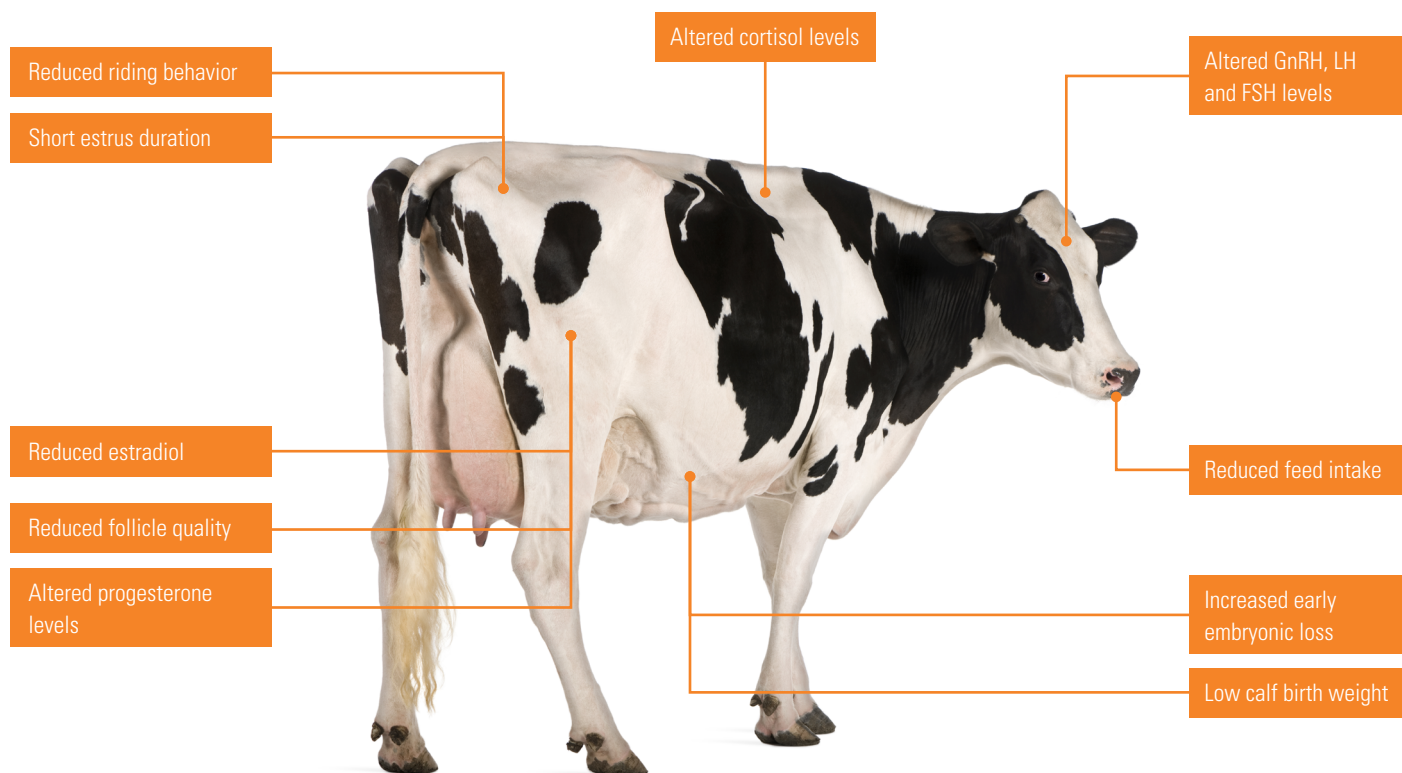


Figure 1. Impact of heat stress on fertility

Evaluation of KemTRACE® Chromium on Reproductive Performance of Holstein Cows in Pennsylvania

A field trial was conducted on a commercial 800-cow Holstein dairy farm in southeastern Pennsylvania to evaluate the effect of KemTRACE® Chromium on reproductive performance.¹⁵ The trial was conducted from January through October 2012, and the dairy had never been fed supplemental chromium prior to the initiation of the trial. The trial was an all-off/all-on design where all lactating cows received 8 milligrams chromium/head/day delivered through KemTRACE Chromium 0.4% in a base corn mix included in all lactating diets. 2012 was also a very challenging weather year in regards to heat stress:

- Between March 1 and October 1, dairy producers in southeastern Pennsylvania experienced a temperature humidity index of 68 or greater on 73 percent of days¹⁶
- 2012 was the hottest year for the U.S. since instrument records began in 1895, and the summer was the third warmest summer on record¹⁷
- 28,000 daily high-temperature records were broken or tied¹⁷



kemin.com/ktchromium
450-467-0854

Results

Chromium supplementation began in January 2012, and by March, pregnancy rate (PR) began increasing and continued to increase to 31.5 percent by July. The first service conception rate (CR) remained at 45 percent throughout this period, but second, third and fourth service CR all increased to their greatest levels on record for the herd. In summary, chromium supplementation has been shown to improve energy utilization and the cows in this trial herd were less severely impacted by negative energy balance in early lactation, and were more fertile under the timed AI program.

