10  Microbial 16S rDNA reveals different pathways between HMTBA and acidifier on broilers. Y. Wu*, X. Yin, Y. Wang, J. Li, and J. Yuan, State Key Laboratory of Animal Nutrition, College of Animal Science and Technology, China Agricultural University, Beijing, China.  

Methionine hydroxyl analogs (HMTBA) has relative strong acidity, however, it is not clear whether HMTBA can serve as an acidifier in vivo. This study aimed to explore whether methionine hydroxyl analogs can serve as an acidifier in poultry. A total of 480 1-d-old AA broilers were randomly divided into 4 treatments: A: basal diet + 0.057% HMTBA (Adisseo); B: basal diet + 0.05% DL-methionine (DLM) + 0.057% acidifier (Selko); C: basal diet + 0.284% HMTBA; D: basal diet + 0.25% DLM + 0.284% acidifier. The diets contain same concentrations of sulfur amino acids and other nutrient levels among groups. Each treatment consisted of 8 replicates of 15 chickens. At day age of 21, the growth performance, chyme pH, digestive enzyme activities and intestinal microflora were measured. The general linear model (GLM) was used for single factor analysis by SPSS 23.0. There was a significant difference when P < 0.05. The pH in crop, gizzard and ileum content were higher in the HMTBA at high-level supplementation than acidifier (P < 0.05). In addition, HMTBA was not able to achieve acidification by stimulating digestive enzyme activities. HMTBA supplementation inhibited proliferation of acid-producing bacteria, such as Fecalibacterium and Allostipes compared with acidifier utilization. In contrast, high-level of HMTBA could significantly increase the daily gain and daily feed intake (P < 0.05) of broiler chickens compared with acidifier. In PICRUSt analysis, HMTBA and acidifier had different effects on bacterial lipid metabolism, amino acid metabolism and carbohydrate metabolism related pathways. These results suggested that HMTBA was better than acidifier regarding the growth performance of the animals, but worked through different pathways from acidifier.  

Acknowledgements: This research was supported by the System for Poultry Production Technology, Beijing Agriculture Innovation Consortium (Project Number: BAIC04-2017).  

Key Words: methionine hydroxyl analog, acidifier, broiler, microflora, crop, cecum, pH

11  Effect of a novel muramidase on broiler performance and foot pad dermatitis. E. C. Goes*1, G. C. Dal Pont1, A. Maiorka1, L. C. Bittencourt2, R. Hermes3, M. Klausen3, R. L. Ulibarri3, and E. P. Calvo3, 1Universidade Federal do Paraná, Curitiba, Paraná, Brazil, 2DSM Nutritional Products, São Paulo, Brazil, 3Novozymes A/S, Bagsvaerd, Denmark, 4DSM Nutritional Products, Basel, Switzerland, 5DSM Nutritional Products, Village-Neuf, France.  

Muramidases are enzymes produced by animals, plants, and microorganisms to hydrolyze peptidoglycans (PGN) that is the major structural components of bacteria cell wall. The microbial cell turnover is a very common pathway that results in the production of several cell components as PGN in the gut. It is hypothesized that excessive accumulation of bacterial cell wall fragments on the surface of the gut could impair nutrient absorption and consequently, growth performance. Thus, a novel muramidase, produced by fermentation (Muramidase 007, MUR), with high affinity for hydrolyzing PGN in bacterial cell wall fractions has been characterized to improve the gastrointestinal functionality, optimizing nutrients absorption and consequently growth performance improvements. Moreover, a better nutrient absorption could contribute to improve the litter quality and consequently the footpad lesions in broiler chickens. The aim of this study was to evaluate the effect of MUR at different doses on the performance and the impact on the foot pad dermatitis (FPD) of broilers from 1 to 42 d of age. A total of 1000 d-old Cobb 500, were randomly distributed across 4 treatments of 10 replicates, using 3-times-reused litter floor-pens. Treatments were: Control (C); C+15,000 LSU (F)/kg of Muramidase (MUR 15); C+25,000 LSU (F)/kg of Muramidase (MUR 25) and C+35,000 LSU (F)/kg of Muramidase (MUR 35). Diets were based on corn and soybean meal, and all diets included phytase 1000 FYT/kg of feed. Feed intake (FI), body weight gain (BWG) and feed conversion ratio (FCR) were evaluated during the whole period. At d 42, FPD were evaluated and percentage between treatments were recorded according to absence (score 0 and 1) or presence (score 2, 3 and 4) of lesions. Data were analyzed by ANOVA, polynomial regression, and means were compared by the Tukey test at 5% probability. There was no significant difference for FI and BWG during the whole period (P > 0.05). However, the FCR presented a negative linear response (P < 0.01) to increasing doses of a MUR, showing the most efficient conversion among treatments (1.694 control vs 1.633 MUR 35, P<0.01). A significant difference was found for FPD scoring among treatments (P < 0.05). The presence of FPD in control group was 29% vs 9% in broilers that receive MUR 35, but it was similar to other treatments. Results of this study demonstrated that supplementation of the novel muramidase in broilers feed, bring benefits to performance by improving FCR and reducing FPD caused by reused litter.  

