Physiology and Endocrinology: Environment, metabolism and physiological processes

T304 Effect of the environmental conditions over the vaginal temperature and respiration rate on wild type and slick-haired Puerto Rican Jersey cows. Amneris M. Castro-Ramos*, Gladycia C. Muñiz-Colón, Jaime E. Curbelo-Rodríguez, Melvin Pagán-Morales, Alexander Mesonero-Morales, Adalberto de Jesus-de Jesus, Neftalí Lluch-García, and Héctor L. Sánchez-Rodríguez, *University of Puerto Rico at Mayagüez Campus, Mayagüez, Puerto Rico.*

The slick hair phenotype is associated with enhanced thermoregulation in Holstein cows; however, no such data are available in slick-haired Jersey cows. The relationship between hair coat type (phenotypically determined), vaginal temperature (VT; as an index of core body temperature), respiration rate (RR), and thermal humidity index (THI) was evaluated in 10 Puerto Rican Jersey cows [5 wild type-haired (WT; 111.2 ± 0.8 d in milk (DIM); 1.2 lactations) and 5 slick-haired (SLICK; 171.6 ± 1.5 DIM; 1.2 lactations)]. Cows were exposed to solar radiation from 1030 to 1130 h and to artificial shade from 1130 to 1030 h during 5 consecutive days. Data loggers recorded VT (TidbiT v2), air temperature, and relative humidity (HOBO Pro v2) every 5 min and the THI was determined. Daily THI ranged from 63.47 – 81.77. The RR was recorded at 0600, 0800, 0900, 1000, 1100, 1200, 1300, 1400, and 1500 h daily. Data were analyzed using the GLIMMIX and CORR procedures of SAS. There were no differences in VT between hair type groups either under sun or shade exposure ($P = 0.43$). From 1030 to 1130 h (direct solar radiation exposure) mean VT values of 39.08 ± 0.02 and 39.26 ± 0.02°C were observed in SLICK and WT cows, respectively. During the 1130–1030 h (shade period), SLICK and WT cows presented mean VT values of 38.80 ± 0.01 and 38.89 ± 0.01°C, respectively. However, SLICK cows presented lower RR than their WT counterparts ($P = 0.004$). Mean daily RR values of 56.0 ± 5.2 and 77.6 ± 5.0 breaths per minute were observed in the SLICK and the WT cows, respectively. Correlation coefficients of 0.68 ($P < 0.0001$) and 0.47 ($P < 0.0001$) were observed between the VT and the RR in WT and SLICK cows, respectively. However, VT was less associated with THI in WT than in SLICK cows [r = 0.24 ($P < 0.0001$) and r = 0.50 ($P < 0.0001$), respectively]. In conclusion, slick-haired Jersey cows were able to maintain similar vaginal temperature than their wild type-haired counterparts, but with a lower respiration rate. These findings suggest that wild type-haired Jersey cows' body temperature regulation requires greater heat dissipation through evaporation than their slick-haired counterparts.

Key Words: slick-haired Jersey cow, thermoregulation, solar radiation

T305 Effects of the thermal humidity index on vaginal temperature of slick- and wild type-haired Puerto Rican Holstein cows. Héctor L. Sánchez-Rodríguez*, Amneris M. Castro-Ramos, Melvin Pagán-Morales, Jaime E. Curbelo-Rodríguez, Alexander Mesonero-Morales, and Gladycia C. Muñiz-Colón, *University of Puerto Rico at Mayagüez Campus, Mayagüez, Puerto Rico.*

