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CYCLIC HEAT STRESS IN COMBINATION WITH A CHALLENGING DIET REDUCES BROILER PERFORMANCE AND MODIFIES ANIMAL PHYSIOLOGY

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Heat stress (HS) is a major concern in poultry production. Cyclic HS (cHS) impairs performance, welfare and behavior, increases risks of leaky gut, oxidative stress (OS) and inflammation. This study aimed to evaluate the effects of cHS in combination with a challenging diet on broilers performance and welfare parameters. A total of 2,112 day-old Ross 308 male broilers were distributed in a randomized block design with 2 temperature conditions x 2 diets (24 pen replicates per treatment combination). Temperature conditions were thermoneutrality (TN) or cHS from d 22 to d 42. TN was set at 22°C with relative humidity (RH) of 60-75 %. cHS was set at 35°C for 10 h and 28°C for 14 h with RH of 50-60 %. Diets D1 and D2 were iso-metabolizable energy and iso-digestible amino acids and fed from d 0. The challenging diet (D2) was higher than the control diet (D1) in soluble fiber (0-21 d: +96 %; 22-42 d: +112 %) and total protein (0-21 d: +11 %; 22-42 d: +10 %). Results were analyzed by ANOVA and linear regression. At d 21, body weight (BW) and feed intake (FI) were reduced by D2, whereas feed conversion ratio (FCR) was increased ($p<0.05$). From 21 to 42 d, cHS vs TN and D2 vs D1 increased FCR by 10.2 % and 4.6 % respectively ($p<0.05$). Final BWs were 3,539 g, 2,992 g, 3,190 g, and 2,851 g for TND1, cHSD1, TND2 and cHSD2, respectively, and were significantly different for main effects and the interaction. Broilers fed D2 had a lower cHS-induced reduction of BW than broilers fed D1 (p0.40). At 22 d, cHS significantly increased rectal temperature (RT) by 0.99°C (n=12). Later, at d 29, 36 and 42, RT remained higher in cHS group with +0.65°C on average ($p<0.05$), showing an adaptation of broilers subjected to cHS after d 22. Accordingly, HS increased blood glucose (6.9 %) and pH (0.94 %) at d 22 ($p<0.05$) but at d 36 measurements of glucose stress response and blood alkalosis were not significant (n=6). More biomarkers (blood gases, hematology, OS and inflammation) will be analyzed and presented at the congress. In conclusion, the cHS model reduced broiler performance and modified their growth and thermoregulatory response. However, the challenging diet have alleviated broiler sensitivity to HS, by lowering BW gain and FI, a result that will have to be compared with welfare parameters.