Improving performance of turkeys through better gut functionality

As the demand for high-quality animal protein continues to grow, it is essential for the poultry industry to find ways to improve the performance and health of turkeys.

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In recent years, the use of enzymes in animal nutrition to improve performance, health, and welfare has increased substantially. Generally, feed enzymes are supplemented to improve digestibility of dietary nutrients.

More recently, another type of feed enzyme, muramidase (Balancius, dsm-firmenich), has been introduced to support gut functionality and improve feed efficiency. Muramidase is known to hydrolyse peptidoglycans (PGN) of dead bacterial cell walls and improve performance of broilers in a dose-dependent manner. However, until recently there has been limited information available on the effects of muramidase supplementation in turkeys. This article describes two experiments that were conducted to evaluate the effects of muramidase supplementation in turkeys on performance parameters.

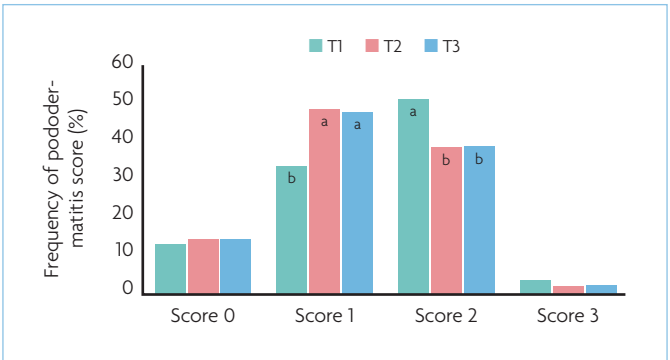

Fig. 1. Frequency of pododermatitis scores (0-4) from turkey poults fed Balancius from hatch to day 56 of age.
Treatments were a control (T1), the T1 supplemented with 45,000 LSU/kg Balancius from phase 1-6 (T2), and the T1 supplemented with 45,000 or 25,000 LSU/kg Balancius from phase 1-3 or 4-6, respectively (T3). a-b Birds fed T2 or T3 had a greater frequency of score 1 and lower frequency of score 2 compared with birds fed the control (P=0.021). Trial 1.

Trial 1

In one study, male BUT 6 turkey poults were fed one of three diets for 126 days.

The diets were nutrient adequate and based on soybean meal, wheat, and maize. A group without muramidase supplementation was the control.

The treatment groups comprised of a group with high dose of muramidase (45,000 LSU(F)/kg) and a group with a step-down dose of muramidase (45,000 LSU(F)/kg until day 56 and 25,000 LSU(F)/kg from day 57-126).

The results showed that turkeys fed the high dose muramidase had significantly greater body weight, average daily gain, and improved feed conversion ratio compared to the control group.

Similarly, birds fed the step-down dose of muramidase had a final body weight and average daily gain that were intermediate to or equivalent to birds fed the high dose of muramidase.

In addition, breast meat yield was significantly greater in turkeys fed muramidase, regardless of the dose, compared to birds fed the control diet. The frequency of pododermatitis score 1 (minor lesions) was significantly greater and score 2 (some lesions) was significantly lower in birds fed muramidase, regardless of dose, compared with those fed the control diet.

These findings suggest that muramidase supplementation can improve the performance of turkeys in a dose-dependent manner.

Trial 2

In another study, the efficacy of the microbial muramidase was evaluated on the growth performance of female BUT Premium turkeys from 1-84 days of age.

Two treatments with a diet based on maize, wheat, and soybean meal with or without 45,000 LSU(F)/kg muramidase supplementation were compared.

The study found that muramidase supplementation increased daily gain and improved feed conversion ratio during the first three weeks of the growing period.

From 22-42 days of age, turkeys receiving muramidase were heavier at 42 days relative to control birds. From 43-63 and 64-84 days of age, muramidase tended to increase daily gain and feed intake.

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Table 1. Growth performance of turkey poults fed Balancius from hatch to 126 days of age[1], trial 1.

	Balancius LSU(F)/kg				
Response variable	**Control**	**45,000 (P 1-6)**	**45,000 (P 1-3) 25,000 (P 4-6)**	**Pooled SEM[3]**	**P-value**
Overall (day 0 to 126)					
Daily intake (g/b)	225.1[b]	236.4[a]	232.5[a]	9.3	0.017
Daily gain (g/b)	101.5[b]	110.1[a]	107.3[a]	6.5	0.016
FCR (g:g[2])	2.350[a]	2.270[b]	2.310[ab]	0.06	0.043
cFCR[4]	2.540[a]	2.120[b]	2.270[b]	0.31	0.014

[1]Data are least square means of 32 birds per pen and eight replicate pens per treatment. [2]Mortality corrected feed conversion ratio. [3]Pooled standard error of the mean. [4]Body weight corrected FCR using the formula from Patricio et al. (2012). [a,b]Means within a row with different superscripts are different (P<0.05).

