

Leaky gut and the liver: The role *Bacillus subtilis* Direct-Feed Microbial on viscosity, bacterial translocation and bone mineralization in neonate poult fed with a rye-base diet. G. Tellez^{1*}, J. Latorre¹, and B. M. Hargis¹, ¹*Department of Poultry Science, University of Arkansas, Fayetteville, AR 72701*

Introduction

Rye contains high concentrations of non-starch polysaccharides (NSP), leading to reduced digestibility. Since poultry has little or no intrinsic enzymes capable of hydrolysing these NSP, the use of exogenous xylanases as additives is used in an attempt to reduce the antinutritive factors (1)(2)(3)(4)(5) (6)(7)(8). Previously, an *in vitro* study conducted in our laboratory showed that dietary inclusion of selected Direct-Feed Microbial (DFM) candidates that produce exogenous phytase, lipases, proteases, cellulases and xylanases in NSP diets significantly reduced both viscosity and *C. perfringens* proliferation. In the present study, starter rye-soybean-based diets without or with DFM (CON and TRT groups, respectively) were administered *ad libitum* to one-day-old poult in two independent experiments.

Material and Methods

In Experiment 1, day-of-hatch, turkey poult were randomly assigned to 2 groups ($n = 20$ birds/group). The right lobule of the liver was collected aseptically to evaluate bacterial translocation and intestinal digesta was individually collected to evaluate viscosity. In Experiment 2, day-of-hatch turkey poult were randomly assigned to 2 groups ($n = 25$ birds/group). At ten days of age, all poult from experiments 1 and 2 were weighted and 12 poult/group were randomly selected and killed humanly. The right lobule of the liver was collected aseptically to evaluate bacterial translocation, and intestinal digesta was individually collected to evaluate viscosity. From birds in Experiment 2, tibiae were collected for bone parameters.

Results and Discussion

In both experiments, the TRT groups showed reduction ($P < 0.05$) in the total number coliforms in liver as well as intestinal viscosity when compared to the CON (Table 1). In Experiment 2, increase ($P < 0.05$) in tibia diameter, breaking strength, ash, calcium and phosphorus were observed in DFM group when compared with CON poult (Table 2). The results from present study suggest that rye-based diets can increase both bacterial translocation and intestinal viscosity, but these adverse effects can be prevented by the inclusion of selected DFM candidates.

Table 1. Evaluation of body weight, intestinal viscosity, and liver bacterial translocation in neonate turkey poult fed with a rye-Soy based diet or rye-soy based diet without or with direct fed microbial (DFM) supplementation in Experiments 1 and 2

	EXPERIMENT 1			EXPERIMENT 2		
	Body Weight (g)	Intestinal Viscosity (cP Log ₁₀)	Bacterial Translocation (CFU Log ₁₀)	Body Weight (g)	Intestinal Viscosity (cP Log ₁₀)	Bacterial Translocation (CFU Log ₁₀)
CON ¹	75.91 ± 3.61 ^a	4.03 ± 0.01 ^a	3.03 ± 0.51 ^a	76.47 ± 1.59 ^b	5.20 ± 0.45 ^b	2.13 ± 0.67 ^a
TRT ²	82.85 ± 4.23 ^a	2.54 ± 0.22 ^b	1.24 ± 0.51 ^b	88.60 ± 2.17 ^a	3.72 ± 0.53 ^a	0.35 ± 0.40 ^b

¹ CON – control rye based diet; ² TRT – control rye based diet with added DFM
Data is express as Mean ± SE. ND= Non determined

Intestinal viscosity is expressed in Log₁₀ (in centipoise, cp = 1/100 dyne sec/cm²)

Serum FITC-d and Liver bacterial translocation (expressed in cfu Log₁₀/gram of tissue).

^{a-b}Superscripts within columns indicate significant difference at P < 0.05

Table 2. Evaluation of bone breaking strength and bone parameters in neonate turkey poult fed with a rye-soy based diet without or with direct fed microbial (DFM) supplementation in Experiment 2.

	Tibia strength Load at yield (kg/mm)	Tibia diameter (mm)	Total ash from tibia (% of dry matter?)	Calcium (% of ash)	Phosphorus (% of ash)
CON	1.14 ± 0.21 ^a	4.45 ± 0.32 ^a	35.61 ± 0.81 ^a	27.35 ± 0.07 ^a	16.35 ± 0.52 ^a
TRT	2.55 ± 0.03 ^b	5.82 ± 0.78 ^b	50.87 ± 0.75 ^b	40.31 ± 0.46 ^b	22.67 ± 0.29 ^b

¹ CON – control rye based diet; ² TRT – control rye based diet with added DFM

Tibias from twelve poult were collected to evaluate bone qualities. Data is expressed as mean ± standard error.

^{a-b}Superscripts within columns indicate significant difference at P < 0.05

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