Abstract: The objective of this study was to assess the effects of low protein diets on feed intake (FI), heat production and markers of FI and thermogenesis regulation in broilers under experimentally induced heat stress. Two-hundred-day-old broiler chicks were weight-matched and assigned into 36 pens (5-6 chicks/pen) followed by assigning them into two treatments (18 pens/treatment): 1) thermoneutral (TN), 2) heat stress (HS). Within each treatment, the pens were randomized to receive two diets (9 pens/diet): 1) normal protein (NP), 2) low protein (LP). The study lasted 6 weeks with 2 weeks of acclimation and 4 weeks of data collection. On week 6, birds were euthanized, and blood and tissue samples collected. All data were analyzed with either GLM or mixed procedure (SPSS). The student’s t-test was used to separate means between NP and LP diets within each treatment. There was no difference in average daily gain between NP and LP diets in the TN group, but LP decreased that during HS (P< 0.05). In TN condition, LP tended to increase the average daily feed intake (ADFI) compared to NP (P< 0.1), while during HS, LP was not different from NP in terms of ADFI (P>0.05). In TN condition, LP had a higher thermal radiation than NP, but LP had less thermal radiation than NP during HS (P< 0.05). In support of ADFI data, LP had a greater ghrelin transcript in the duodenum than NP in TN condition (P< 0.05). However, during HS, LP tended to decrease the plasma ghrelin concentration compared with NP (P< 0.1). Unlike TN condition, LP had a decreased muscle sirtuin and cytochrome c oxidase transcript than NP during HS (P< 0.05). Our data provide evidence that low protein diets mitigate the negative outcome of heat stress by reducing feed intake and heat production, which are regulated through genes expressed in the gut and skeletal muscle.

Keywords: feed intake, heat stress, low protein diet

Abstract: Low-protein diets mitigate the negative outcome of heat stress in birds; however, the underlying mechanisms are largely unknown. The objective of this study was to investigate the effects of low-protein diets on broilers oxidative stress, plasma metabolomics and cecal microbiota composition during experimentally induced heat stress. Two-hundred-day-old male broiler chicks were assigned into 36 pens with of 5-6 chicks/pen. All pens were weight-matched and randomly subjected into either thermoneutral (TN) or heat stress (HS) with 18 pens/treatment. Within each treatment, the birds were randomized to receive either normal protein (NP) or low protein (LP) diets with 9 pens/diet (50 birds/diet). The study lasted 6 weeks with 2 weeks of acclimation (starter phase) and 4 weeks of data collection (grower and finisher phases). On week 6, birds were euthanized and blood and cecal samples were collected. Oxidative stress biomarkers and peak height of metabolites in plasma were analyzed using GLM procedure (SPSS). Paired t-test was used for comparing diet treatments within TN and HS groups. Under TN condition, birds fed with LP had a decreased plasma superoxide dismutase activity and lipid peroxidation compared with NP (P< 0.05), but no differences on these measurements were detected during HS (P>0.05). Birds fed with LP diet had a greater lipid hydroperoxides than NP under HS (P< 0.05). Principal component analysis showed a clear separation for plasma metabolites found between NP and LP diets under TN and HS. Dietary protein content impacted plasma metabolites related with metabolism and biosynthesis of alanine, aspartate, glutamate and phenylalanine during both TN and HS. Compared with NP, cecal contents of chickens fed with LP diet had greater abundances of p_Tenericutes, c_Mollicutes, c_Mollicutes_RF9, and f_tachnospiraceae under HS. Thus, dietary protein content influenced the plasma metabolites with similar pattern during TN and HS, but that had differential effects on cecal microbiota composition under TN and HS.

Keywords: heat stress, low-protein diet, plasma metabolomics and cecal microbiota

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285 Effect of low Protein Diets on Oxidative Stress, Plasma Metabolomics and Cecal Microbiome of Broiler Chickens During Experimentally Induced Heat Stress. Julia Sutton1, Mohammad Habibi1, Cedrick n. Shili1, Adel Pezeshki1, 1Department of Animal and Food Sciences, Oklahoma State University