Table 2. Carcase yield and cut up proportion from 130-day-old turkey poults fed Balancius from hatch to 130 days of age[1], trial 1.

	Balancius LSU(F)/kg				
Response variable	**Control**	**45,000 (P 1-6)**	**45,000 (P 1-3) 25,000 (P 4-6)**	**Pooled SEM[3]**	**P-value**
Proportion (% of live weight)					
Carcase	70.6	71.6	71.5	2.0	0.057
Breast	22.4[b]	23.4[a]	23.3[a]	1.8	0.012
Leg	24.5	24.5	24.6	0.9	0.704
Proportion (% of carcase)					
Breast	31.7[b]	32.7[a]	32.6[a]	1.9	0.034
Leg	34.7	34.2	34.4	1.4	0.315

[1]Data are least square means of five birds per pen and eight replicate pens per treatment. [2]Pooled standard error of the mean. [a,b]Means within a row with different superscripts are different (P<0.05).

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Over the 84-day trial period, muramidase supplementation increased weight gain and resulted in a final heavier weight of turkeys fed a maize, wheat, and soybean meal-based diet. A secondary benefit found was that there was no difference found in the incidence and severity of footpad dermatitis.

Results

The results of the experiments indicate that muramidase supplementation can improve the performance parameters of turkeys. The improvement in performance, as indicated by the greater body weight, average daily gain and FCR, can be attributed to the ability of muramidase to hydrolyse PGN of dead bacterial cell walls.

This leads to a reduction in bacterial cell debris and a subsequent improvement in gut functionality, which is crucial for efficient nutrient utilisation and performance.

The greater breast meat yield in turkeys fed muramidase, regardless of dose, can be attributed to the improvement in gut function, which leads to better nutrient absorption and feed utilisation.

The lower pododermatitis score 2, can be attributed to the ability of muramidase to reduce the bacterial cell debris covering the intestinal epithelium and maintain an effective gut environment. ■

Table 3. Frequency of pododermatitis scores (0-4) from turkey poults fed Balancius from hatch to day 56 of age.

	T1	T2	T3
Score 0	12.9	13.3	13.5
Score 1	33.2	48.1	47.1
Score 2	51	37.6	38
Score 3	3	1	1.4

Treatments were a control (T1), the T1 supplemented with 45,000 LSU/kg Balancius from phase 1-6 (T2), and the T1 supplemented with 45,000 or 25,000 LSU/kg Balancius from phase 1-3 or 4-6, respectively (T3). a-b Birds fed T2 or T3 had a greater frequency of score 1 and lower frequency of score 2 compared with birds fed the control (P=0.021). Trial 1.

Table 4. Performance results, trial 2.

	T-1: NC	T-2: NC+ 45,000 LSU(F)/Kg	Root MSE	Anova P-value
Phase 1 (1-21 d of age)				
Body weight 1 day (g)	63.5	63.9	1.36	0.327
Body weight 21 day (g)	602[b]	622[a]	19.4	P<0.01
Daily gain (g)	25.7[b]	26.6[a]	0.92	P<0.01
Daily feed intake (g)	37.2	37.2	1.38	0.904
FCR (g feed/g gain)	1.450[a]	1.403[b]	0.0335	P<0.001
Overall (1-84 day of age)				
Body weight 1 day (g)	63.5	63.9	1.36	0.327
Body weight 84 day (g)	7,368[b]	7,513[a]	220.4	P<0.05
Daily gain (g)	87.0[b]	88.7[a]	2.62	P<0.05
Daily feed intake (g)	176.6	179.7	7.39	0.154
FCR (g feed/g gain)	2.030	2.026	0.0385	0.654

Values are least-square means of 52 replicates of 22 female turkey poults at the beginning of the study. [a,b,c] Values in the same row with different letters are significantly different.

Conclusion

In conclusion, muramidase supplementation improved performance, breast meat yield, feed efficiency, and additional parameters, proportional to the dose in the diets.

These findings are consistent with previous studies on the effect of muramidase in broilers, where it also showed positive effects on performance, nutrient digestibility, and more.

Overall, this suggests that muramidase could be a valuable addition to the diets of both broilers and turkeys to improve their performances.