ADSA SOUTHERN SECTION SYMPOSIUM: STRATEGIES FOR HOUSING DAIRY ANIMALS IN THE SOUTHEAST

0006 Photoperiod management of dairy cattle: considerations and applications. G. E. Dahl*, *University of Florida, Gainesville.*

Photoperiod, the duration of light exposure relative to darkness in a day, has significant impact on productivity and health of dairy cattle and other farmed species. A light:dark cycle of 16 h light and 8 h dark (16L:8D) is termed a long day photoperiod, whereas a 8L:16D cycle is termed a short day photoperiod. The physiological basis for the response begins with light perception at the eye and signaling to the hypothalamus and pineal gland to alter secretion of melatonin. Circulating melatonin increases during exposure to darkness from concentrations that are typically undetectable and thus the lighting schedule drives a pattern of melatonin release that allows the animal to track daylength. The most consistent endocrine effects of variable photoperiod are the responses of circulating prolactin and insulin-like growth factor-1, both of which impact growth and mammary gland function throughout the life cycle. Specifically, long day photoperiod increases lean growth in heifers and increases milk yield in lactating cows. In contrast, cows maintained on short days during the dry period subsequently produce more milk than those on long days when dry. Cows on short days when dry and those on long days in lactation have increased dry matter intakes relative to herdmates on the respective opposite treatments. Managing lighting in barns is easily implemented with commonly available fixtures and lamps. Indeed, the choice of light installed is made by combining the highest efficiency lamp available for the effective mounting height of the barn. Typically, with lower ceilings, a compact fluorescent lamp is the most appropriate selection, whereas the higher mounting heights available in freestall barns are better suited to metal halide or similar high efficiency lamps. Recently, LED lamps have been recommended due to their superior energy efficiency, but direct, robust testing of LED lamps has not been reported. Low intensity red lighting can be used in facilities during darkness, as it is not perceived as light by many species, including cattle. Target light intensity is in the range of 150 lux at a level 1 m above the barn's floor and that intensity should be maintained throughout the facility. Photoperiod manipulation is a low cost, high return method to increase a dairy herd's productivity throughout the cow's life cycle.

Key Words: dairy cow, housing, photoperiod

0007 Impacts of heat stress on cow and calf. S. Tao*[1], G. E. Dahl[2], and J. K. Bernard, *[1]University of Georgia, Tifton, [2]University of Florida, Gainesville.*

Heat stress has negative impacts on dairy cattle at different stages of their life cycle. Compared with the lactating dairy cow, the dry cow and neonatal calf have lower upper critical temperature, but their performance is still negatively impacted by heat stress. During the dry period, heat stress elevates cow body temperature and also disrupts several normal physiological functions during late gestation, such as impaired mammary growth and fetal development, which compromise future performance of the cow and calf. Compared with cooled cows, heat-stressed dry cows have lower milk production in the subsequent lactation and altered metabolic and immune function during the transition period. Maternal heat stress of dams during the dry period also has negative effects on their offspring. For example, calves born to heat-stressed cows have lower birth weight and impaired ability to absorb immunoglobulin from colostrum relative to calves from cooled dams. Emerging evidence also suggests that heat stress in utero may have long-term impact on a heifer's future performance, including milk production in the first lactation. Heat stress has direct negative impact on neonatal calf performance, as well. When exposed to heat stress, calves have impaired passive immunity and high mortality rate in the first month of life. Additionally, heat stress lowers a calf's average daily gain, feed efficiency, and overall growth during early life. Thus, proper management tools need to be implemented to cool the dry cow and neonatal calf as a way to alleviate the negative impacts of heat stress on these animals.

Key Words: dairy calves, dry period, heat stress

0008 Implications of overstocking on the behavior, health, and productivity of dairy cows in the Southeast. P. D. Krawczel*, *The University of Tennessee, Knoxville.*

The survivability of dairy farms across the Southeastern United States is being challenged by a variety of factors, such as high costs of production and aging housing and milking facilities. One common response to this is to attempt to increase revenue by increasing herd size, yet keep costs low by not investing in related infrastructure. This approach may be counterproductive to the overall performance of the farm, as there is a growing body of evidence that suggests there are negative consequences on lactating dairy cows that are required to compete for resting and feeding resources. This presentation reviews the current understanding of: 1) the relationships among overstocking, behavior, health, and productivity; 2) the behavioral strategies that dairy cows use to mitigate the effects of overcrowding and potential consequences of these strategies on health and productivity; 3) factors that are spe-

cific to the Southeast that may impact the relationship among stocking density and other considerations of housing management; and 4) current gaps in our knowledge that should be addressed with future research. Overall, the behavioral changes that were evident in overstocked freestall-based housing facilities included a decrease in the number of hours spent lying per day, an alteration of the feeding times and overall time spent feeding, and increased antagonistic behaviors occurring at the freestalls and feed barriers. From a performance perspective, there were indications that both milk production and reproductive success might be altered by overstocking either the freestalls or feed barriers of a housing facility. The hot, humid summers, which typify the region, and the age, design, and management of freestall facilities represent 2 factors with the potential to compound the overall impact of overcrowding in the Southeast. On the other hand, the commonality of pasture access in the overall housing strategy across the region might mitigate some of the negative effects of overstocking on lactating cows. The extent to which these interactions are detrimental or successful when associated with overstocking reflects a major gap in our current understanding of managing dairy housing systems in the Southeast. Beyond freestall-based housing facilities, there is a growing interest in the use of composted bedding pack housing in the region. However, there is little empirical data to support recommendations for the space required per cow within these housing systems.