The slick hair phenotype has been suggested as an alternative for dairy production in tropical and subtropical countries. The present study evaluated the relationship between hair coat type (phenotypically determined), vaginal temperature (VT) and thermal humidity index (THI) in lactating Puerto Rican Holstein cows. In trial 1, 4 wild type-haired (WT; 169.8 ± 3.8 d in milk (DIM) and 3.8 ± 2.2 lactations) and 5 slick-haired (SLICK; 146.6 ± 63 DIM and 3.0 ± 2.1 lactations) cows were used. In trial 2, 5 WT (173.2 ± 42.3 DIM and 3.0 ± 2.1 lactations) and 5 SLICK (163.8 ± 43.0 DIM and 2.8 ± 1.7 lactations) cows were evaluated. Data loggers recorded VT (TidbiT v2), air temperature, and relative humidity (HOBO Pro v2) every 5 min for 8 consecutive days and the THI was determined. The THI presented daily ranges from 63.72 to 80.63 and 61.79–81.47 on trial 1 and trial 2, respectively. Data were analyzed by the GLIMMIX and CORR procedures of SAS. In trial 1 there were no differences in VT between SLICK and WT cows (38.71 ± 0.08 and 38.71 ± 0.09°C, respectively; $P = 0.96$). Daily VT in SLICK and WT cows began to increase ($P < 0.001$) at similar THI values (68.49 and 65.02, respectively; $P = 0.82$). In this first trial, correlation coefficients of 0.27 ($P < 0.0001$) and 0.36 ($P < 0.0001$) were found between the VT and THI in SLICK and WT cows, respectively. In trial 2, hair coat type and time of the day interacted to affect VT ($P < 0.001$). During the 1900–2100 h WT cows presented VT values 0.25°C greater than SLICK cows ($P = 0.02$). From 2200 to 1800 h WT and SLICK cows presented similar VT values (38.68 ± 0.10 and 38.60 ± 0.07°C, respectively; $P = 0.39$). Also in trial 2, daily VT began to increase ($P < 0.001$) in both hair type groups when THI reached 70.08. In this second trial, correlation coefficients of 0.32 ($P < 0.001$) and 0.42 ($P < 0.001$) were found between the VT and THI in SLICK and WT cows, respectively. In general, environmental conditions had a greater association with the vaginal temperature in wild type cows than in their slick-haired counterparts, and in trial 2 than in trial 1. However, vaginal temperature only differed between hair type groups during a limited period.

Key Words: slick-haired Holstein cow, thermoregulation, thermal humidity index

T306 Relationship between daily milk production and core-body temperature of lactating Holstein cows. E. O. S. Batista*[1,2], C. Collar[1], P. D. Carvalho[3], N. Silva-Del-Rio[1], P. S. Baruselli[2], and A.H. Souza[1], *[1]University of California, Tulare, CA, [2]University of Sao Paulo, Sao Paulo, SP, Brazil, [3]University of Wisconsin, Madison, WI.*

Our objective was to study the daily variation in the core-body temperature (CBT) of lactating dairy cows under heat stress. Holstein cows (8 multiparous and 5 primiparous) producing 37.1 ± 2.9 kg/d and at 234 ± 15 DIM were used in the study. Cows were milked twice daily and located in a commercial dry-lot facility in California. The CBT of all cows was synchronously measured at every 10 min throughout 7 d from August 7 to August 13, 2014, using a temperature data logger (iButton, Maxim Integrated) attached to an intravaginal CIDR device. Body condition scores were recorded at device insertion. Environmental temperature was collected at 10 min intervals throughout the experimental period (Average = 29.0°C; Max = 38.9°C; Min = 18.3°C). Individual milk production was recorded daily and extracted from the herd's management software (Dairy Comp-305). Two cows lost their device and records were not used. Data were analyzed by repeated measures using the GLIMMIX procedure of SAS. In some analysis, cows were categorized into 2 milk production categories (high and low) based on milk production average. Parity, days in milk, and body condition score were not associated with CBT ($P > 0.10$). In contrast, time of the day and milk production influenced CBT ($P < 0.01$). Although large individual CBT variations were observed, further analysis comparing cows with high vs. low milk production indicated that maximal CBT was reached later in the afternoon and was greater for high compared

with low producing cows ($P = 0.04$). More importantly, high producing cows remained for a longer period (45.1% of their daily time budget, $P < 0.01$) with their CBT above the 39.9°C threshold compared with the low producing cows (27.1% of their daily time budget). In conclusion, cows with greater daily milk production seem to be more susceptible to heat stress. Thus, cooling systems should be designed to match milk production requirements.

