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ABSTRACTS
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SYMPOSIA AND ORAL SESSIONS

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trol group (P<0.05). No pH differences were detected in other GI regions (P>0.05). Caecal butyric and propionic acid concentrations were higher in OA supplemented broilers than in control group birds (P<0.0001). Formic and acetic concentrations were not different between treatments (P>0.05). In conclusion, the formic and propionic acid-based products reduced distal digesta pH and increased some caecal SCFA concentrations in *E. coli* challenged broilers. Given decreased digesta pH and increased SCFAs are considered beneficial to gut health, these data demonstrate the ability of the organic acid products to promote GI health of broilers.

Key Words: Broiler, Organic acid, Digesta pH, Short chain fatty acid, Butyrate

T140 A single feces index (LIAN1.1) as indicator of intestinal health in broilers Diego Martínez*[1], Carlos Vílchez[2] [1]*LIAN Development & Service;* [2]*Universidad Nacional Agraria La Molina*

Data from three experiments (E1, E2, E3) on intestinal health with Cobb 500 broilers were used to test the sensitivity of a feces index as indicator of intestinal health. E1 and E2 had two and three treatments with eight replicates each, used 128 and 192 day-old male chicks placed on litter at a research facility, and were evaluated at 3 and 1 different ages, respectively; while E3, had two treatments with four replicates each, used 18,000 male/female birds placed in commercial facilities, and were evaluated at two different ages. Droppings were collected on absorbent papers placed on the litter in all the groups of birds and ages, and were evaluated with the following index: LIAN1.1 index = ΣS_i x (25/n); where «ΣS_i" indicates the summatory of the score (S) of each dropping sampled (*i*) in the same experimental unit, and "n" is the number of droppings sampled in the experimental unit. Score: 0, normal; 1, watery (if the diameter of humidity is at least twice the one of the dropping); 2, with undigested feed; 3, with desquamated mucosa; 4, bloody. The data was analyzed using a CRD and the GLM procedure of SAS to obtain the P-value of each variable for each treatment comparison at each age. The values obtained in all the variables were used to correlate the LIAN1.1 index to body weight, prevalence and intensity of intestinal lesions, and morphometry of lymphoid organs by the CORR procedure of SAS. The LIAN1.1 index showed significant correlations with body weight (-0.45; P=0.0001), density of intestinal lesions (0.32; P=0.0258), lesion score of *Eimeria acervulina* (0.29; P=0.0441) and percentage of birds positive to coccidia (0.33; P=0.0142), bursa diameter (0.33; P=0.0225) and thymus morphometric index (0.30; P=0.0360), and presented the lowest P-values among the 7 evaluated variables of feces quality in most of the cases (87.5%) when comparing treatments within each experiment and age. In conclusion, the LIAN1.1 index is sensitive to intestinal health, statistically stronger than other fecal variables, and can be used as a one-single grading index to compare different flocks.

Key Words: LIAN index, gut health, intestinal integrity, feces quality, broilers

T141 Effect of protected sodium butyrate and nutrients concentration on broilers performance Monica Puyalto*, Pilar Honrubia, Juan Mallo *NOREL S.A.*

The study was conducted to compare the effect of sodium butyrate protected with PFAD sodium salt (GUSTOR N'RGY) with different diets on growth performance.

A 2 x 2 factorial design was used with two basal diets based on wheat, barley and soy: S (standard nutrient diet) and L (low nutrient diet) with a reduction of 60 Kcal/Kg of ME and 2.3% lower concentration of aminoacids; with or without addition of protected sodium butyrate at 1 kg/t.

A total of 200 Cobb one day old chickens were randomly allocated on floor to 4 treatments with 5 pens of 10 birds per treatment: SN (standard nutrient diet; no additive), SY (standard nutrient diet; protected butyrate), LN (low nutrient diet; no additive), LY (low nutrient diet; protected butyrate). Mash feeds and water were offered ad libitum.

BW, ADG, ADFI and FCR were recorded at 0, 21 and 42 d. Data were analyzed using the GLM procedure of SAS.

There were no statistical differences due to nutrient level in any growth phase.