In today's current economics, the increase in PR from 28 to 31.5 percent with the supplementation of chromium would be worth \$105 per cow per year or \$54,000 for a herd of 800 cows. At a cost of \$0.05 per cow per day, the reproductive return on investment based on the current trial would be roughly 10.5:1¹⁸. From a production and reproductive performance standpoint, a customer who decides to feed KemTRACE® Chromium to their lactating herd should feel confident in the return on their investment.

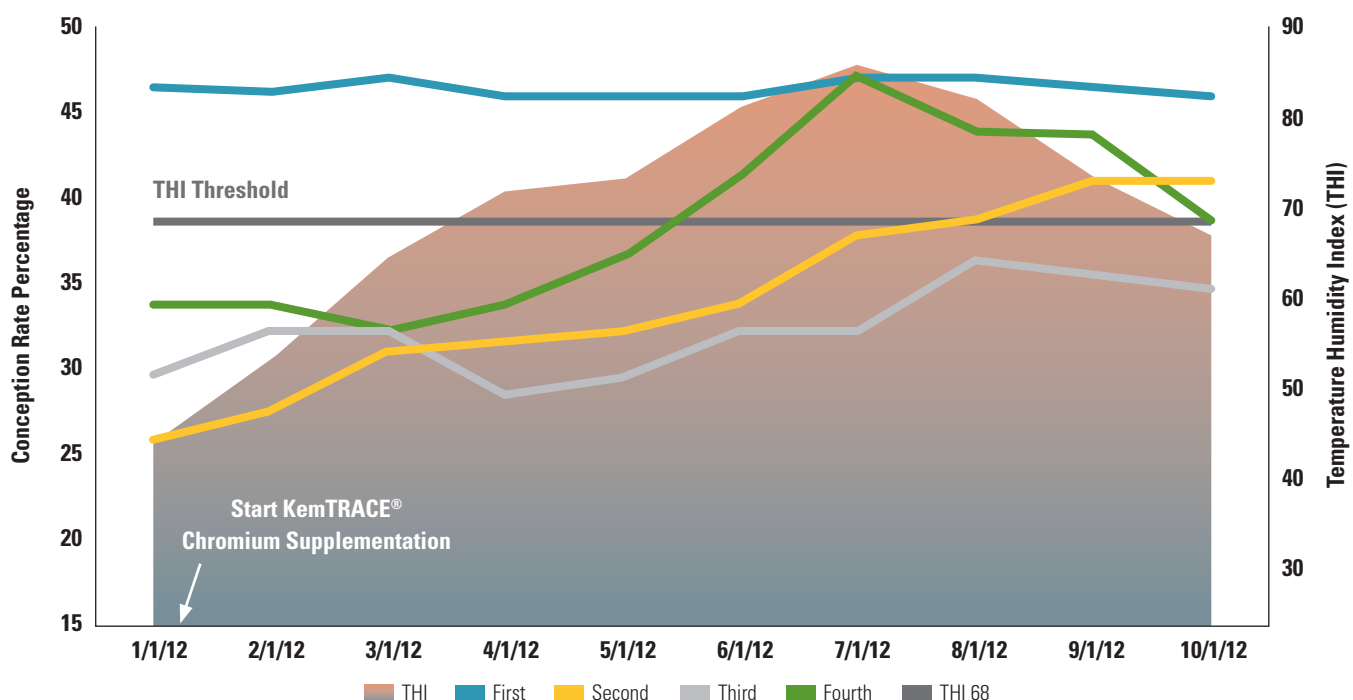


Figure 2. Conception rates for first, second, third and fourth inseminations from January through October 2012

References:

1. Fuquay et al., 1981. J. Anim. Sci. 1981;52:164-174.
2. Kadzere et al., 2002. Livest. Prod. Sci., 77(1): 59-91.
3. West et al., 2003. J. Dairy Sci., 86(6): 2131-2144.
4. Collier et al., 1982. J. Dairy Sci 65: 2213-27.
5. Wolfenson et al., 1997. Anim. Reprod. Sci 47: 9-19.
6. Christison and Johnson et al., 1972. Journal of Animal Science 35: 1005-10.
7. Abilay et al., 1975. J. Dairy Sci 58: 1836-40.
8. Pennington et al., 198. J. Dairy Sci 68: 3023-30.
9. Hall et al., 1959. J. Dairy Sci 42:1086-94.
10. Wilson et al., 1998. J. Dairy Sci 81: 2124-31.
11. Roth et al., 2001. Reproduction 122: 737-44.
12. Honig et al., 2016. Theriogenology 86(2): 626-34.
13. Putney et al., 1989. Theriogenology 31: 765-78.
14. Wheelock et al., 2010. J. Dairy Sci, 93(2): 644-655.
15. Kemin Internal Document 13-0002.
16. NOAA Climate Online Database. <https://www.ncdc.noaa.gov/cdo-web/>. Accessed 8-10-16.
17. NOAA "NCDC Announces Warmest Year on Record for Contiguous U.S." <https://www.ncdc.noaa.gov/news/ncdc-announces-warmest-year-record-contiguous-us>. Accessed 8-10-16.
18. Permission granted from Dr. James Ferguson, University of Pennsylvania, 2016.

KEMIN®

**KemTRACE®
CHROMIUM**
Essential to you and your operation.