Key Words: milk production, heat stress, body temperature

T307 Effect of castration and multi alleviation treatment on growth and physiological responses in Korean cattle. Seung Ju Park, Min Yu Piao, Hyun Jin Kim, Hyeok Joong Kang, and Myunggi Baik*, *Seoul National University, Gwanak-gu, Seoul, Republic of Korea.*

This study was performed to determine the effects of castration and multi alleviation treatment (MAT) on growth and physiology in Korean cattle male calves. Forty Korean cattle calves (BW = 197.0 kg; 188 d of age) were allocated to 4 treatments (n = 10/group): castration with MAT (12 ml of 2% lidocaine hydrochloride injection for local anesthesia in the scrotum and 2 mg/kg body weight of 50 mg/ml flunixin meglumine injection for antiinflammation in the muscle of the buttock immediately before castration), castration without MAT, no castration with MAT, and no castration without MAT. Surgical castration was performed using a Newberry knife and Henderson castrating tool. The 0.9% NaCl solution was used for non-drug groups instead of MAT. Blood was collected immediately before castration and drug injection (0 h) and 0.5 h, 6 h, 1 d, 3 d, 7 d, and 14 d after castration, body temperature was measured at same time points. Food intake was recorded daily, and body weight was measured at 0 d before castration and 14 d. Average daily gain was analyzed using 2-way ANOVA, using mixed model procedure of SAS. Other variables were analyzed in a repeated measures model using PROC GLIMMIX of SAS. Castration tended to decrease ($P = 0.07$) average daily gain (castration group 0.58 kg/d vs. non-castration group 0.79 kg/d), but MAT did not affect weight gain. Castration increased ($P < 0.001$) body temperature only at 1 d after castration, but not at other time points. Castration increased ($P < 0.001$) plasma cortisol concentrations (castration group 102 ng/mL vs. non-castration group 49 ng/mL) only at 0.5 h after castration, but not at other time points. MAT did not affect cortisol concentrations. Castration increased ($P < 0.05$) plasma nonesterified fatty acid (NEFA) concentrations at 0.5 h, 1 d, and 14 d after castration, but MAT did not affect NEFA concentrations. In conclusion, castration of bulls increased temporally circulating cortisol and NEFA concentrations and tended to decrease forage intake and retard animal growth, but neither increased cortisol concentration nor retarded growth caused by castration were alleviated by MAT.

Key Words: alleviation treatment, castration, cortisol

T308 The effect of exercise in pregnant Holstein heifers on fitness and heat tolerance. Jessica Winkler* and Timothy G. Rozell, *Kansas State University, Manhattan, KS.*

Heat stress negatively affects milk production and feed intake of dairy cows resulting in efforts to find ways of reducing heat stress. A possible avenue could be implementing an exercise regimen to improve thermoregulatory capacity. Our objective was to determine if exercising late gestation heifers in a warm climate could physiologically improve thermoregulation. Pregnant Holstein heifers (n = 25) were randomly assigned to 3 treatment groups: exercise (EX; n = 8), exercise control (EC; n = 8; walked with exercise heifers to exerciser but held in a holding pen), and sedentary control (SC; n = 9). Exercise regimens were implemented 4–5 d per wk in the morning for approximately 30–45 min for 8 wk using a motorized panel walker to control duration and speed. Data were collected on fitness test d 0, 28, and 56 of the experiment in which heifers were pushed to reach their maximum speed and time before exhaustion. Pre- and post-exercise blood samples, intra-vaginal temperature, duration, final speed, and heart rate were collected. During wk 2 and wk 6 of the experiment, intra-vaginal temperature devices recorded temperature for 2–4 d and all data were analyzed using PROC GLIMMIX. Duration (min) and final speed (kph) were significantly greater ($P = 0.04$, $P = 0.009$) at d 28 for the EX compared with the SC (duration = 19.31 vs. 13.81; final speed = 6.65 vs. 5.20), implying fitness was achieved. During wk 6, EX heifers spent a smaller percentage of time in Zone 3 (temperature > 39.17°C) than EC during the hottest h of a d (7% vs. 76%; $P = 0.045$), and both EX and EC heifers also spent less time in Zone 3 compared with the SC during the cooler part of a d ($4.16e^{-}17\%$ vs. 20%; $P = 0.02$). During the first wk of lactation, milk protein tended ($P = 0.06$) to be greater in EX than in SC heifers (3.88 vs. 3.57). There was no significant difference between pre- and post-serum samples (Na^+, base excess, ionized Ca, glucose, lactate, pCO_2, pO_2) and heart rate collected on fitness days. Based on results from our pilot study, it appears that heifers undergoing an exercise regimen may be able to improve their ability to regulate a homeostatic body temperature.

