RESEARCH ABSTRACT
ANIMAL SCIENCE

Title: Effects of Dietary Aflatoxin on Hepatic Gene Expression in Swine - **NBP** #08-075

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Scientific Abstract

Aflatoxins, especially aflatoxin B1 (AFB1), can be high in dried distillers grains with solubles (DDGS) when concentrated during the ethanol production process. Increased use of DDGS in swine diets could potentially lead to an increased incidence of aflatoxicosis, a disease associated with decreased feed intake, reduced BW gain, and impaired liver function. The objectives of this study were to determine the effects of AFB1 on 1) the health, performance, and serum profiles and 2) the hepatic gene expression of growing barrows. Duroc x Yorkshire crossbred barrows (n = 90; age = 35 ± 5 d; initial BW = 14.2 ± 3.0 kg) were randomly assigned in a 3 x 3 factorial design to receive 0 (CON), 250 ppb AFB1 (LOW), or 500 ppb AFB1 (HIGH) for 7, 28, or 70 d. Feed intake was measured daily, and pigs were weighed and blood samples collected weekly. Serum was analyzed for concentrations of aspartate aminotransferase (AST), alanine aminotransferase (ALT), total bilirubin (BILI), and blood urea nitrogen (BUN). Average feed intake was lower ($P < 0.01$) in HIGH and LOW barrows than in CON barrows in wk 8 and 9, and was lower ($P < 0.05$) in HIGH barrows only in wk 10. Lower ADG ($P < 0.05$) was observed in HIGH barrows than in CON barrows in wk 8 and 10; no differences in ADG were noted between CON and LOW barrows. There was no effect of AFB1 treatment on ALT or BILI concentrations. However, both AST and BUN were affected ($P < 0.05$) by AFB1 treatment. Concentrations of AST were greater in both HIGH ($P = 0.067$) and LOW ($P = 0.073$) barrows than CON barrows, while BUN concentrations were lower in both HIGH ($P = 0.073$) and LOW ($P = 0.012$) barrows.

RNA-Seq was performed on liver samples from the d 70 groups. Forty-three functional groups were identified using DAVID, and genes within the apoptosis regulation functional group were selected for 1) validation of d 70 gene expression differences using real-time RT-PCR (n = 4 genes), and 2) investigation of d 7 expression to identify early response to aflatoxins (n = 15 genes). Expression levels of the four apoptosis genes selected for validation, *CDKN1A*, *ZMAT3*, *KNG1*, and *PIM1*, were confirmed with real-time RT-PCR. Of the 15 genes tested in the d 7 liver samples, 4 were differentially expressed: *CDKN1A*, *ZMAT3*, *YWHAZ*, and *AEN*. Results from this study demonstrate that administration of an AFB1-contaminated diet to growing barrows reduces performance, compromises health, and alters hepatic gene expression.