Key Words: enzyme, feed conversion, litter, gastrointestinal functionality, peptidoglycan

12  Performance and meat yield of broilers challenged with Clostridium perfringens and supplemented with yeast cell wall and zinc bacitracin. E. U. Ahive*1,2, M. E. Abdallh3, E. P. Chang’A1, A. Omede1, H. Graham3, and P. A. Iji1,2, 1School of Environmental and Rural Science, University of New England, Armidale, Australia, 2Department of Animal Science and Technology, Federal University of Technology, Owerri, Imo State, Nigeria, 3AB Vista, Marlborough, Wiltsire, UNITED KINGDOM, 4College of Agriculture, Fisheries and Forestry, Fiji National University, Koronivia, Fiji.  

The aim of this study was to determine the effect of dietary supplementation of yeast cell wall extract on performance and meat yield of broiler chickens challenged with Clostridium perfringens. Six diets based on maize and soybean were offered to 576, Ross 308 broiler chickens from d 0 to 35. Each 6 treatments was replicated 8 times, with 12 birds per replicate. Treatments consisted of Negative control (NC, no supplement and not challenged); Positive control (PC, no supplement but challenged); YCW (supplemented with yeast cell wall at 2 g/kg diet but unchallenged); YCWC (supplemented with yeast cell wall at 2 g/kg diet but challenged); YZB (supplemented at 0.267 g Zinc bacitracin/kg diet but unchallenged), and ZNWC (supplemented at 0.267 g Zinc bacitracin/kg diet but challenged). Birds in the challenged group were given 1-mL Eimeria spp. on d 9 and 1-mL C. perfringens on d 14 and 15 while the unchallenged groups were given 1-mL sterile phosphate-buffer saline suspension orally. Data of feed intake and body weight were collected on d 10, 24 and 35 while feed conversion ratio (FCR) was calculated and corrected for mortality. At d 35 2 birds were randomly selected, slaughtered by cervical dislocation and processed for assessment of meat yield. Data were analyzed using ANOVA of Minitab 17. Mortal-
ity did not differ ($P > 0.05$) between dietary treatments. There was no significant difference ($P > 0.05$) in FI between birds in all treatment groups at d 10. At d 24 and 35, birds in the PC group had the least FI ($P < 0.05$) compared with other treatment groups. Birds in the ZNB group had superior body weight and FCR but this was comparable to birds in the YCW group. Both BWG and FCR were least in the PC group at d 24 and 35. ZNBC and YCWC groups had better ($P < 0.05$) BWG and FCR than birds in the PC group. The dressing %, relative weight of breast, thigh and drumssticks at d 35 were lowest in birds from the PC group. However, birds from the ZNBC group although comparable to birds in the YCWC group were superior ($P < 0.05$) in these values to birds in the PC group. Supplementation with ZNB or YCW supported a higher dressing %, relative weight of breast, thighs and drumssticks than the unprotected (PC) group, in response to the challenge. It can be concluded that supplementation with yeast cell wall extract at 2 g/kg can improve performance, dressing % and meat yield of broilers challenged with C. perfringens and may serve as a possible alternative to antibiotics when fed to broiler chickens.