Key Words: heat acclimation, cattle exercise

T309 Comparative efficacy of dexamethasone or corticotropin releasing hormone and vasopressin administration as a model to induce chronic physiological stress in beef cattle. Nathan D. May*[1], Jeff A. Carroll[3], Nicole C. Burdick Sanchez[3], Shelby L. Roberts[1], Heather D. Hughes[1], Paul R. Broadway[3], Kate P. Sharon[2,3], Michael A. Ballou[2], and John T. Richeson[1], *[1]Department of Agricultural Sciences, West Texas A&M University, Canyon, TX, [2]Department of Food and Animal Sciences, Texas Tech University, Lubbock, TX, [3]USDA-ARS, Livestock Issues Research Unit, Lubbock, TX.*

The objective of this study was to delineate a model for chronic stress by evaluating physiological and hematological alterations in cattle administered: 1) 0.5 mg/kg BW dexamethasone (DEX) once daily at 10am for 3 d consecutively, or 2) 0.3 µg/kg BW corticotropin releasing hormone (CRH) and 1 µg/kg BW vasopressin (VP) twice daily at 10am and 10pm for 3 d consecutively. Twelve (n = 6) beef steers (BW = 389 ± 11kg) were stratified by BW, assigned randomly to treatment, and fitted with indwelling rectal temperature (RT) devices and jugular catheters, before relocation into individual stanchions in an environmentally-controlled facility. Blood samples were collected at 0.5-h intervals from −2 to 6 h relative to each 10am challenge. Serum was analyzed for cortisol concentration and whole blood samples were evaluated to profile hematological responses via automated hemocytometer. All data were analyzed using PROC MIXED with repeated measures and steer was the subject. A trt × time interaction ($P < 0.001$) was observed for RT, which increased transiently in both treatments following the 10am challenge time each d. However, the magnitude of the febrile response was greater ($P < 0.001$) for DEX. Likewise, serum cortisol increased transiently in response to both challenges, yet the cortisol increase was more pronounced for CRH-VP (trt × time; $P < 0.001$). On d 1, cortisol was 24.8 and 30.4 ng/mL for DEX and CRH-VP, respectively (trt × d; $P < 0.001$). Total peripheral blood leukocytes (PBL) were increased in both treatments; however, the PBL concentration was greater for DEX vs. CRH-VP from h 5 to 54 (trt × d; $P < 0.001$). The total PBL was associated with a corresponding increase in circulating neutrophils observed for DEX, but not CRH-VP on d 2 (12.2 vs. 7.2 × 103/µL) and 3 (11.7

vs. 6.6 × 103/μL; trt × d; $P < 0.001$). In contrast, eosinophils decreased ($P < 0.001$) sharply for DEX on d 1 and remained undetectable through d 3. These data suggest that exogenous administration of both DEX and CRH-VP alter RT and cortisol variables indicative of stress, while DEX may more strongly inhibit neutrophil translocation from peripheral blood, a key component of stress-induced immunosuppression.

