

**AGRICULTURAL RESEARCH FOUNDATION
FINAL REPORT
FUNDING CYCLE 2018 – 2020**

TITLE: Nutritional strategies for mitigating breast meat myopathies in meat-type broiler chickens

RESEARCH LEADER: Gita Cherian

COOPERATORS: None

EXECUTIVE SUMMARY: Modern-day meat-type broiler chickens have faster growth rates and higher metabolic rates. These features promote an increased workload, predisposing broiler birds to metabolic disorders. In modern broiler flocks, two muscle quality-related anomalies have received much attention recently. These include degenerative myopathy called wooden breast and white striping. Occurrence of these modern myopathies increases carcass downgrading and condemnation while reducing meat quality and consumer acceptance. The effect of docosahexaenoic acid (DHA, 22:6 n-3)-rich microalgae and methionine (Met) supplementation on breast muscle quality, lipid profile, incidence of white striping, and pathological aspects in broiler chickens were investigated through this project. The hypothesis tested is that feeding Met and n-3 fatty acid (FA)-rich diet enhances muscle n-3 FA content and meat quality while attenuating breast muscle myopathies in broiler chickens.

PROCEDURES:

One hundred and forty four (n=144) day-old Cornish cross chicks were fed a corn-soybean meal-based diet containing 0% microalgae product, (Control), 2% microalgae product (Diet 1), and Diet 1+100% more NRC requirement of Met (Diet 2) for 42 days. All diets were isocaloric and isonitrogenous. The chicks were kept in six pens with eight chicks per each replicate pen. Feed consumption and feed efficiency was calculated on day 10, 21 and 42. On day 43, three chicks per each pen (n=18/treatment) were euthanized. The breast muscle (pectoralis major) was visually scored for muscle striping (0= no striping, 1= moderate, 3= severe) and were subjected to histopathology. Breast muscle quality (moisture, color, drip loss, shear force, cook loss, pH, lipid oxidation products) and nutrient characterization (total lipids, FA composition, cholesterol, total protein, minerals) were conducted. A one-way analysis of variance was done with diet as the main factor and significance was set at $P<0.05$

SIGNIFICANT ACCOMPLISHMENTS TO DATE: The incidence of muscle striping was lower ($P<0.02$) for Control vs Diet 2 and a trend for reduction in white striping was noticed in birds fed Diet 1 vs Control ($P=0.09$). Histopathology revealed least severe changes in myofiber damage and least inflammation in birds fed Diet 2 ($P<0.05$). No effect of diet on body weight gain, feed efficiency, carcass or breast muscle yield was observed ($P>0.05$). Total n-3 and total long chain ($\geq 20C$) n-3 FA were highest in the breast muscle of Diet 2 birds ($P<0.05$). No effect of diet on breast muscle pH, moisture, lipid oxidation products, cook loss, minerals (Ca, P, Mg, Na), or protein content was observed ($P>0.05$). Muscle drip loss and shear force was highest in Diet 2

($P < 0.05$). Meat color (a^* , redness) was reduced ($P < 0.05$) and a trend for reduction in b^* (yellowness) was observed in Diet 2 ($P = 0.07$). Total lipid content was lowest in birds fed Diet 1 ($P < 0.05$). In conclusion, the results demonstrate a significant effect of DHA-rich microalgae along with Met supplementation in attenuating breast muscle striping and myopathy, while enriching meat with n-3 FA. As the current western diets are lacking in n-3 FA and chickens being the major source of animal protein consumed globally, diet management strategies using microalgae and Met could be used in broiler diets to enhance meat n-3 FA content, reduce muscle myopathy and white striping without affecting productivity.

Through this project, further research mentoring and laboratory training was given to Ibrahim Khan. A part of the research results were included in his MS thesis. Ibrahim successfully defended thesis “Broiler Chicken Meat Quality and Lipid Composition: Consequences of Production Systems and Diet.” in August, 2019. The principal investigator is hoping to present a poster related to the current study at the World Poultry Science Meeting in August 2020 at France. The title of the poster is “Docosahexaenoic acid (22:6 n-3)-rich microalgae along with methionine supplementation in broiler chickens: Effects on production performance, breast muscle quality, lipid profile, and incidence of white striping and myopathy”. An abstract related to this poster is submitted and also will be presented at the Animal and Rangeland Science poster symposium on January 29, 2020.

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