HEAT STRESS effects prepartum are passed on to the next generation and compromise birth weight and health.

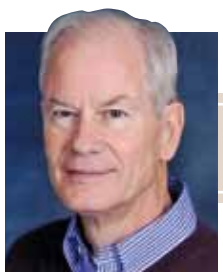
Heat stress shortchanges heifers

For calves and heifers, every effort should be made to mitigate the effects of heat.

by A.F. Kertz

AT THE July 2012 joint annual Animal and Dairy Science meetings held in Phoenix, Ariz., it was hot. A rather fitting symposium coincided with the temperature. The topic: heat stress.

On-farm considerations are rarely made for moderating heat stress on young stock. However, Cathy Williams of Louisiana State University and Bob James of Virginia Tech addressed this issue for calves and heifers, respectively.



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Plentiful evidence has fostered our understanding of the influence the first several months of a calf's life has on growth, development and milk production potential. Calves endure cold or heat stress when the ambient temperature is below 60°F or above 77°F. Outside this range, calves must expend additional energy to stay warm or cool down. Heat stress is typically associated with Southern regions, but, last summer, extensive heat stress was experienced throughout the U.S.

Overheating in hutches

Hutches, a common housing option for unweaned calves, can become like small ovens when in direct sunlight during hot weather. And for many calves born in the summertime, the hutch is their only shade source. Calves try to compensate for rising temperatures by elevating respiration and water intake. The results we often see are a drop in dry matter intake (DMI), daily gain, fecal score (quality) and feed efficiency. The immune system, too, may be compromised. Dehydration can occur, and kidney function is impaired. If factors are not corrected, death may result.

In one study with polypropylene hutches, supplemental shade reduced temperature inside hutches and exercise areas, as well as the rectal temperature of calves. There was little effect on overall growth and health of calves.

In another study with more intensive measurements, outer and inner surface temperatures of hutches dropped with supplemental shade, hutch air temperature was reduced, and in the evening when heat stress was greatest, shaded calves had lower skin temperatures and respiration rates. Supplemental shade diminished the severity of heat stress experienced by calves housed in hutches in summer.

In a July 2012 *Journal of Dairy Science* study, simply elevating the rear of each hutch with a concrete block improved airflow. Internal hutch temperatures were lower than the environmental temperature. Elevating each hutch also lowered evening respiratory rates from 58 to 44 breaths per minute and lowered carbon dioxide levels.

In several other studies discussed, housing, bedding and summer cooling options were evaluated. Calves were housed in poly hutches or wire mesh pens inside a calf facility for one study. Nursery pens were bedded with either straw or sand. Weight gain and starter intake were greater, with less scouring, in the nursery with straw bedding. In a second trial, calves were housed in nursery pens, bedded with straw and had fans for 9 hours or no fans. Weight gain, feed efficiency and hip width change were greater, and respirations per minute were lower for calves cooled with fans.

Strategies to minimize heat stress effects on calves should consider housing types and modifications, providing shade and using cooler bedding such as sand.

Heifers often forgotten

Heifers for many reasons are even less likely to be considered for heat stress abatement: they are low input animals, fed low-cost feeds, housed in lower cost facilities and undergo low-intensity management. Records, too, are minimal with reproduction, age at first calving and first-lactation performance the major or only parameters measured.

Larger heifers have greater maintenance requirements during hot weather. Their body size makes it more difficult to relieve heat load, with a smaller surface area relative to body size. The use of poorer quality forages and lack of intensive housing systems, especially in the Southeastern U.S., make the risk of heat stress an even greater problem.

Heifer responses to heat stress include elevated water intake, along with reductions in ration dry matter intake (DMI) and reproductive performance. There is also a severe influence on prepartum dairy heifers resulting in diminished colostrum production and quality, with smaller calves and negative health impacts.

James reviewed several studies that showed that the best predictors of water intake and performance were the temperature humidity index, mean ambient temperature, minimum temperature and maximum temperature. Solar radiation and DMI had lesser influences. In one study, three days after heat stress ensued, water intake had risen 55 percent, while after seven days it jumped further to 65 percent. At the same time, DMI declined by 7 and 10 percent, respectively.

In a study of thermoneutral versus heat-stressed heifers, the second wave dominant follicle was larger and followed by ovulation in 9 to 11 days for thermal neutral heifers. In heat-stressed heifers, second wave follicles regressed and were followed by ovulatory third wave follicles.

Heat-stressed heifers had a lesser decline of plasma Ig during their last two weeks of pregnancy. This was associated with lower mean concentrations of IgG and IgA, total protein, casein, lactalbumin, fat, lactose, and short and medium chain fatty acids in colostrum. Heat-stressed heifers have smaller, less vigorous calves. These calves also have reduced colostral antibody absorption.

Needs vary by system

Heifer facilities can vary depending on whether they are extensive, where shade is essential, or intensive, which could include mechanically or naturally ventilated facilities. Stocking density is a major concern in either system.

Portable shades need to be provided for grazing situations. Trees are a short-term solution and usually will not survive as a shade provider. Shade needs depend on the extent of nighttime cooling. For intensive systems, open-side walls with an east to west orientation and roof overhang for summer shade are critical. These heifers may show an improved feed efficiency of 12 to 25 percent due to lower body maintenance expense.

Water must be plentiful and clean since, under "normal" situations, water intake is four times DMI. Limiting water intake limits DMI. Clean and noncontaminated water without high sulfates or iron helps ensure water and DMI.

Heifers of the greatest concern are the first postweaning pen and should be fed the highest quality forage. Limited amounts of silage should be fed to these heifers. Palatability and DMI are of greater concern for breeding age animals where heat detection and strength of estrus are key. Prepartum feeding, care and facilities help ensure colostrum production, calf weight and development.

For heat stress, it is important to address those groups most affected (youngest, breeding age, prepartum), ensure water availability and quality, and formulate for a reduced DMI. Develop facilities to mitigate heat stress if the expense can be offset with improved performance.