Key Words: behavior, dairy cow, housing, overstocking

0009 Managing heat stress in dairy calves and heifers: Housing considerations. S. H. Ward*, *Mississippi State University, Mississippi State.*

Dairy calves and heifers are often overlooked when considering not only cooling strategies but housing in general. Providing housing with cooling in the summer for both young calves and older heifers could improve growth, subsequent lactation performance, and profitability for the dairy operation. While hutches for dairy calves have become fairly standard throughout the industry, providing a source of shade over the hutches has been shown to improve respiration rates and reduce skin temperature of calves (Spain and Spiers, 1996). Coleman et al. (1995) found a tendency for improved feed efficiency when calves were housed in shaded hutches, along with lower rectal temperatures. Calves that were housed under metal roofing, with and without cooling, had lower temperatures, increased IgG, and lower mortality rates compared with those housed in hutches (with metal covers). Providing a source of shade over hutches during prolonged heat stress can improve calf performance, but cooling the shaded area may not result in further improvements. Similar trends have been noted in older heifers housed on pasture with different shade sources. Twenty-one yearling, Holstein heifers (n = 7) were assigned to 1 of 3 paddocks, each with a different type of shade: 1) natural shade from trees (T); 2) hutches (H); and 3) shade cloth (SC). All heifers were fed a commercial grain mix and ryegrass hay, and grazed a grass-legume mix pasture. Body weight, frame measures, rectal temperatures, and blood samples were collected once per week. Heifer behavior was observed twice weekly for a total of 24 h. There was a tendency for decreased body weights in heifers housed under SC, but ADG, wither height, or hip height were not affected by shade type. Blood parameters were not affected by shade type. Time spent in the shade vs. not was also not different with shade type, but time spent lying was greater in both T and SC when compared with H ($P < 0.05$). Temperature was also lower in T and SC compared with H, which may have contributed to decreased time lying down.

Key Words: dairy heifers, heat stress, housing

0010 Compost bedded pack barns as a lactating cow housing system for the Southeast. J. M. Bewley*[1], R. A. Black[2], F. A. Damasceno[3], E. A. Eckelkamp[1], G. B. Day[1], and J. L. Taraba[1], *[1]University of Kentucky, Lexington, [2]University of Tennessee, Knoxville, Federal University of Mato Grosso, Campus Rondonópolis, Brazil.*

A compost bedded pack barn is a lactating dairy cow housing system consisting of a large, open resting area, usually bedded with sawdust or dry, fine wood shavings. Bedding material is composted in place, along with manure, when mechanically stirred on a regular basis. Recently, the popularity of compost bedded pack barns has unquestionably increased in the Southeast (at least 80 compost bedded pack barns have been constructed in Kentucky). Because of warm climates, the compost bedded pack barn fits the Southeast particularly well. Galama (2011) suggested that compost bedded pack barns fit within goals of sustainable agriculture because of benefits to the cow (space, rest, exercise, and social interaction), farmer (low investment, labor extensive, reduced manure storage costs), and environment (reduced ammonia and greenhouse gas emissions, odor and dust emissions, reduced energy consumption). Producers report reduced incidence of lameness and improved hoof health, resulting from greater lying times and a softer, drier surface for standing. Cows may be more likely to exhibit signs of estrus because of improved footing on a softer surface, leading to improved heat detection rates. Compost bedded pack barns reduce the need for liquid-based manure storage systems and provide producers with the option to economically transport nutrients in a dry, concentrated form to areas where there is an off-farm demand for nutrients. The initial investment costs of a compost bedded pack barn are lower than for traditional freestall or tiestall barns, because less concrete and fewer internal structures (stall loops, mattresses) are needed. This system represents a viable entry option for smaller, start-up dairies. Proper composting increases the bedding temperature and decreases the bedding moisture by increasing the drying rate. Keeping the top layer of bedding material dry is the most important part of

managing a compost bedded pack barn. The pack should be stirred at least twice daily. Stirring is typically accomplished while the cows are being milked, using various types of cultivators or roto-tillers. Poor management may lead to undesirable compost bed conditions, dirty cows, elevated SCC, and increased clinical mastitis incidence. Proper management of compost bedded pack barns includes facility design, ventilation, timely addition of fresh, dry bedding, frequent and deep stirring, and avoidance of overcrowding.

Key Words: cow comfort, compost bedded pack, housing,