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## **Effects of Sodium butyrate on performance, cecal microbiome and intestinal immune-related genes of broilers**

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The objective of this study was to evaluate the effect of sodium butyrate (SB) on performance, cecal immune-related genes, and cecal microbiome of broilers when dietary energy and amino acids concentrations were reduced. One-day-old male Ross 708 broiler chicks were fed dietary treatments in a 3 x 2 factorial design (8 pens/treatment; 46 birds/pen) with 3 dietary formulations (control diet, reduction of 2.3% of amino acids and 60 kcal/kg, and reduction of 4.6% of amino acids and 120 kcal/kg) with or without the inclusion of SB. Feed intake (FI), body weight gain (BW gain) and feed conversion ratio (FCR) were determined. At 28 d of age, cecal tonsils and cecal content were collected for gene expression and microbiota analysis using real time PCR and 16S RNA sequencing, respectively. SB improved the BW gain ( $P < 0.05$ ), without affecting FCR. The amino acid and energy reduction impaired BW gain by 6% ( $P < 0.01$ ), while the SB improved BW gain by 2% ( $P < 0.05$ ). An interaction effect ( $P = 0.004$ ) showed that SB improved the BW gain of birds fed the first level of nutrient and energy reduced diets. SB and the nutritional density of the diets modified the structure, composition and predicted function of the intestinal microbiota. The nutritionally reduced diet altered the imputed function performed by the microbiota, and the SB supplementation was able to reduce these variations, keeping microbial function similar to that observed in chickens fed a control diet. Dietary supplementation of SB to broiler chickens modulated the immune measures in the cecal tonsils; wherein SB upregulated the expression of ubiquitin-editing enzyme A20 in broilers fed control diets ( $P < 0.05$ ) and increased IL-6 expression ( $P < 0.05$ ). SB partially recovered BW gain of birds fed nutrient and energy reduced diets, modulated the cecal microbiota and demonstrated immune modulatory effects.