Key Words: cattle, immunosuppression, stress

T310 Intraperitoneal administration of lipopolysaccharide induces differential expression of mRNA encoding inflammatory mediators in the oviducts of mice. Katheryn L. Cerny* and Phillip J. Bridges, *University of Kentucky, Lexington, KY.*

Infection with gram-negative bacteria is a major cause of aberrant inflammation in the oviduct; consequences can include tubal infertility and/or ectopic pregnancy. Understanding inflammatory responses due to bacterial infection is necessary for the development of novel treatment options that specifically target inflammatory responses. Our objective was to test the hypothesis that intraperitoneal (IP) administration of *E. coli*-derived lipopolysaccharide (LPS) induces the expression of inflammatory mRNAs in the mouse oviduct. On the day of estrus, 6–8 week old CD1 mice (n = 4/treatment) were treated IP with 0 (control), 2 μg (low dose) or 10 μg (high dose) of LPS from *E. coli* serotype 055:B5 in 100 mL of PBS. Mice were killed 24 h later and the oviducts collected for determination of inflammatory gene expression by a targeted nanostring approach using the nCounter GX Mouse Inflammation Kit (Nanostring Technologies, Seattle, WA). Real-time PCR was used to validate selected mRNAs. The effect of LPS was evaluated by one-way ANOVA and treatment means of differentially expressed mRNA ($P < 0.05$) were separated using a post-hoc LSD test. In total, 56/179 targeted genes were affected by treatment ($P < 0.05$). Pairwise comparison revealed 8 mRNA differentially expressed in control vs. low dose, 50 mRNAs in control vs. high dose and 43 mRNAs in low vs. high dose ($P < 0.05$). These results indicate that systemic treatment with LPS induces inflammation in the oviducts of mice; this study provides evidence of a new model to investigate the regulation of oviductal inflammation in the future.

Key Words: oviduct, inflammation, immune response

T311 Effects of lipopolysaccharide (LPS)-induced inflammatory response on early embryo survival in ewes. M. R. Graham*[1], E. C. Bowdridge[1], S. A. Bowdridge[1], I. Holásková[1], T. H. Elsasser[2], and R. A. Dailey[1], *[1]West Virginia University, Morgantown, WV, [2]United States Department of Agriculture-Agricultural Research Service (USDA-ARS), Beltsville Agricultural Research Center (BARC), Beltsville, MD.*

The effects of proinflammatory pathway triggers on pregnancy success was assessed in early pregnant ewes. Effects of endogenous cytokine activation (via LPS), direct exogenous tumor necrosis factor-α (TNF-a) and TNF-a+Dexamethasone (TNF-a+Dex) administration were compared in regard to pregnancy rate. Dorset × Texel ewes (n = 38) were synchronized for estrus and bred to fertile rams (d 0). On d 6, ewes were assigned to receive via the jugular 2.5 mL containing either PBS (n = 9), 2.5 μg/kg LPS (n = 9), 1 μg/kg TNF-a (n = 10) at 0 and 30min, or 2.5 μg/kg of LPS after 3.5 mL containing 0.14 mg/kg BW im Dex (n = 10) at −12h and 0h. Behavioral changes and rectal temperatures (BT) were recorded before challenge and hourly for 12 h. Jugular blood was collected before challenge, every 30 min for 3 h, hourly until 12 h, at 24, 36, and 48 h, and on d 10 and d 26 for progesterone. At d 26, pregnancy was examined using ultrasonography. The proportion of ewes pregnant was analyzed by Chi-squared and Fisher's exact test with preplanned contrasts. Other data were analyzed by repeated measures ANOVA. Treatment with LPS resulted in peak BT at 4 h (40°C; control 38°C; $P < 0.05$), increased lethargy, mucosal response, white blood cell (WBC) count (9.8×10^6; control 9.1×10^6; $P < 0.05$), serum TNF-a (0.9 ng/mL; control 0.2 ng/mL; $P < 0.05$). Treatment with LPS+Dex resulted in peak BT at 4 h (39°C), but was blunted by Dex. Additionally, Dex blocked mucosal and lethargic responses and attenuated LPS-induced increases in TNF-a and did not improve pregnancy rate compared with LPS alone ($P > 0.05$). TNF-a treatment increased BT at 1 h (39°C), did not induce lethargy; 5/10 ewes showed a mucosal response; and WBC counts did not change but high concentrations of TNF-a were not sustained. More control and TNF-a ewes (15/19) were pregnant than LPS or LPS+Dex ewes (9/19; $P = 0.045$). In summary, an inflammatory response was elicited by LPS and resulted in reduced proportion of ewes pregnant regardless of Dex administration. Treatment with TNF-a did not affect proportion of ewes pregnant, perhaps due to low serum TNF- a levels or different pathway components stimulated by LPS. These data show that a sustained inflammatory response to LPS decreased pregnancy rate and may involve a complex cascade of inflammatory mediators elicited by LPS.