The results regarding to the addition of protected butyrate showed that in the first 21 days animals achieved higher final BW with higher ADG than those without additive (0.807 Kg vs 0.773 Kg; P<0.0121 and 35.83 g/d vs 34.18 g/d; P<0.0123). Also, tended to present better FCR (1.271 vs 1.305; P<0.0912); FCR was only numerically different in the growing phase (21-42d) (1.758 vs 1.775) and in the total period (0-42d) (1.547 vs 1.579).

Looking at the interaction between additive and nutrient, treatment with low energy and butyrate (LY) had higher FBW (2.34^a Kg; P<0.0243) and ADG (54.34^a g/d; P<0.0245) than SN, SY and LN respectively (2.29^{ab} Kg, 2.21^b Kg and 2.19^b Kg; 53.27^{ab} g/d, 51.46^b g/d and 51.04^b g/d).

We can conclude that the addition of GUSTOR N'RGY improves performance results at early stages in broiler chickens. On the other hand, broilers feed with low nutrient diet (ME reduction of 60 Kcal/Kg and 2.3% lower concentration amionacids) and 1 Kg/t of protected sodium butyrate obtained the same FBW than standard diet.

Key Words: sodium butyrate protected, energy, aminoacids

T142 Effect of protected sodium butyrate and nutrients concentration on broilers gut health Monica Puyalto, Pilar Honrubia, Cinta Sol, Juan Mallo* *NOREL S.A.*

The study was conducted to compare the effect of sodium butyrate protected with PFAD sodium salt (GUSTOR N'RGY) with different diets on growth performance.

A 2 x 2 factorial design was used with two basal diets based on wheat, barley and soy: S (standard nutrient diet) and L (low nutrient diet) with a reduction of 60 Kcal/Kg of ME and 2.3% lower concentration of aminoacids; with or without addition of protected sodium butyrate at 1 kg/t.

A total of 200 Cobb one day old chickens were randomly allocated on floor to 4 treatments with 5 pens of 10 birds per treatment: SN (standard nutrient diet; no additive), SY (standard nutrient diet; protected butyrate), LN (low nutrient diet; no additive), LY (low nutrient diet; protected butyrate). Mash feeds and water were offered ad libitum.

At the end of the trial (42 days) chickens were euthanized and samples from the GIT were removed to analyze gut microflora (*Lactobacillus, E. Coli and Coliforms*), lactic acid and short chain fatty acids (SCFA) by HPLC. Moreover, duodenum, jejunum and ileum epithelium samples were obtained in order to determine their development status. Data were analyzed using the GLM procedure of SAS.

There were no differences in gut microflora in any part of GIT. Lactic acid was statistically higher in duodenum, jejunum and numerically higher in ileum in SY treatment compared to LN, LY and SN (33.84 vs 19.36, 11.53 and 9.83 for duodenum; 32.95 vs 13.89, 9.27 and 2.72 for jejunum, respectively). Lactic acid was not affected by the interaction of the treatments in caecum nor in colon, despite the fact that in general, animals fed additive showed higher values of lactic acid in all parts of GIT, except in caecum.

Total SCFA followed the same distribution as lactic acid in duodenum and ileum being the interaction statistically significant with the highest values for SY, followed by LN, LY and SN. The interaction was also significant in caecum where the highest value was found for LN, followed by SY, SN and LY (182.33, 152.49, 114.98 and 93.10 mM, respectively). The addition of additive to the diet increased numerically the values of total SCFA in all parts of GIT, except in caecum.

There were not differences in histomorphology at duodenum and ileum level, however, there were significant interactions in villus, mucosa and V:C ratio in jejunum, showing the highest values for LY treatment.

It can be concluded that the interaction between the diet composition and addition of **GUSTOR N'RGY** modify bacterial fermentations, however more studies are necessary to evaluate what kind of bacteria have been affected.

