

# Effects of Heat Stress on Passive Transfer of Immunity

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*Extreme heat can negatively influence a cow's ability to produce high quality colostrum. Heat stress can also negatively affect a calf's ability to absorb IgG from colostrum. Favorable environmental conditions are vital to promoting calf health, minimizing disease risk and mortality, subsequently encouraging growth rates. With summer upon us, this issue of The Calf Coach will focus on the two main reasons heat stress negatively influences successful passive transfer of immunity.*

## Effects of heat stress on colostrum quality

During heat stress cows exhibit reduced feed intake, decreased activity, increased respiratory rate, and increased peripheral blood flow in sweating<sup>1</sup>. When heat stress is experienced close to calving an additional negative side effect **is impaired transfer of maternal IgG's to colostrum.**

A study which proved this phenomenon grouped 1st calf heifers in either a cool (Temperature Humidity Index (THI) of 65) or hot environment (THI of 82 from 0900 to 900h, THI 76 from 2100 to 0800h) for the last 3 weeks of pregnancy and first 36 h post calving<sup>2</sup>.

- o Blood taken from these heifers during the final 2 weeks of pregnancy showed lower plasma concentrations of IgG in the non-heat stressed group, suggesting IgG had been diverted from the bloodstream to colostrum. In the heat stressed group, higher plasma concentrations of IgG were found suggesting less IgG had been diverted to colostrum.

- o After calving, colostrum samples from cows kept in the hot environment contained lower concentrations of IgGs (22.3% less) than the cows kept in cooler environments.

- o This study demonstrates that heat stressed cows experience decreased transfer of maternal IgG to colostrum, meaning colostrum from these cows tends to be of lower quality.

## Effects of heat stress on the absorption of IgGs

Heat stress has also proven to have negative effects on colostral IgG absorption in the calf. A trial which fed groups of calves the same volume of pooled colostrum, one being exposed to high ambient temperatures, reported significant findings concerning the depressant effect of heat stress on colostral IgG absorption<sup>3</sup>.

- o Blood samples taken from calves kept in high ambient temperatures had significantly decreased serum IgG on days 2 and 10 after birth than did control calves kept at lower environmental temperatures and fed the same volume of pooled colostrum.

- o Mortality reached 25% (9 of 36) for calves kept in the heat stressed environment while only 3 calves from the other environments died.

- o **This study demonstrates that heat stressed calves have a decreased ability to absorb IgG and experience significantly more mortality than non heat stressed calves.**

During periods of heat stress, take necessary measures to ensure cows and heifers are kept cool. Alleviate heat stress by providing constant access to water, shade and proper ventilation. For cows, measures including provision of an enriched, more easily digestible ration as well as sprinklers over feeding areas can help ease heat stress. For calves, good colostrum management becomes even more important during heat stress. When colostrum quality is questionable, CCT colostrum replacers are a practical alternative to ensure calves receive the amount of IgG required for immune protection.

<sup>1</sup>West, J.W. 2003. Effects of Heat-Stress on Production in Dairy Cattle. Journal of Dairy Science. 86:2131-2144 <sup>2</sup>Nardone, A. et al. 1997. Composition of Colostrum from Dairy Heifers Exposed to High Air Temperatures During Late Pregnancy and the Early Postpartum Period. Journal of Dairy Science. 80:836-8443 <sup>3</sup>Stott, G. 1980. Immunoglobulin Absorption in Calf Neonates with Special Considerations of Stress. Journal of Dairy Science. 63:681-688

