TH327 Type 2 diabetes mellitus increases sensitivity to dietary iron overload in pigs. M. S. Morales*[1], A. Espinoza[1,2], M. Arredondo[2], and F. Pizarro[2], *[1]Facultad de Ciencias Veterinarias y Pecuarias, Universidad de Chile, Santiago, R.M., Chile, [2]INTA, Universidad de Chile, Santiago, R.M., Chile.*

Oxidative stress (OS) due to high levels of iron (Fe) may be involved in type 2 diabetes mellitus (DM2) etiology. We determined effects of high dietary Fe in pigs induced with DM2 by Streptozotocin injection on Fe nutritional status, OS parameters, apoptosis and expression of genes related to Fe metabolism. Four groups of pigs (15 kg BW; 6 pigs/group) were assigned to: Control, a basal diet (120 ppm Fe; C); High Fe, C + 3000 ppm $FeSO_4$ (HFe); DM2 fed C diet (D); and DM2 pigs fed HFe (DFe). Diets were fed for 2 mo; pigs were evaluated weekly for biochemical, Fe metabolism and OS parameters. Pigs were killed, and liver (LI), pancreas (PA) and duodenum (DU) were taken for Fe content and apoptosis. mRNA expression of DMT1, transferrin receptor (RTf), ferroportin (Fpn), hepcidin (Hpc) and ferritin (Fn) genes were measured in LI and DU. Data were analyzed by ANOVA and Tukey test or Kruskal Wallis test. All differences indicated are $P < 0.05$. In plasma OS TBARS was higher only in D at d 60. Apoptosis and 4-HNE in LI, PA and DU were highest in DFe. DMT1 expression in DU and LI was lower in HFe and DFe groups as expected, but in D and C expression was similar; thus, DM2 did not affect DMT1 expression. Hcp gene expression in LI was increased by HFe and DFe as expected for high dietary Fe, but was not modified by DM2. Hcp in DU was downregulated by HFe, thus dietary Fe level caused differential tissue expression of this gene. RTf expression was decreased by HFe in LI as expected. Treatment did not modify expression of Fpn and Fn in DU, but Fn was highly expressed in LI of DFe pigs, reflecting greater Fe storage in DFe pigs with high Fe intake; thus, Fn was differentially expressed as well. HFe on DM2 induced higher OS, apoptosis and differential expression of Fn and Hpc gene.

Key Words: iron, gene expression, pig

TH328 Severe heat stress affects amino acid transporters expression and serum concentration of amino acids in pair-fed pigs. F. Grageola, M. Morales, H. García, B. A. Araiza, N. Arce, and M. Cervantes*, *ICA - Universidad Autónoma de Baja California, Mexicali, BC, México.*

Heat stress (HS) depresses pig performance mainly because of appetite reduction although other factors involved in the cellular availability of nutrients may also contribute to that depression. A 19-d experiment was conducted with 12 pigs (30.3 ± 2.7 kg BW) to examine the effect of severe HS (up to 45°C) on the expression of 2 cationic amino acid (AA) transporters ($b^{0,+}$ in jejunum; $b^{0,+}$ and CAT1 in jejunum, liver, longissimus–LD, and semitendinosus–ST), and myosin in LD and ST, and serum concentration (SC) of AA. Treatments were: Comfort, pigs housed at an average temperature of 22 (±2) °C; and HS, pigs housed in a room with no climate control (21 to 45°C). All pigs received the same wheat-soybean meal diet and had similar daily feed intake. Intestinal mucosa, tissue and blood samples were collected at the end of the trial. Relative expression of $b^{0,+,}$ CAT1, and myosin, and the SC of AA were analyzed. The expression in Comfort and HS pigs were: $b^{0,+}$: jejunum, 2.98, 0.45; liver, 2.24, 0.54; CAT1: jejunum, 0.05, 0.15; liver, 0.001, 0.005; LD, 0.008, 0.006; ST, 0.005, 0.002; myosin: LD, 4.14, 2.73; ST, 1.06, 0.20, respectively. The expression of $b^{0,+}$ in jejunum and liver, and myosin in ST was lower ($P<0.05$); but CAT1 in jejunum and liver was higher ($P < 0.05$) in HS pigs. In jejunum and liver, the average relative expression of $b^{0,+}$ was about 15× higher than that of CAT1 ($P<0.01$), but $b^{0,+}$ was barely expressed in muscles. CAT1 expression in muscles was not affected by HS. The SC of AA in Comfort and HS pigs were: Arg, 567, 552; His, 689, 513; Ile, 341, 470; Leu, 397, 592; Lys, 580, 306; Met, 95, 17; Phe, 214, 310; Thr, 639, 483; Val, 667, 1401 µmol/L, respectively. The SC of Lys and Met were lower ($P < 0.05$) in HS pigs. In contrast, the SC of Ile, Leu, and Val were higher ($P < 0.05$), and Phe tended to be higher ($P < 0.10$) in HS pigs. The SC of Arg, His, and Thr were not affected in HS pigs. These results suggest that HS modifies molecular mechanisms that affect the expression of cationic AA transporters and hence the cellular availability of limiting AA, which in turn may affect the performance of pigs