Key Words: butyrate, Short chain fatty acids, Histomorphology

T143 Dose response of organic Zn chelated with 2-hydroxy-4-methylthio butanoic acid (HMTBA) on the performance, carcass quality, gut health and immunology of male broilers Ricardo Gonzalez-Esquerra[1], Raquel Araujo[*1], Sérgio Vieira[2], Cesar Pontin[2], Liris Kindlein[2], César Lima[3], Ricardo Hayashi[4], Elizabeth Santin[4] *[1]Novus International Inc.; [2]Universidade Federal do Rio Grande do Sul; [3]Universidade de São Paulo; [4]LABMOR/MESSA - Universidade Federal do Paraná*

An experiment was conducted to evaluate the effect of increasing levels of Zn-HMTBA chelate (Novus International Inc.) on performance, carcass, and meat quality traits, gut health, and immune response in broilers. A total of 2,960 Cobb 500 male chicks randomly allocated to 7 treatments and 10 replicates were used. A density of 12.2 birds/m^2, reused litter, vaccination (IBD at d 1), and commercial-like feeder space were imposed. Broilers were fed an isonutritional corn-soy diet across treatments except for Zn, using a 3 feeding phases program: Starter (1 to 14 d), Grower (15 to 28 d), and Finisher (29 to 38 d). Seven levels of Zn-HMTBA chelate were fed from 0 to 96 ppm in grades of 16 ppm, and methionine levels were adjusted to account for the HMTBA content of Zn-HMTBA. Carcass and meat quality were evaluated at 38 d in 4 birds randomly selected per pen. The ileal index on histological changes of intestinal villi (ISI) was obtained from 1 bird/pen as an indicator of gut health. Cell mediated and humoral immune responses were tested by blood flux cytometry and IBD titles, respectively. ANOVA and regression analyses were performed. Qualitative parameters and incidence of lesions were analyzed by the Kruskal-Wallis test. Production efficiency, BWG, and livability were improved linearly with Zn-HMTBA addition in all feeding phases ($P < 0.05$). The FCR decreased linearly at 14 and 28 d ($P < 0.01$). Cooking loss, carcass and thighs yields (%) also improved linearly. Breast weight and yield increased with Zn-HMTBA addition ($P < 0.05$) while breast pH, footpad lesions, white striping, and wooden breast score and occurrence were not affected. Skin scratches size reduced linearly in more than 5 mm with an increased Zn-HMTBA level. The incidence of meat bruises dropped vs Control by 73% and 67% with 48 ppm and 80 ppm Zn-HMTBA, respectively. Zn-HMTBA improved ($P < 0.0001$) gut health and functionality (ISI) at 38 d. Three populations of lymphocytes increased linearly ($P < 0.05$). In conclusion, Zn-HMTBA chelate can improve performance, carcass yield, meat quality, gut health, and immune responses of broilers.

Key Words: organic mineral, zinc, gut health, performance, Mintrex Zn

T144 I. Effect of Ration Plus™ for Poultry on broiler chickens fed antibiotic free diets in three 21 day dose-response trials, two with bacterial challenges and one with heat stress David Hall[*1], E. Wozniak[1], J. Mcnaughton[2] *[1]Cytozyme Laboratories, Inc.; [2]AHPharma, Inc.*

Ration Plus™ for Poultry (RP; AAFCO 36.11 Dried Lactobacillus acidophilus fermentation product), in 3 dose titration trials, was administered via an antibiotic free corn-soy based starter diet to mixed sex Ross 708 broiler chicks at 4 levels of 0, 250, 500, or 1,000 ppm. In Trial 1, *Eimeria acervulina* and *Escherichia coli* and in Trial 2 *Clostridium perfringens* were administered to birds as mild challenge levels on built up litter. Coccivac-B was used with no coccidiostats added to feed. Trial 3 on built up litter included a heat stress at temperatures of 29-32°C days (d) 0-7, 38°C d 7-14 and 41°C d 14-49. Ross 708 mixed-sex broiler chicks were allocated at 56 chicks/pen each to 10 replicate pens per treatment (0.85 sq ft/bird; 0.079 sq m/bird). Live performance and small intestinal lesion scores (0-4), *Escherichia coli* counts (EC) and *Salmonella* spp. incidences (SI) were determined on d21.

