

**Title:** Evaluation of lipid oxidation levels in DDGS sources and impact of feeding (with or without antioxidants) on swine health, performance, and metabolic oxidation – **NPB #10-002**

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## Abstract

Some sources of corn dried distillers grains with solubles (DDGS) contain relatively high amounts of oxidized lipids produced from PUFA peroxidation during the production process. These oxidized lipids may negatively affect growth performance and metabolic oxidation status of pigs. The objective of this study was to understand the effects of feeding corn-soybean meal diets (CON) or diets containing 30% DDGS containing one of 3 levels of vitamin E ( $\alpha$ -tocopheryl acetate): none supplemented, NRC level (11 IU/kg), and 10X NRC level (110 IU/kg) on oxidative status of nursery pigs. The DDGS source used in this study contained the highest thiobarbituric acid reactive substances (TBARS) value, peroxide value, and total S content (5.2 ng/mg oil, 84.1 meq/kg oil, and 0.95%, respectively) among 30 other DDGS sources sampled (mean values = 1.8 ng/mg oil, 11.5 meq/kg oil, and 0.50%, respectively). Barrows ( $n = 54$ ) were housed in pens and fed the experimental diets for 8 wk after weaning and transferred to individual metabolism cages for collection of feces, urine, blood, and liver samples. Total S content was higher in DDGS diets than CON (0.39 vs. 0.19%). Dietary inclusion of 30% DDGS improved apparent total tract digestibility of S (86.8 vs. 84.6%,  $P < 0.001$ ), S absorbed and retained ( $P < 0.01$ ) compared to CON. Although pigs were fed highly oxidized DDGS in this study, serum TBARS were similar between DDGS and CON treatments. There was no interaction between dietary DDGS and  $\alpha$ -tocopherol concentration in serum TBARS. Serum  $\alpha$ -tocopherol increased by feeding DDGS diets compared to CON (2.25 vs. 1.56  $\mu\text{g/mL}$ ;  $P < 0.001$ ). Pigs fed DDGS diets had higher concentrations of S-containing AA, particularly methionine ( $P < 0.001$ ) and taurine ( $P = 0.002$ ) in serum of fed pigs, and a higher concentration of taurine in serum of fasted pigs ( $P = 0.006$ ) compared with those fed CON. Liver glutathione concentration was higher in pigs fed DDGS diets than CON (56.3 vs. 41.8 nmol/g). Dietary inclusion of DDGS ( $P < 0.001$ ) and  $\alpha$ -tocopherol ( $P = 0.03$ ) increased serum enzyme activity of glutathione peroxidase. The elevated concentrations of S-containing antioxidants (methionine, taurine, glutathione) *in vivo* may protect pigs against oxidative stress when feeding highly oxidized DDGS. Therefore, increasing levels of  $\alpha$ -tocopherol in diets containing DDGS with high oxidized lipid content may not be necessary to protect pigs from metabolic oxidation stress.

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