**Acknowledgements:** AB Vista UK and UNE for the research funds.

**Key Words:** yeast, antibiotics, performance, broiler

### 13 Supplementation of Bacillus subtilis in the diet of broiler breeders and its effect on progeny.


The objective of the current study was to evaluate the effect of supplementing a strain of the probiotic Bacillus subtilis in broiler breeder diets on egg hatchability and hatching chick quality. A total of 640 Cobb 500 broiler breeder hens were distributed in a completely randomized design in 32 floor pens. Water was supplied ad libitum, whereas feed was restricted following Cobb recommendations. Each experimental unit was composed of 20 hens and 2 roosters. The experiment consisted of 2 treatments (provided for males and females): control diet, and control diet added with 60 g/MT of probiotic (1 x 10^8 CFU/g Bacillus subtilis (Calsporin)), with 16 replications each. Resulting data were measured in 10 periods (25–28, 29–32, 33–36, 37–40, 41–44, 45–48, 49–52, 53–56, 57–60, 61–64 weeks of age). After hatch, chicks were weighed, measured, and evaluated for leg morphology (score 1 for normal and 2 for altered), and navel opening (1 normal, 2 slightly altered and 3 altered). Data were analyzed using the Mixed procedure of SAS (2009) with period as repeated measure. Means were considered significantly different at ($P < 0.05$) using the Tukey Kramer test. Females fed diets with probiotic addition had increased egg and body weights as well as progeny length ($P < 0.05$). In the last weeks the weight of the eggs increased in size, which consequently generated heavier chicks ($P < 0.05$). Leg scores and navel buttons were not different for both ($P > 0.05$). The periods from wk 49 to 52, and 57 to 60 were those that presented better conditions of legs in the progeny. An interaction between treatments and period was found for chicks length and navel scores ($P < 0.05$). According to this study it was possible to conclude that the supplementation of Bacillus subtilis in diets of broiler breeders has a beneficial effect on birds and egg weight and characteristics such as length and weight in the progeny.

**Key Words:** Bacillus subtilis, broiler breeder, progeny quality, probiotics

### 14 Effect of Ganoderma spp. fungal biomass on the intestinal morphology and broiler performance.


Antimicrobial multidrug resistance is one of the most important current threats to public health. The restriction in the use of antibiotics as growth promoters, together with the growing demand for differentiated healthy and safe products, has opened the doors for the use of functional additives of natural origin. The objective of this research was to determine the effect of different levels of inclusion (50, 100, 150 ppm) and routes of administration (water and food) of fungal biomass of Ganoderma spp., on the productive performance and the intestinal morphology of broilers. A total of 320 male one-day old Ross 308 broilers were allocated in isolated units at Universidad Nacional de Colombia and randomly assigned to 8 treatments (4 replicates with 10 broilers each) with a same basal diet. The performance parameters (feed intake FI, body weight gain BWG, feed conversion FCR) were evaluated weekly and intestinal morphology were made at the end at 21 d. The treatments were: birds without any additive (negative control; NC); birds with feed with 55 ppm of Bacitracin methylene disalicylate BMD (positive control; PC); 6 groups of birds supplemented with Ganoderma fungal biomass at 50 ppm, 100 ppm and 150 ppm in drinking water (WG50, WG100, WG150) and feed (FG50, FG100, FG150). Statistical analysis was performed with ANOVA and Tukey ($P < 0.05$). There were significant differences in FI and FCR being lower for PC group, the BWG were higher for FG150 compare with the CN, and there were no differences between the inclusion levels of Ganoderma in water or food and the CP. In relation to intestinal morphometry, significant differences were found, with FG150 and CP groups having the best performance, with 1169.14 µm and 1171.05 µm of villus height, respectively. Heights were significantly shorter in the other treatments, WGD50 (901.3 µm) and WGD100 (895.3 µm). The largest intestinal absorption area in FG150 was associated with a higher IF and BWG. Supplementation with Ganoderma may be an alternative to the replacement of antibiotic growth promoters.

**Key Words:** broiler, Ganoderma, broiler performance, intestinal morphology

### 15 Effects of a nutritional source of nucleotides on performance and serum biochemical parameters in broilers challenged with LPS.


This study aimed to evaluate the effects of a supplemental source of nucleotides (NUCL) in the diet of broilers challenged with E. coli lipopolysaccharide (LPS) on performance and serum biochemical parameters. A total of 96 Cobb 500 8-10 old male broilers chicks were randomly divided into 2 treatment groups with 2 subgroups of each (8 replicate cages; 3 birds/cage; totalizing 32 experimental units) and were fed a basal diet without or with 2 kg/MT of a nutritional additive based on NUCL (15% of free and purified NUCL). Birds from each subgroup of the 2 treatment groups were intra-abdominally injected with LPS (1, 1.12, 1.25, 1.40 mg/kg of BW) or saline at 21, 23, 25, and 27 d of age. The experiment was divided into 2 phases: 8–21 (initial, before LPS challenge), and 21–35 d of age (final). Blood samples were collected from 1 bird per replicate on d 21 (before LPS challenge), 28, and 35 of age and analyzed serum biochemical indices such as uric acid (UA), total proteins (TP), albumin and globulin. Study criteria also included body weight (BW), average daily gain (ADG), average daily feed intake (ADFI), and feed conversion ratio (FCR). Analysis was performed with an one-way ANOVA for the data of the initial phase and 2-way ANOVA for the data of the final phase.
for the final phase. On initial phase, the birds supplemented with NUCL showed greater BW (+3.3%), ADG (+4.0%), and had best FCR (−3.4%) when compared with the control group (P < 0.05). The treatments had no effect (P > 0.05) on ADFI, UA, TP and globulin, but albumina tended (P < 0.1) to be increased in the control group. On final phase, no interactions between NUCL supplementation and LPS challenge were found either on performance or serum biochemical parameters. However, LPS decreased ADG (−7.9%) and ADFI (−4.7%) when compared with no challenged group (P < 0.05), and tended (P < 0.1) to decreases BW and FCR at d 35. On d 28, supplementation of NUCL tended (P < 0.1) to increase UA and LPS tended (P < 0.1) to increases globulin level. There was no significant difference on biochemical parameters at d 35. In summary, this study demonstrated that broiler diets supplemented with NUCL significantly improved performance at initial phase and LPS challenge negatively affects birds’ weight gain and consumption.