The RP diets reduced lesion scores ($P \leq 05$; 1.8^a, 1.5^a, 1.1^b, 1.0^b for control, 250, 500,1000 ppm RP dose titration, average for 3 trials). In the heat challenge trial, RP diets increased body weight at d21 (704^a, 717^b, 726^c, 735^d, g; $P \leq .05$), and reduced feed conversion ratio (1.40^a, 1.39^{a,b}, 1.36^{b,c}, 1.35^c; $P \leq .05$). Mortality was also reduced in the heat challenge trial by RP diets (4.6%^{a}, 4.3%^{a,b}, 3.6%^{a,b,c}, 3.0%^{c}; $P \leq .05$). In summary of 3 trials, crop and small intestinal content averaged 6.5-$\log_{10}$ for EC and 42% SI across all Controls. The RP-treated birds' intestinal contents for EC and SI were: 6.4 $\log_{10}$ and 33% for 250 ppm; 5.5 $\log_{10}$ and 28% for 500 ppm ($P \leq 0.05$ from Control); and 5.0 $\log_{10}$ and 29% for 1000 ppm ($P \leq 0.05$ from Control). The RP diets reduced lesion scores, crop and intestinal *Escherichia coli* counts and *Salmonella* incidences in all 3 trials and improved live performance during heat stress in pre-harvest age broiler chickens fed antibiotic free diets.

Key Words: Ration PlusTM, antibiotic free diets, heat stress, chicken

T145 II. Effect of Ration Plus™ for Poultry on broiler chickens fed antibiotic free diets during heat stress for 49 days. David Hall[*1], E. Wozniak[1], J. Mcnaughton[2] *[1]Cytozyme Laboratories, Inc.; [2]AHPharma, Inc.*

Ration Plus™ for Poultry (RP; AAFCO 36.11 Dried Lactobacillus acidophilus fermentation product) was administered via antibiotic free corn-soy based diets to mixed sex broilers at 4 levels of 0 (Control), 250, 500, or 1,000 ppm. Heat stress was controlled at temperatures of 29-32°C days (d) 0-7, 38°C d 7-14 and 41°C d 14-49. Chicks were raised on built up litter from at least 3 previous trials (.85 sq. ft./bird; .079 sq. m/bird). Coccivac-B was used for all chicks with no coccidiostats added to feed. Ross 708 mixed sex broiler chicks were allocated at 56 chicks per pen to 10 replicate pens per treatment. Live performance, crop and small intestinal lesion scores (0-4), *Escherichia coli* counts (EC) and *Salmonella* spp. incidences (SI) were determined on d21 and d49.

The RP diets reduced lesion scores ($P \leq .05$) on d21 and d49 (d21 = 2.1^a, 1.9^a, 1.0^b, 1.1^b; and d49 = 2.0^a, 1.7^b, 1.3^c, 1.1^c for control, 250, 500,1000 ppm RP dose titration levels, respectively). RP diets increased body weight (704^a, 717^b, 726^c, 735^d g d21; $P \leq .05$) and reduced feed conversion ratio (1.40^a, 1.39^{a,b}, 1.36^{b,c}, 1.35^c d21; $P \leq .05$). At d49, RP diets increased body weight (2.66^a, 2.71^b, 2.75^c, 2.78^d kg; $P \leq .05$) and reduced feed conversion (1.92^a, 1.89^{a,b}, 1.86^{a,b}, 1.84^b; $P \leq .05$). Mortality was reduced at d21 and d49 by RP diets (d21 = 4.6%^{a}, 4.3%^{a,b}, 3.6%^{a,b,c}, 3.0%^{c}; d49 =12.6%^{a}, 10.4%^{b}, 8.5%^{b,c}, 7.0%^{c}; $P \leq .05$). At d49, crop and small intestinal content averaged 6.5 $\log_{10}$ EC and 53% SI for Controls. The RP-treated birds' intestinal contents for EC and SI were: 6.1 $\log_{10}$ and 40% for 250 ppm ($P \leq .05$ vs control); 5.5 $\log_{10}$ and 26% for 500 ppm ($P \leq 0.05$ vs control); and 5.2 $\log_{10}$ and 26% for 1000ppm ($P \leq 0.05$ from control), respectively. In conclusion, the RP diets improved live performance and reduced mortality, lesion scores, and crop and intestinal *Escherichia coli* counts and *Salmonella* incidences in broiler chickens fed antibiotic free diets during heat stress.

Key Words: Ration Plus TM, antibiotic free diets, heat stress, chicken