Key Words: LPS, embryonic loss, sheep

T312 Intramammary lipopolysaccharide induces increased luteal mRNA abundance of tumor necrosis factor alpha and toll-like receptor 2 but not luteolysis in dairy cows. Johannes Lüttgenau[1], Olga Wellnitz[1,2], David Kradolfer[3], Christina Zbinden[2], Susanne E. Ulbrich[3], Rupert M. Bruckmaier*[2], and Heiner Bollwein[1], *[1]Clinic of Reproductive Medicine, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland, [2]Veterinary Physiology, Vetsuisse Faculty, University of Bern, Bern, Switzerland, [3]ETH Zurich, Animal Physiology, Institute of Agricultural Sciences, Zurich, Switzerland.*

Recently, we observed that the application of *Escherichia coli* lipopolysaccharide (LPS) into the mammary gland induce severe clinical symptoms (pyrexia, increased cardiac and respiratory frequencies), an intense stress, and systemic immune response (increased plasma cortisol and haptoglobin concentrations). However, no obvious suppression of luteal size, blood flow, and progesterone secretion in lactating dairy cows were detectable. To investigate possible effects of intramammary LPS challenge on gene expression in luteal tissue, biopsies of the corpus luteum (CL) were analyzed. On d 9 of the estrous cycle (d 1 = ovulation), 8 lactating dairy cows received once 200 μg LPS (dissolved in 10 mL NaCL) and 6 cows received once 10 mL saline (control) into one quarter of the mammary gland. Luteal tissue was collected for biopsy 24 h before and 6 h after treatment, using an ultrasound-guided semi-automatic high-speed biopsy needle. RT-qPCR was applied to assess the mRNA expression of toll-like receptors (*TLR2*, *TLR-4*), tumor necrosis factor α (*TNFα*), steroidogenic factors (*STAR*, *3βHSD*), and factors related to apoptosis (*CASP3*) and prostaglandin synthesis (*PGES*, *PGFS*, *FP*). Data were normally distributed (Shapiro-Wilk-test) and Student's *t*-test was used for dependent comparisons of repeated measures. LPS challenge increased ($P \leq 0.05$) mRNA abundance of *TNFα*, *TLR2* and *CASP3*, whereas *TLR4*, *STAR*, *3βHSD*, and prostaglandin-related factors did not change significantly. In control cows, only mRNA expression of *CASP3* was increased ($P \leq 0.05$) at 6 h after compared with 24 h before treatment. Our results indicate that LPS-induced mammary immune

response increases luteal TNFα and TLR2 synthesis but do not induce luteolysis in the bovine CL.

Key Words: lipopolysaccharide, mammary gland, corpus luteum

T313 Different weaning age changes piglets blood parameters related to stress prior anxiety test. Patricia M. Ramos*[1,2], Maicon Sbardella[1,2], Marcelo A. S. Coutinho[1,2], Valdomiro S. Miyada[1,2], and Eduardo F. Delgado[1,2], *[1]"Luiz de Queiroz" College of Agriculture, Piracicaba, SP, Brazil, [2]University of São Paulo, São Paulo, Brazil*

