Published April 25, 2019

2018 Reciprocal Meat Conference – Meat and Poultry Quality

Meat and Muscle Biology™

Effect of L-Glutamine Supplementation in Replacement of Antibiotics on Meat Quality Attributes of Pigs Exposed To Transport and Weaning Stress during Different Seasons

D. Ma[1]*, Y. H. B. Kim[1], J. S. Johnson[2], A. Duttlinger[2], and J. M. Guedes[1]

[1]Animal Sciences, Purdue University, West Lafayette, IN, 47907, USA;
[2]Livestock Behavior Research Unit, USDA-ARS, West Lafayette, IN, 47907, USA
*Corresponding author. Email: ma128@purdue.edu (D. Ma)

Keywords: L-glutamine, pork quality, stress mitigation, transport at weaning
Meat and Muscle Biology 2(2):89 **doi:10.221751/rmc2018.079**

Objectives

Transporting weaned pigs to separated growing facilities is commonly practiced in the pig industry to improve farming efficiency. However, concurrent stressors during weaning and travel may lead to physiological and metabolic alternations and negatively impact overall health, growth performance, and productivity of the animals. Antibiotics were commonly applied as a mitigation strategy; however, there is an increasing consumer demand for antibiotic-free animal farming practices. L-glutamine supplementation was recently reported as a potentially viable nutraceutical replacement to the use of antibiotics. Currently, most published studies have focused on the animal productivity and general carcass characteristics of pigs undergoing these environmental stressors. However, little to no information is available on how these multiple stressors and mitigation strategies during the early phase of pig handling affect the final meat quality attributes. Therefore, the study objective was to determine the effect of L-glutamine supplementation on quality attributes of different muscles from pigs exposed to weaning and transport stress at different seasons.

Materials and Methods

Pigs were weaned and transported in 2 different seasons: thermal-challenged summer vs. thermal-neutral spring. Each group were BW-blocked and randomly assigned to 3 different diets (supplemented with non-antibiotic, antibiotic, and 0.20% L-glutamine) for 14 d after transport, then fed antibiotic free basal diets until market weight. After reaching market weight, 30 gilts (n = 10/diet treatment) were slaughtered at each season. Pairs of longissimus dorsi (LD) and psoas major (PM) muscles from each carcass were separated at 1 d and 7 d postmortem, respectively. Carcass yield and meat quality attributes, including Warner-Bratzler shear force, display color, water-holding capacity (WHC), proximate composition and lipid oxidation, were evaluated.

Results

Muscles from pigs transported under heat stress exhibited a decrease in tenderness and water-holding capacity as indicated by elevated shear force values, display loss, thaw loss, and cook loss ($P < 0.05$). Significant interactions between transport season and dietary supplementation treatment were found in WHC. In pigs that were subjected to the thermal-challenging transport condition, L-glutamine supplementation decreased display loss and cook loss ($P < 0.05$). In addition, L-glutamine supplementation decreased lipid oxidation (TBARS, $P < 0.05$) and discoloration (hue angle, $P < 0.05$), regardless of transporting season. Thermal-challenge coupled with wean/transport stress increased muscle pH, which would likely be due to decreased glycogen content. Transportation season also affected proximate components, where pigs that were transported during the thermal-neutral season have higher lipid and lower protein contents ($P < 0.05$) in LD and PM muscles than muscles from heat-stressed pigs.

Conclusion

The current results indicated that heat stress accompanied with transport stress at weaning could negatively affect meat quality characteristics, as shown by decreases in meat tenderness, WHC and oxidative stability. L-glutamine supplementation as a nutraceutical mitigation strategy showed a trend of resulting in better or equivalent impacts on meat quality attributes compared to meat from pigs treated with antibiotics.