Key Words: pig, heat stress, expression

TH329 Thyroid function and growth are impaired by *Moringa oleifera* leaf meal in pair-fed growing poultry. J. Ashong* and D. Brown, *Cornell University, Ithaca, NY.*

Moringa oleifera Lam, a popular highly valued fast-growing crop in many tropical and subtropical countries has the potential to be used as high quality nutrient concentrate because of its high content of protein and micronutrients like iron and vitamin A. However, *Moringa oleifera* has been shown to retard growth in poultry. The objectives of the present study were to clarify the mechanism of the growth retardation effects of *Moringa oleifera* leaf meal and to compare thyroid function in growing chickens fed *Moringa oleifera* meal as a protein source. *Moringa oleifera* leaf powder was mixed with soybean as supplemental protein sources in a soybean-corn based chicken diets (based on National Research Council's requirement for white-leghorn type chickens) to formulate 2 isocaloric and isonitrogenous experimental diets—0% (control) and 20% moringa leaf powder. 7-d old chickens were completely randomized and assigned to the diets over a 28 d period as: control ad libitum (CAL), 20% moringa ad libitum (MAL) and control pair-fed (CPF)—chickens fed with control at the same quantity as the feed intake of 20% moringa ad libitum. CAL and CPF had 3 replicates with 5 chickens per replicate. MAL had 2 replicates with 3 chickens per replicate. Daily feed intake and weekly body weights were recorded, and feed efficiency calculated. Serum thyroid hormones were measured at d 14 and 28. Postmortem kidney, liver and heart weights were recorded. Liver tissues were harvested for histopathology. Moringa fed chickens showed heavier liver weight, ($r^2 = 0.64$, $P = 0.003$,), decreased serum thyroxine (T_4), $r^2 = 0.37$, $P = 0.039$ and thyronine (T_3), $r^2 = 0.55$, $P = 0.008$ on d 28. Serum T_4 ($P = 0.79$) and T_3 ($P = 0.25$) were not different on d 14. M. oleifera led to reduced feed intake ($P = 0.003$) leading to 27% and 39% suppression in growth compared with CPF and CAL respectively ($r^2 = 0.26$, $P = 0.0029$). Histopathology results were not different. The results suggest that the growth retardation effects of moringa is likely metabolic and thyroid function might be impaired in chickens fed moringa leaf meal as protein source.