This study aimed to identify behavior and metabolites changes in piglets after different weaning when submitted to anxiety test. Thirty-two piglets were separated in 2 homogeneous groups, regarding sex and weight, within 2 pairs of sows based on same parturition date. Half of each sow litter was submitted to different weaning ages (days): 23 (early weaning - EW) and 30 (normal weaning - NW). One week after the NW date, piglets at the same age were submitted to an anxiety test (ATest) in elevate plus maze. Piglets were weighed and blood sampled on the day before and at weaning and also before and after the maze. Blood glucose (mg/dL), lactate (mg/dL) and protein (g/dL) concentrations were measured. ATest was recorded for 3 min and analyzed. GLM was run and means compared by Tukey's test at 0.05. Average daily gain during the week after early weaning were greater ($P < 0.01$) for NW animals, that were still suckling, compared with EW animals. This scenario was inverted in the week after NW date. The blood glucose before weaning was greater ($P < 0.01$; SEM ± 2.26) for the EW (127.62) than for NW (114.28) piglets. Those differences were still present ($P < 0.01$; ± 3.11) in the blood before ATest for EW and NW at 115.92 and 101.54, respectively. Differences were not observed neither after weaning nor after ATest. Likewise, lactate was greater ($P < 0.05$; ± 4.48) in EW vs NW animals before weaning and ATest, with 53.55 vs 38.48 and 66.21 vs 35.09 (SEM ± 6.32), respectively. Inverted after weaning, where NW (52.85) animals presented greater ($P < 0.05$; ± 4.43) lactate compared with EW (39.87). Lactate did not change between groups after ATest. Total protein was different ($P < 0.05$; ±0.12) between EW and NW animals only after weaning, with 5.48 and 5.06, respectively. There was no difference between the EW and NW on the variables recorded in ATest. After anxiety test blood glucose was negatively correlated (−0.35; $P < 0.01$) to the entry in open arms. Early weaning changes blood parameters at weaning and when animals are submitted to novel environmental challenges. Blood glucose concentration is negatively associated with more active and less anxious animals in maze test.

Key Words: early weaning, metabolites, maze

T314 Conjugated linoleic acid (CLA) isomers strongly improves the redox status of bovine mammary epithelial cells (BME-UV1). Loredana Basiricò[1], Arnoulf Troscher*[2], Daniele Dipasquale[1], Patrizia Morera[1], Andrea Serra[3], Marcello Mele[3], and Umberto Bernabucci[1], *[1]Dipartimento di scienze e tecnologie per l'Agricoltura, le Foreste, la Natura e l'Energia, Università degli Studi della Tuscia, Viterbo, Italy [2]BASF-SE, Ludwigshafen, Germany, [3]Dipartimento di Scienze Agrarie, Alimentari e Agro-ambientali, Università di Pisa, Pisa, Italy.*

To date, there is no information available concerning the relationship between administration of CLA and changes in oxidative status of bovine mammary gland. The aim of this study was to assess in vitro the role of CLA in cell protection against the oxidative stress of bovine mammary cells. The uptake rates of CLA in BME-UV1 cells at 3 h and 48 h were tested using DAD HPLC analysis. BME-UV1 cells were treated with complete medium containing 50 μ*M* of *cis*-9,*trans*-11 CLA (c9,t11), *trans*-10,*cis*-12 CLA (t10,c12) and CLA Mixture (50% c9,t11 and 50% t10,c12). After 48 h from addition of CLA, cell samples were collected for determining oxidative markers such as nicotinamide adenine dinucleotide phosphate (NADPH), glutathione (GSH/GSSG), thiobarbituric acid reactive substances (TBARS), cytoplasmic superoxide dismutase (SOD), glutathione peroxidase (GPx1), glutathione S-transferase (GST) and glutathione reductase (GR) using commercial kits. The mRNAs quantification of antioxidant enzymes (SOD, GPx1, GST and GR) was performed by rt-PCR. The potential protection of CLA against H_2O_2-induced oxidative stress was assessed by XTT assay after 48h of pre-treatment with CLA and 3h with H_2O_2. The data were analyzed by ANOVA and differences were declared significant at $P < 0.05$. The results showed that the uptake rates of CLA in cells increased from 3 (26.54%) to 48h (73.95%). CLA increased ($P < 0.01$) the concentration of reduced GSH (CLA 17.25 vs control 11.73 μM) and NADPH (CLA 0.28 vs control 0.20 μM), mostly in cells treated with t10,c12 (0.50 μM). The enzymatic antioxidant activity of GR (CLA 7.00 vs control 11.82 U/L) was decreased ($P < 0.01$) whereas GSPx1($P < 0.01$), GST ($P < 0.05$) and SOD ($P < 0.01$) activities (CLA 19.85, 0.70, 0.05 vs control 7.07 U/L, 0.61 U/mL, 0.02 U/mL, respectively) were increased in cells treated with CLA. Lower levels of TBARS (CLA 1.50 vs control 1.96 μM/MDA equivalent) were observed in cells treated with CLA. CLA had not any substantial effect on gene expression of antioxidant enzymes. All CLA isomers were able to enhance ($P < 0.01$) cell resistance against oxidative stress (CLA 2.85 vs control 2.65 O.D.). Findings of the present study corroborate the antioxidant role of CLA, in particular of t10,c12 isomer, by improving of redox status in cells, and might be of help during physiological oxidative stress situations such as the periparturient period in dairy cow. This work was funded by BASF-SE.

