

2017 Reciprocal Meat Conference – Meat and Poultry Quality

Meat and Muscle Biology™



Effects of Supplemental Dietary Glutamine and Arginine on Broiler Live Performance, Blood Chemistry, and Incidence of White Striping and Wooden Breast

C. Wu*, G. K. Walker, M. Livingston, K. Flores, M. F. Warren, J. Cabanas, and K. A. Livingston

Prestage Department of Poultry Science, Raleigh, NC, USA

Keywords: amino acids, blood, broilers, meat quality, wooden breast
Meat and Muscle Biology 1(3):65

doi:10.221751/rmc2017.059

Objectives

The broiler industry has been recently plagued with muscle myopathies, namely wooden breast (WB) and white striping (WS). These myopathies negatively affect the most valuable cut of a broiler, the pectoralis major muscle, whereby there is reduced protein content and increased fat and collagen content, resulting in reduced meat quality and consumer preference. The current cause of WB and WS in broilers is yet to be fully elucidated. One theory is that increased corn prices, availability of distiller's dry grains with solubles, and other food industry co-products have led to less soybean meal and more synthetic amino acids in broiler diets can result in marginal dietary levels of glutamine (Gln) and amino acids such as arginine (Arg). It was hypothesized that increasing intracellular Gln and Arg may relate to an increased rate of protein synthesis, decreased inflammatory immune responses, a reduction of muscle proteolysis, and consequently a reduced incidence of WB and WS.

Materials and Methods

A total of 288 male broiler chicks were allocated to 1 of 4 diets that had 0 or 1% supplemental Gln or 0 or 0.25% supplemental Arg to complete a 2x2 factorial design. Chicks were housed in Alternative Design

cages with 8 chicks/cage and 9 replicates/treatment. Individual body weights (BW) were recorded weekly, blood chemistry was analyzed at 28 and 41 d using iStat, and 2 birds/pen were scored for WB and WS after being harvested at 42 d of age. Shear force, drip loss, cook loss, and meat pH were then evaluated. Data were analyzed using PROC GLM and PROC MIXED on SAS (SAS Inst. Inc., Cary, NC).

Results

There were no differences among feed conversion ratio, BW, or WS. Total carbon dioxide, partial pressure of oxygen, and pH of the blood at 28 d were reduced by supplementing Gln at 1% ($P < 0.05$). Similarly, the base excess extracellular fluid and potassium of the blood at 28 d were reduced by supplementing Gln at 1% ($P < 0.01$). Broilers fed diets with Arg or Gln alone exhibited significantly greater WB incidence when compared to those fed the control (0% Gln and 0% Arg) or combined interaction levels of 1% Gln and 0.25% Arg ($P < 0.05$).

Conclusion

These data demonstrated that Gln and Arg were able to reduce the incidence of WB when supplemented simultaneously as opposed to individually in broiler diets.