Key Words: *Moringa oleifera*, thyroid hormone, growth

TH330 Effects of immunization against GnRH and feeding allowance on the performance of growing-finishing pigs. O. A. Dalla Costa, G. J. M. M. Lima*, F. C. Tavernari, and L. S. Lopes, *Embrapa, Concordia, SC, Brazil.*

Immunization against GnRH is an innovative technology in swine production because it enhances performance and welfare. The objective of this study was to evaluate the effects of gender and feeding allowance on growing-finishing performance and carcass parameters. This experiment was carried out with 1200 pigs (23.13 ± 3.20 kg) of 2 genders (barrows and intact males), divided into 3 feeding systems (F1 = ad libitum; F2 = 96% feed consumption of F1; F3 = 93% feed consumption of F1). Therefore, there were 6 combinations of factors with 20 replicates of 10 pigs, each, according a randomized complete block design. All animals received the same diets, based on corn, soybean meal and meat and bone meal. Diets were formulated based on the concept of ideal protein, with the following apparent ileal digestible lysine (%) and metabolizable energy (kcal/kg) values: 0.83 and 3189; 0.75 and 3169; 0.75 and 3167; 0.90 to 3164 for growing diets 1 and 2 and finishing diets 1 and 2, respectively. Finishing diet 2 was supplemented with 5 ppm ractopamine and fed during the last month of experiment. The immunization against GnRH occurred at wk 8 and 4 before slaughter. Performance (pig initial and final weights, ADG, ADFI, feed:gain ratio) and post mortem carcass (liver, heart, and kidney weights, meat % in carcass and back fat thickness) parameters were evaluated. There were no significant interactions ($P > 0.05$) between gender and feeding system. Immunized intact males showed better results ($P < 0.05$) on final weight (116.26 vs. 111.96 kg), ADG (0.835 vs. 0.802 kg/d) and feed:gain ratio (2.56 vs. 2.70) compared with barrows during the total period. Final weight (116.19; 113.67 and 112.48 kg), ADG (0.839; 0.814 and 0.803 kg/d), and feed:gain ratio (2.70; 2.62 and 2.58) differed ($P < 0.05$) among F1, F2 and F3 pigs, respectively. Post mortem carcass parameters were not affected ($P > 0.05$) by feed allowance but showed a significant effect of gender ($P < 0.05$). Immunized intact males showed greater means, except for back fat thickness. Immunization against GnRH provides better results and it seems to be independent of the amount of feed provided to animals.

Key Words: feed restriction, carcass, organ

TH331 Effects of melamine in young barrows. B. R. Landers[1], G. Hosotani*[1], D. Y. Kim[2], M. C. Shannon[1], G. E. Rottinghaus[2], and D. R. Ledoux[1], *[1]Animal Sciences Department, University of Missouri, Columbia, [2]Veterinary Medical Diagnostic Laboratory, College of Veterinary Medicine, University of Missouri, Columbia.*

A study was conducted to investigate the toxicity of melamine (MEL) fed to young barrows, and to determine residual levels of MEL in selected tissues. Thirty 14-d post-weaning barrows (initial weight = 10.6 ± 1.2 kg) were allotted to 1 of 6 dietary treatments containing 0, 0.25, 0.50, 0.75, 1.0, or 1.25% MEL. A completely randomized design was used with 5 replicate pens of one pig/pen assigned to each treatment. Compared with controls, BWG and ADG were lower ($P = 0.0205$) in pigs fed ≥1.00% MEL. A decrease in gain to feed with increasing dietary MEL concentrations contained both linear ($P = 0.0076$) and quadratic ($P = 0.0407$) components. Pigs receiving 1.25% MEL had a lower ($P = 0.0427$) gain to feed value than controls. Linear decreases in serum glucose ($P = 0.0124$) and serum calcium ($P = 0.0053$) were observed as dietary MEL levels increased. In contrast, aspartate aminotransferase increased ($P = 0.0049$) linearly as MEL inclusion in the diet increased. An increase in residual MEL levels in the kidney contained both quadratic ($P < 0.0001$) and linear components ($P < 0.0001$). There was a linear ($P < 0.0001$) increase in MEL concentrations in bile with increasing dietary concentrations of MEL. Pigs fed diets containing ≥0.25% MEL had kidney MEL residue levels greater ($P < 0.0001$) than controls, whereas pigs fed ≥0.50% had MEL residue levels in bile and muscle that were greater ($P < 0.0001$) than controls. In summary, results indicate that ≥1.00% MEL was toxic to pigs fed dietary MEL treatments for 21 d.

Key Words: pig, melamine, toxicity