Key Words: conjugated linoleic acid, bovine mammary cell, oxidative stress

T315 Antioxidant potential in the gut of juvenile fish fed with lyophilized bovine colostrum. Debora B. Moretti*, Wiolene M. Nordi, Thaline M. P. Cruz, Jose Eurico P. Cyrino, and Raul Machado-Neto, *University of São Paulo, Piracicaba, São Paulo, Brazil.*

Bovine colostrum is a rich source of immunological factors and contains a large concentration of antioxidant components that can affect gut physiology. Thus, the antioxidant potential was evaluated in the gut of juvenile pacu (*Piaractus mesopotamicus,* Holmberg, 1887), an omnivorous fish, and dourado (*Salminus brasiliensis,* Cuvier, 1816), a carnivorous fish, fed with diets containing 0, 10 and 20% of lyophilized bovine colostrum (LBC) for either 30 or 60 d. The antioxidant capacity in the intestinal tissue was assessed by the determination of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and by the oxygen radical absorbance capacity (ORAC value expressed as equivalent trolox in μ*M*/mg of protein). Experimental design was completely randomized with treatments arranged as a 3 × 2 factorial, considering the 3 diets and the 2 periods as main effects. If F value was significant, Tukey test was used for comparisons between means ($P < 0.05$). In pacu, interaction between diet and period was observed to SOD ($P < 0.05$), juveniles fed 0 and 10% LBC did not change enzyme activity at 30 (423 ± 27 and 692 ± 42 U/mg of protein, respectively) and 60 d (504 ± 14 and 890 ± 57 U/mg of protein, respectively), whereas juvenile fed 20% LBC showed higher enzyme activity at 60 d (1122 ± 71 U/mg of protein) compared with 30 d (595 ± 61 U/mg of protein). GPx was not influenced by diet and period ($P > 0.05$) and CAT was

affected only by period ($P < 0.05$), showing higher activity at 60 d (891 ± 86 U/mg of protein) compared with 30 d (437 ± 99 U/mg of protein). The ORAC was affected by diet and period ($P < 0.05$); the juveniles fed 10% LBC (505 ± 100 μM/mg) had greater oxygen absorbance capacity than the juveniles fed 20% LBC (348 ± 104 μM/mg), and the value was greater at 30 (628 ± 61 μM/mg) than at 60 d (234 ± 31 μM/mg). In dourado, GPx was affected by period ($P < 0.05$), showing greater activity at 30 (224 ± 30 U/mg of protein) than at 60 d (94 ± 19 U/mg of protein). SOD, CAT and ORAC value were not affected by diet and period ($P > 0.05$). Inclusion of lyophilized bovine colostrum improved SOD activity in the gut of juvenile pacu, an omnivorous fish, indicating a possible protective action of this lacteal secretion.

Key Words: colostrum, antioxidant enzyme, oxygen radical absorbance capacity (ORAC)