Micronutrients Inc., Indianapolis, IN) and dietary NDF source (forage diet = 26% NDF vs. NFFS = 36%) on total-tract nutrient digestibility. We hypothesized that hydroxy trace minerals, which are soluble at a lower pH compared with sulfates, would increase digestibility regardless of fiber source. During the entire experiment (56 d), cows remained on the same fiber treatment but the source of supplemental trace mineral was different for each 28-d period so all cows were exposed to both mineral treatments. During each of the two 28-d periods, cows were fed no supplemental Cu, Zn, or Mn for 16 d followed by 12 d of feeding supplemental Cu, Zn, and Mn from either sulfates or hydroxy sources. Basal Cu, Zn, and Mn concentrations for the forage diet were 9, 30, and 38 mg/kg, respectively, whereas basal concentrations were 11, 50, and 47 mg/kg, respectively, for the NFFS diet. Supplemental concentrations of Cu, Zn, and Mn fed were approximately 9, 30, and 30 mg/kg, respectively. No mineral source × fiber interactions were observed for production measures or digestibility. Treatment had no effect ($P \geq 0.38$) on DMI (24.2 kg) or milk production (34.9 kg). Mineral source had no effect on macronutrient intakes ($P \geq 0.63$), but feeding hydroxy Cu, Zn, and Mn increased NDF digestibility (48.5 vs. 46.4%). Cows fed NFFS had decreased DM digestibility (65.9 vs. 70.2%), OM digestibility (67.4 vs. 71.7%), CP digestibility (58.8 vs. 62.1%), and starch intake (4.3 vs. 8.8 kg) and increased starch digestibility (97.5 vs. 96.3%), NDF intake (8.6 vs. 6.0 kg), and NDF digestibility (50.5 vs. 44.4%) compared with cows fed the forage treatment. Digestible OM (DOM) was reduced (62.0 vs. 66.8%) for cows fed NFFS compared with those fed forage, indicating a reduced concentration of DE. Mineral source did not affect DOM ($P = 0.32$). Replacing dietary forage with NFFS reduced dietary energy and although hydroxy minerals increased NDF digestibility, the effect was not great enough to influence DOM.

Key Words: fiber, total-tract nutrient digestion, trace minerals

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0738 Economic value of cooling dry cows across the United States. F. C. Ferreira*[1,2], A. De Vries[2], G. E. Dahl[2], and R. Gennari[2], [1]*Embrapa Gado de Leite, Juiz de Fora, Brazil,* [2]*Department of Animal Sciences, University of Florida, Gainesville.*

Heat stress during the dry period reduces milk yield in the next lactation. Our objectives were to quantify the economic losses due to heat stress of dry cows and to evaluate investment in cooling of dry cows. We used weather data from The National Oceanic and Atmospheric Administration to quantify the average amount of heat stress for the 48 contiguous U.S. states. A heat stress day was declared when the average daily temperature–humidity index was ≥68. A spreadsheet was developed for economic analyses. Assumptions were that 15% of the cows were dry at any time, the dry period length was 46 d, and only cows in parities ≥2 increased milk yield if cooled in the dry period. Milk yield decreased by 0.11 kg/d in the next lactation (305 d) per heat stress day in the dry period based on a review of the literature. Marginal decrease in DMI was 0.4 kg per 1 kg less milk. Marginal value of milk minus feed cost was $0.33/kg. Economic analysis included investment in fans and soakers and use of water and electricity. Building investment was considered separately at a price of $2,500 per stall. On average, a U.S. dairy cow is under heat stress 96 d during the year and loses 271 kg of milk in the subsequent lactation if not cooled when dry. Weighted by the number of cows in each state, annual losses would be $820 million if dry cows were not cooled ($89/cow per year). For the top 3 milk-producing states (California, Wisconsin, and New York) and Florida, the average milk loss in the next lactation was 316, 212, 234, and 726 kg and profit loss/cow per year were $104, $70, $77, and $238, respectively. The average benefit:cost ratio of cooling dry cows in the United States is 2.46 (dry cow building already present) and 1.59 (including building a dry cow barn) in the baseline scenario. For positive net present values, 18 and 27 d are necessary when a building is not built (considering marginal milk prices of $0.33 and $0.22, respectively). If a barn is built, minimum days of heat stress would be 47 and 69, respectively. Other benefits of dry cow cooling, such as increased health and more productive offspring, were not considered. In conclusion, cooling of dry cows was profitable in all 48 states and very profitable in most states.

Key Words: dry cows, economics, heat stress, temperature–humidity index

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0739 Palmitic acid feeding increases hepatic ceramide accumulation and modulates expression of genes responsible for ceramide synthesis in midlactation dairy cows. J. E. Rico*, A. T. Mathews, and J. W. McFadden, *West Virginia University, Morgantown.*

Circulating sphingolipid ceramides are associated with elevated NEFA availability and reduced insulin sensitivity in dairy cows transitioning from gestation to lactation. In monogastrics, palmitic acid (C16:0) can increase hepatic synthesis and lipoprotein secretion of ceramides, lipid mediators that inhibit insulin action in skeletal muscle. Increasing ceramide synthesis by feeding C16:0 may be a means to restore insulin resistance and enhance milk yield during midlactation. Therefore, our objective was to determine whether dietary C16:0 can augment liver and skeletal muscle ceramide concentrations in midlactation dairy cows. Twenty multiparous Holstein cows were enrolled in a study consisting of a 5-d covariate and a 49-d treatment period. Cows were randomly assigned to a sorghum silage–based diet containing no supplemental fat (control; $n = 10$; 138 ± 45 DIM) or C16:0 at 4% of ration DM (PALM; 98% C16:0; $n = 10$; 136 ± 44 DIM). Blood was routinely collected, and liver and skeletal muscle tissue was biopsied at d 47 of treatment. Intravenous glucose

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