**Key Words:** poultry, lipopolysaccharide, additive, globulin

**Table 1. Egg weight (EW), albumen weight (AW), eggshell weight (SW), egg yolk weight (YW), eggshell thickness (ST) and specific gravity (SG) of eggs from breeders fed a control diet (CD) and diet containing phytotherapy feed additive (PFA)**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Parameter</th>
<th>EW (g)</th>
<th>AW (g)</th>
<th>YW (g)</th>
<th>SW (g)</th>
<th>ST (mm)</th>
<th>SG</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD</td>
<td></td>
<td>67.287b</td>
<td>40.287b</td>
<td>21.30b</td>
<td>5.694</td>
<td>0.456</td>
<td>10.732</td>
</tr>
<tr>
<td>PFA</td>
<td></td>
<td>68.741a</td>
<td>41.400a</td>
<td>21.61a</td>
<td>5.572</td>
<td>0.449</td>
<td>10.733</td>
</tr>
<tr>
<td>P-value</td>
<td></td>
<td>0.001</td>
<td>0.001</td>
<td>0.002</td>
<td>0.118</td>
<td>0.738</td>
<td>0.675</td>
</tr>
<tr>
<td>CV (%)</td>
<td></td>
<td>6.84</td>
<td>9.42</td>
<td>8.12</td>
<td>11.19</td>
<td>86.48</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Means followed by lowercase letters differ in the same parameter by Tukey test (P < 0.05).

**Acknowledgements:** To LEPNAN, UFPR and PROPHYTUS

**Key Words:** additives, breeder, egg quality, phytotherapy

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**Inclusion of a commercial phytotherapeutic feed additive on breeders’ egg quality parameters.** L. S. Bassi*1, J. C. Panisson1, C. M. M. Souza1, V. G. Schramm2, P. M. N. Floriano1, E. M. C. Lima3, and A. Maiorka1, 1Federal University of Paraná, Curitiba, Paraná, Brazil, 2JBS S. A., Itajaí, Santa Catarina, Brazil, 3ProPhytus, São José dos Campos, São Paulo, Brazil.

The purpose of this study was to evaluate egg quality parameters of breeders fed with a microencapsulated phytotherapeutic feed additive (ProPhytus) composed of a blend of copaiba oil-resin, cashew shell oil and castor oil. 32,907 female breeders and 3,278 roosters, totaling 36,185 birds, with 24 weeks old, were distributed in a randomized block design with 2 treatments (T): Control diet (CD); Dietary inclusion of 300 g/ton of a phytoherapeutic feed additive (PFA). Ninety eggs per treatment were collected at 40, 44, 48, 52, 56, 60 and 64 weeks old. Quality parameters were analyzed, including egg weight (EW), albumen weight (AW), egg yolk weight (YW), eggshell weight (SW), eggshell thickness (ST) and specific gravity (SG). Experimental blocks were formed separating the birds by age. All data were submitted to ANOVA, and when significant, means were compared by Tukey test with 5% probability. Results for egg quality are shown in Table 1. Inclusion of PFA resulted in eggs with higher EW, AW and YW when compared with CD (P < 0.05). Dietary phytotherapeutic feed additives used as growth promoters can have beneficial effects on the animal digestive and immune system, improving diet utilization and absorption rate of minerals such as Ca and Mg, which could explain the higher results of internal egg quality obtained in this study. No significant difference was found for eggshell weight, eggshell thickness and specific gravity (P > 0.05). In conclusion, the use of phytotherapeutic feed additive in breeders’ diet may improve egg quality parameters.

**Table 1. Egg weight (EW), albumen weight (AW), eggshell weight (SW), egg yolk weight (YW), eggshell thickness (ST) and specific gravity (SG) of eggs from breeders fed a control diet (CD) and diet containing phytoherapeutic feed additive (PFA)**

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